# Beyond Classes of Service
## - a new opportunity for service providers

## EXECUTIVE SUMMARY

Telcos face increasing pressure to offer high-value services that can be provided reliably and consistently. As enterprise customers continue to introduce applications over their WAN, they become increasingly concerned about whether application performance can be maintained and optimized, particularly for mission-critical applications.

Each of these applications has its own application performance criteria. For example, transactional applications such as enterprise resource planning applications exchange little data but are very sensitive to transfer delays, real-time flows such as VoIP require low jitter, and file transfers such as e-mail and FTP traffic are usually less critical and not delay sensitive but they require high levels of bandwidth.

Service providers have been offering their clients various Classes of Service (CoS) as a way to differentiate the treatment of different applications. Although CoS is a step in the right direction, it has a number of limitations that make it a best-effort approach that cannot guarantee the performance of critical applications.

To be able to offer their clients truly application-centric services with Application Service Level Agreements (SLAs), service providers are going to require a new generation of traffic management tool. Ipanema Technologies, through its Business Network Optimization solutions, offers telcos a scalable system that transcends the limitations of CoS and allows them to offer Application SLAs.

Using the Ipanema System, telcos can offer a variety of application-centric services. By doing so, not only will they address the number one concern of their clients—application performance guarantees—but they will also increase their margins, improve customer loyalty and protect themselves from the strategic threat of large IT outsourcers.

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# MARKET TRENDS

**Network managers are faced with several trends that make the WAN an increasingly key IT infrastructure:**

1. **Data Center Consolidation**
2. **An Increasing Number Of Applications**
3. **More Non-Critical TCP/IP Traffic**
4. **Voice, Video And Data Traffic Are Converging Over The Same Infrastructure**
5. **Pressure To Keep Telecom Costs Under Control**

## 1. Data Center Consolidation

A great deal has been said and written lately about data center consolidation. The main argument has been that maintaining the right level of staff at branches offices is both expensive and challenging. Many network and IT administrators feel that consolidating servers also decreases the probability of security breaches. In essence, data center consolidation is driven by two powerful trends:

- Costs reduction
- Security

However, data center consolidation creates a challenge of its own. According to a September, 2005 *Computerworld* survey of large U.S. companies, "*slower or unacceptable application response time/performance*" is the number one challenge cited by network managers. Unless this issue can be addressed properly and cost effectively, the jury is still out on whether the trends driving data center consolidation will accelerate. In fact, on that same survey 43.7% of the respondents preferred deploying more servers at branch offices while only 42.5% favored further data center consolidation.

## 2. An Increasing Number Of Applications

Regardless of whether the trend towards data consolidation will accelerate or not, over half of the employees of large organizations are located at branch offices and most organizations cannot afford to have servers at every site. Therefore, remote office personnel increasingly depend on WAN performance to drive their productivity. Consequently, the number of critical applications running over the WAN continues to increase. An IDC survey of network managers of large European companies conducted in November 2005 showed that on average there are 55 applications running over their corporate WANs and that 54% of respondents predict that this number will go up in the months to come. The success of a company like Citrix that provides on-demand access to applications is a testimony to this trend.

## 3.  More Non-Critical TCP/IP Traffic

 While WANs are transporting an increasing number of critical business applications, TCP/IP traffic is booming and most of this TCP/IP traffic is made of non business-critical applications such as web surfing. Usually, the traffic over the WAN is divided between 40-to-45% for web surfing, 35-to-45% for e-mail and between 10-to-15% for critical business applications. Most of the capacity is therefore consumed by non-critical applications. The volume of this traffic (if not controlled) tends to increase on average by 25% per year, causing greater impact on the performance of critical applications.

## 4. Voice, Video And Data Traffic Are Converging Over The Same Infrastructure

 The much-touted convergence between voice, data and video traffic is finally happening. A Yankee Group survey quoted in the March 2006 issue of *Capacity magazine* found that 93% of European enterprises surveyed have IP telephony activities underway or planned, and 16% of these enterprises have already fully deployed IP telephony. The cohabitation of sensitive traffic such as VoIP and video with critical business applications and other non-critical TCP/IP traffic places tremendous strains on WAN performance.

Indeed, each category of application will have a different behavior and require a different treatment. Transactional applications such as SAP and thin-client applications such as Citrix (which are often critical applications for an organization) exchange little data but are very sensitive to transfer delays. On the other hand, real-time flows such as VoIP require low jitter, and file transfers (i.e. e-mail, FTP) are usually less critical and not delay sensitive but they require high levels of bandwidth. Applications will increasingly create new demands on the network; for example, the emergence of VoIP requires an ability to optimize meshed flows.

## 5. Pressure To Keep Telecom Costs Under Control

 While network managers are faced with increased traffic and the obligation to provide satisfactory levels of application performance, they remain very cost sensitive. According to a recent survey of global organizations by ICM Research, network cost reductions remain the top priority for organizations in the next two years, and according to 76% of the respondents, "lowest overall cost" is the top key influencing factor in network outsourcing decisions. Telcos can therefore not expect enterprise customers to view continual bandwidth increases as a viable option.

# SHIFT OF FOCUS FROM INFRASTRUCTURE TO APPLICATION PERFORMANCE

As a result of these trends, the infrastructure manager's focus is shifting. While in the past the primary concern was to provide a stable infrastructure, the main concern now (according to a March, 2005 Forrester Research Study of IT infrastructure managers at $1 billion-plus companies) is "*consistent end-to-end application and service performance guarantees*» according to an overwhelming 87% of respondents.

But while guaranteeing performance of applications is the ultimate goal and the overarching theme, there is more to the story. To provide a satisfactory overall end-user application performance experience, organizations also need to be able to monitor application performance in real time and anticipate the impact of network changes. A recent IDC survey showed the list of features deemed useful by network managers; however, it also showed that network managers felt that their existing network management tools did not allow them to benefit from these features.
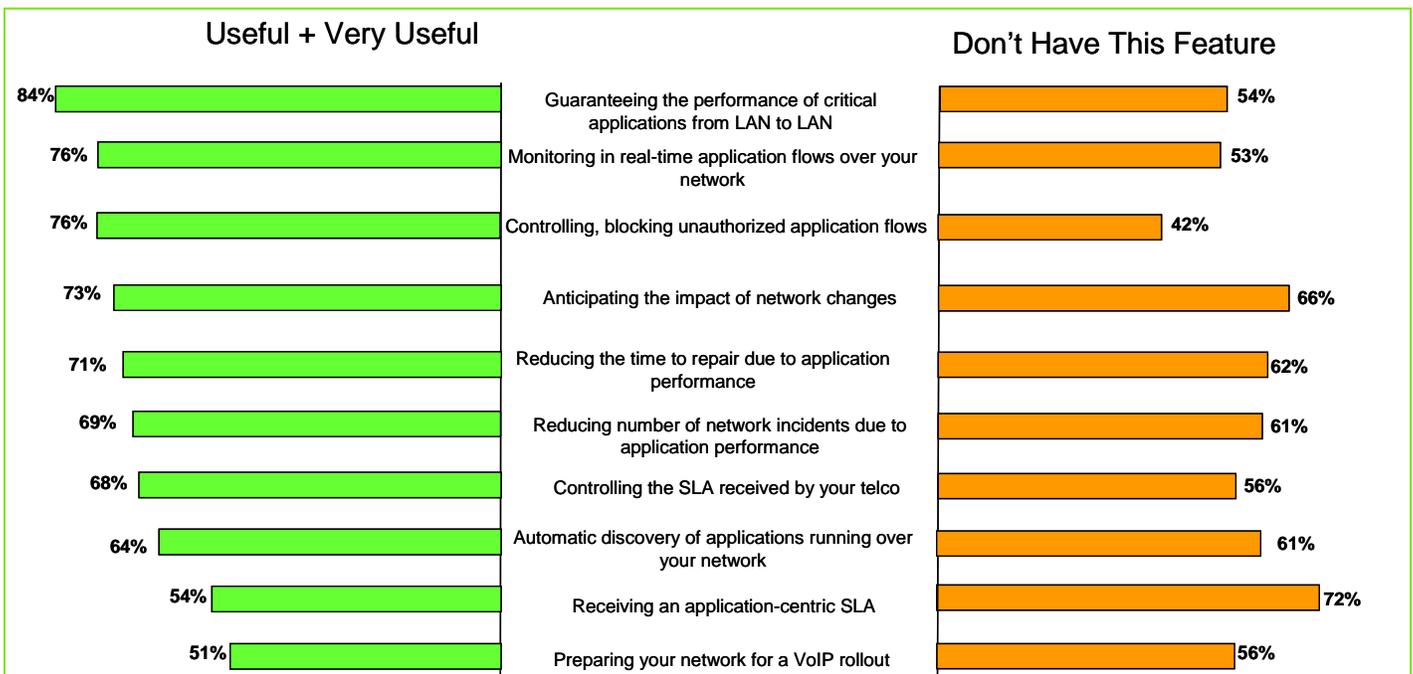
| Useful + Very Useful | | Don't Have This Feature |
|---|---|---|
| 84% | Guaranteeing the performance of critical applications from LAN to LAN | 54% |
| 76% | Monitoring in real-time application flows over your network | 53% |
| 76% | Controlling, blocking unauthorized application flows | 42% |
| 73% | Anticipating the impact of network changes | 66% |
| 71% | Reducing the time to repair due to application performance | 62% |
| 69% | Reducing number of network incidents due to application performance | 61% |
| 68% | Controlling the SLA received by your telco | 56% |
| 64% | Automatic discovery of applications running over your network | 61% |
| 54% | Receiving an application-centric SLA | 72% |
| 51% | Preparing your network for a VoIP rollout | 56% |

Figure 1. IDC survey results.
Source: *Application Traffic Management: Taking Control of Your Network, January 2006*

## Highlights Of The IDC Survey

Market research firm IDC conducted a survey in December of 2005 that was commissioned by Ipanema Technologies. Representatives of 107 multinational companies with more than 1,000 employees were interviewed. Each of the interviewees had at least partial responsibility for his/her company's WAN strategy and choice of services. The major findings were:

The WAN is an essential component of a company's operations, according to 97% of the interview subjects.

- The demands on the WAN will increase within the next 24 months. 88% said that traffic will increase, 54% said that the number of applications will increase and 46% said the number of sites supported by the WAN will increase.
- To cope with increasing demands, network managers plan to increase their network capacity and/or acquire network management tools.
- All the features of a traffic management tool are deemed useful but a majority of network managers do not possess the technology to benefit from them, and 47% are willing to acquire them as a service.

# TRADITIONAL ANSWERS OFFERED BY TELCOS

Telco offerings have evolved a great deal in the last 25 years. A first generation of point-to-point communication based on leased lines and the X.25 protocol was followed by a second generation of technology based on Frame Relay and ATM.

In the last five years, IP networking has been taking over from these older protocols and technologies. Private and public IP networks have become the new standards for enterprise networking. More and more enterprises are migrating toward MPLS Virtual Private Networks (VPNs) to manage all of their application because MPLS makes it easier to manage any-to-any traffic flows.

Whereas the first MPLS VPNs did not differentiate among the different applications, service providers quickly implemented CoS over MPLS networks to offer this differentiation capability. Today most MPLS networks offer three Classes of Service such as a Gold, Silver and Bronze CoS, and some provider offerings go as high as six classes.

CoS addresses the issue of undifferentiated treatment of application flows. By assigning some flows to a higher class, the traffic will spend less time in congested router queues and will receive a minimum amount of dedicated bandwidth. As a result, the higher-class traffic will have lower transfer delays and lower packet losses.

These are some of the limitations of CoS:

Real-time traffic like VoIP—along with delay and loss sensitive protocols like SNA over IP—will benefit from having the lowest possible delay within network routers. Critical transactional applications may also benefit from a higher class than that of non-transactional bandwidth hungry applications.

CoS based on the DiffServ model is in theory simple for a service provider to implement inside the network. It requires the implementation of local priority rules in the routers. As such, it doesn't require a lengthy and costly overhaul of the existing network infrastructures. However, CoS has some important limitations.

1. **Bandwidth Allocation Is Not By User Session**
2. **No Direct Link Between Application Performance And Network Behavior**
3. **CoS has Difficulties Adapting Cost Effectively To Network Changes**
4. **Limited Infrastructure Centric Metrics & SLAs**

## 1. Bandwidth Allocation Is Not By User Session

With CoS, traffic is classified by group of applications (aggregate behavior), but no differentiation is made by user session. Consequently, inside a class the standard TCP rules apply and all flows are handled in the same way. If there are several applications in one class and several users utilizing these applications simultaneously, congestion and deterioration of application performance can still be experienced despite the assigned CoS level. This explains why the CoS approach to QoS is best-effort based; it cannot guarantee the performance of individual application flows.

## 2. No Direct Link Between Application Performance And Network Behavior

CoS offers no direct link between application performance requirements and network behavior. Instead, it is focused mainly around infrastructure behavior and does not address end-to-end user needs. There is a difference between customer expectations that CoS will improve application performance and the fact that actual performance depends on both infrastructure performance and the way the infrastructure is actually used. It is interesting to note that the majority of poor performance helpdesk calls are due to the customer overloading the network rather than to actual network problems. CoS has no way of influencing end-user behavior. The relationship between the ways the CoS levels are established and application performance expectations is tenuous at best.

## 3. CoS has Difficulties Adapting Cost Effectively To Network Changes

CoS is a static approach to WAN optimization. Indeed, the sizes of the Classes of Service and the mapping of applications in different classes are decided at the onset of the service. However, like living organisms WANs are constantly evolving with the addition of new users, new applications, with traffic conditions changing quickly and new sites. The original CoS configuration hypotheses has quickly become obsolete; but revisiting CoS parameters is a tedious and risky task since rules for priority management of classes have to be implemented in all network routers. Thus, there is a natural tendency for client organizations and service providers alike to delay or ignore the changes necessary for optimal use of the network—and as a result WANs remain unoptimized.

## 4. Limited Infrastructure Centric Metrics & SLAs

The SLAs currently offered deal only with statistical measurement of the infrastructure quality, and never with real, end-to-end traffic performance. Measurements are on parts of the network only (such as POP-to-POP) and are generated from router statistics or by test traffic from shadow routers.

In summary, while existing CoS technology has been a step in the right direction, it falls short of end-user expectation in terms of application performance management over the WAN.

# GOING BEYOND CLASSES OF SERVICE WITH THE IPANEMA SYSTEM

To address client expectations, carriers need to go beyond the limitations of CoS. They need to adopt a technology that directly and automatically links application performance objectives and WAN behavior. They need a system that adapts in real-time to the supply and demand interplay between user activities, application performance objectives and network resources. Telcos need a system that provides thorough information on the WANs contribution to application performance and that can "rightsize" bandwidth according to application performance objectives.

With such a system in place, carriers could finally provide the holy grail of networking to their clients. An application-aware network that could offer Application SLAs that guarantees application performances over the WAN. Such a service would not only respond to the number one customer issue of application performance but would also allow telecom operators to move-up the value chain and avoid becoming commodity suppliers of bandwidth.

1. **The Ipanema System**
2. **Benefits of the Ipanema System**

## 1. The Ipanema System

Ipanema's WAN optimization system in essence provides real-time and flexible CoS per user session. It removes all the traditional limitations of CoS and provides the technology that allows service providers to offer application-centric services with Application SLAs.

The Ipanema System is made up of a central management software platform, physical devices and tele-optimized sites. Depending on network configuration, physical devices are deployed at the edges of the network in the relevant branch offices and data centers. The network devices and the central management software form a distributed Autonomic Networking System that delivers the visibility, optimization and rightsizing features.
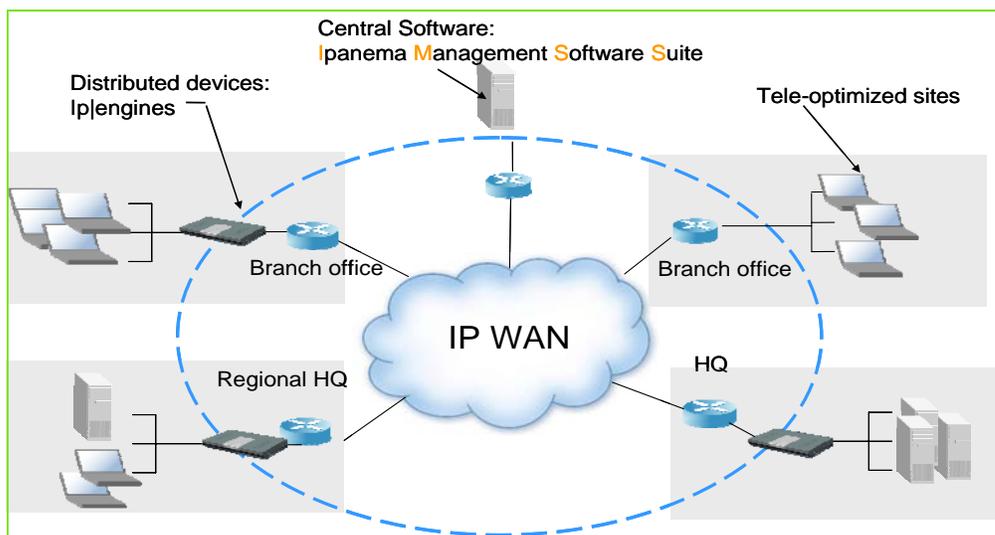


Figure 2. Solution overview

The essence of the Ipanema System is rather simple and can be described in three steps:

1.  A user ranks applications based on how business critical they are, and then determines the performance objectives expected for each application and for each user group.

2. The Ipanema System automatically and "autonomically" optimizes networks resources to match the application performances required using a combination of optimization technologies: Dynamic Bandwidth Allocation, Smart Packet Forwarding, Advanced Compression and TCP Acceleration. It guarantees application performance for critical applications regardless of the network conditions.

3. The Ipanema System provides exhaustive, real-time information about the application performance over the network. If non-critical applications do not reach their performance objectives 100% of the time, it provides precisely the amount of bandwidth required to achieve different levels of performance. In other words, it allows a precise rightsizing of the network according to application performance objectives.

## 2 Benefits of the Ipanema System

**The Ipanema System provides major business benefits to telcos**:

### 2.1 Dynamic Bandwidth Allocation Per User Session
Unlike CoS that allocates traffic flows per group of applications, the Ipanema System shapes and protects flows per session. It applies its optimization technologies (Dynamic Bandwidth Allocation, Smart Packet Forwarding, Compression and TCP Acceleration) at the session level. The Ipanema System can therefore guarantee the performance of each session.

### 2.2 Direct Link Between Application Performance And Network Behavior
Ipanema's optimization rules are driven by application performance objectives, not network policies. They adapt to any network conditions in real-time and do not require lengthy policy parameters programming, such as on the number of simultaneous users, the number of applications, the number of sites, etc. The Ipanema System automates the link between application performance objectives and network behavior.

### 2.3 Fully Flexible and Adaptive To A Variety of Traffic Situations
The objectives-driven nature of the Ipanema System's optimization capabilities allows it to constantly and instantaneously adapt to changes in traffic situations. There is no need to re-configure new policies if new critical applications or new sites have been added, or if the traffic behavior from some specific sites has been permanently or temporarily changed. The system will automatically adapt to all of these changes. This is quite a difference from the rigid, rules-based approach of CoS.

### 2.4 Exhaustive, Application-Centric Measurements
Unlike the SLA metrics associated with CoS, the Ipanema System collects information on a real-time basis on real traffic. It does not rely on statistics from simulated traffic, but instead captures an exhaustive set of metrics for each application session. These metrics include one way and two way, LAN-to-LAN and WAN-to-WAN, throughput, jitter, delay and loss for each session.

### 2.5 Carrier Class SALSA Architecture

Ipanema has developed the SALSA (Scalable, Application-Level Service Architecture) platform specifically for service providers. It covers multiple domains, scales up to hundred-of-thousands of sites, integrates with existing OSS/BSS platforms and offers a secure architecture. It is an ideal architecture for allowing service providers to offer the Ipanema System as a managed service.

### 2.6 Low Cost of Ownership

Again, thanks to its objectives-driven optimization principal, the Ipanema System is scalable and easy to implement, requiring very little manual intervention. It therefore offers the lowest total cost of ownership in the industry.

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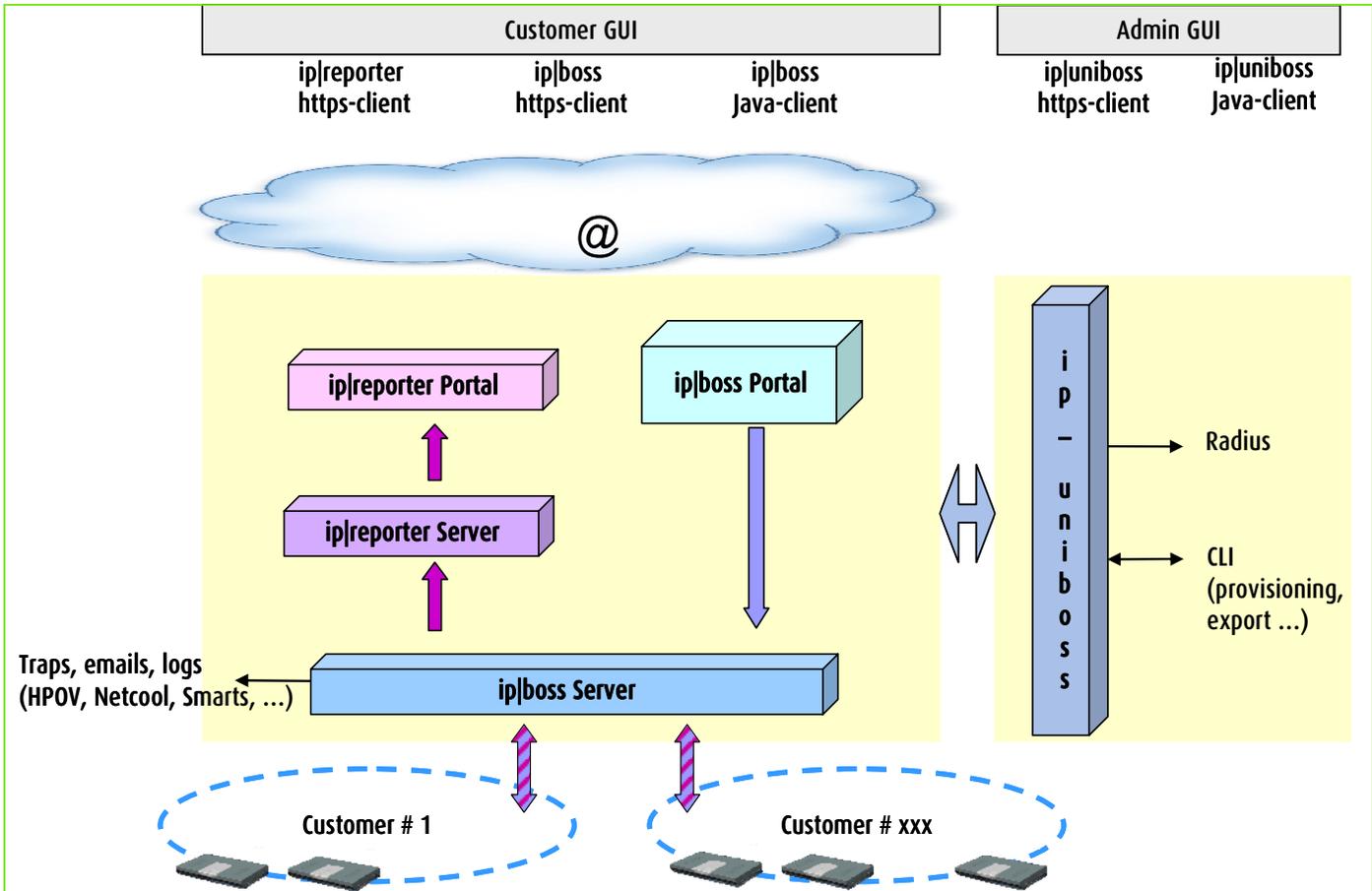


Figure 3. The SALSA platform

# IPANEMA ALLOWS TELCOS TO OFFER APPLICATION-CENTRIC SERVICES

Ipanema allows service providers to offer a new generation of application-centric networking services that directly address their customers' concerns through a highly scalable platform.

BT Infonet was the first service provider to pioneer a new generation of network services by launching in April 2005 its Application Centric VPN. This service is based on a solution developed by Ipanema Technologies, and it allows BT/Infonet to offer its clients dynamic bandwidth allocation whereby each application session is assigned a minimum bandwidth according to the business criticality of the application. In addition, BT Infonet can offer exhaustive application monitoring services.

1. **Offering A Variety Of Application-Centric Services**
2. **Offering Application SLAs**

## 1. Offering A Variety Of Application-Centric Services

Telcos can offer their clients an extensive range of services based on the Ipanema System:

- Discover applications running over the WAN so the enterprise can make informed decisions about bandwidth utilization.

- Block unauthorized applications so that malicious applications can be denied bandwidth or non-critical applications can be allocated limited bandwidth.

- Monitor in real-time the applications flows crossing the WAN.

- Provide 24/7 helpdesk support on application issues so that problems can quickly be tracked, pinpointed and resolved.

- Offer proactive helpdesk support by uncovering and correcting application issues before they affect the end-user experience.

- Deliver detailed monthly reporting on application performance so that enterprise management can understand how applications are performing and how bandwidth is being used per-site.

- Optimize in real-time the WAN resources to meet application performance objectives.

- Anticipate WAN evolution to sustain application performance over time.

- Rightsize the network according to application performance objectives.

**These are just some examples of services that would be useful to customers. However, the most forward-thinking telcos can go even further and fulfill the wishes of their customers by providing capabilities such as Application SLAs and bandwidth on demand.**

## 2. Offering Application SLAs

Telcos have traditionally provided infrastructure SLAs that cover areas such as responsiveness, availability and efficiency. While infrastructure SLAs are appreciated, the real interest of customers is in the performance of their critical applications over the network infrastructure. So the time has come for telcos to think about guaranteeing the contribution of the network to the performance of critical applications and to determine bandwidth size in collaboration with their clients based on the application performance levels that clients expect.

Let us imagine a service in which a telco asks its clients to force-rank its applications by how business-critical they are, with each application ranked in one of four categories ranging from most critical to least critical. For example, a client could decide that Citrix, SAP and VoIP are the most critical applications, followed by some homegrown applications and then followed by e-mail. In this example, web browsing and all other applications would be deemed as non-critical. In addition, for each application, service level objectives in terms of delay, jitter and packet loss would be defined.

The telecommunication service provider could then offer Application SLAs based on these objectives. For example, a telco could guarantee that the service level objectives are met 99.9% of the time for the most critical application categories while they will be met 90% of the time for the other categories. The telco could also suggest the ideal level of bandwidth needed to meet these SLAs and show that the goals for the SLA have been achieved.

As the traffic increases beyond a certain level, the telco could provide the precise justification for bandwidth upgrades, or even better let the customer choose between a bandwidth increase or SLA deterioration. Figure 5 shows a type of report that can be used for making the bandwidth upgrade/application performance tradeoff. In this case, for all the applications to meet their SLAs 100% of the time, a 1,500 Kbit/s link would be required; however if the client is happy with having only the highest priority and most critical applications meet their SLAs 100% of the time while the other ones could meet their SLAs 95% of the time, then only 768 Kbit/s is needed.

| APPLICATION DEFINITION | | | PER USER SERVICE LEVEL DEFINITION (Per metric: Objective – Maximum) | | | |
|---|---|---|---|---|---|---|
| APPLICATION | Criticality | TYPE | BW (kpbs) | DELAY (ms) | JITTER (ms) | LOSS (%) |
| SAP | TOP | Transac. | 50 | 100 - 300 | n/a | 1 - 3 |
| CITRIX | TOP | Transac. | 20 | 100 - 300 | n/a | 1 - 3 |
| VoIP (G729) | HIGH | Real Time | 11 | 50 - 150 | 40 - 80 | 0 - 1 |
| ORACLE | HIGH | Transac. | 20 | 100 - 300 | n/a | 1 - 5 |
| LDAP | MEDIUM | Data Trans. | 20 | 200 - 1000 | n/a | 1 - 5 |
| Web | MEDIUM | Data Trans. | 20 | 200 - 1000 | n/a | 1 - 5 |
| Other | MEDIUM | Data Trans. | 10 | 200 - 1000 | n/a | 1 - 5 |
| FTP | LOW | Data Trans | 25 | n/a | n/a | 1 - 10 |
| NETBIOS | LOW | Data Trans | 50 | n/a | n/a | 1 - 10 |
| EMAIL | LOW | Data Trans | 25 | n/a | n/a | 1 - 10 |

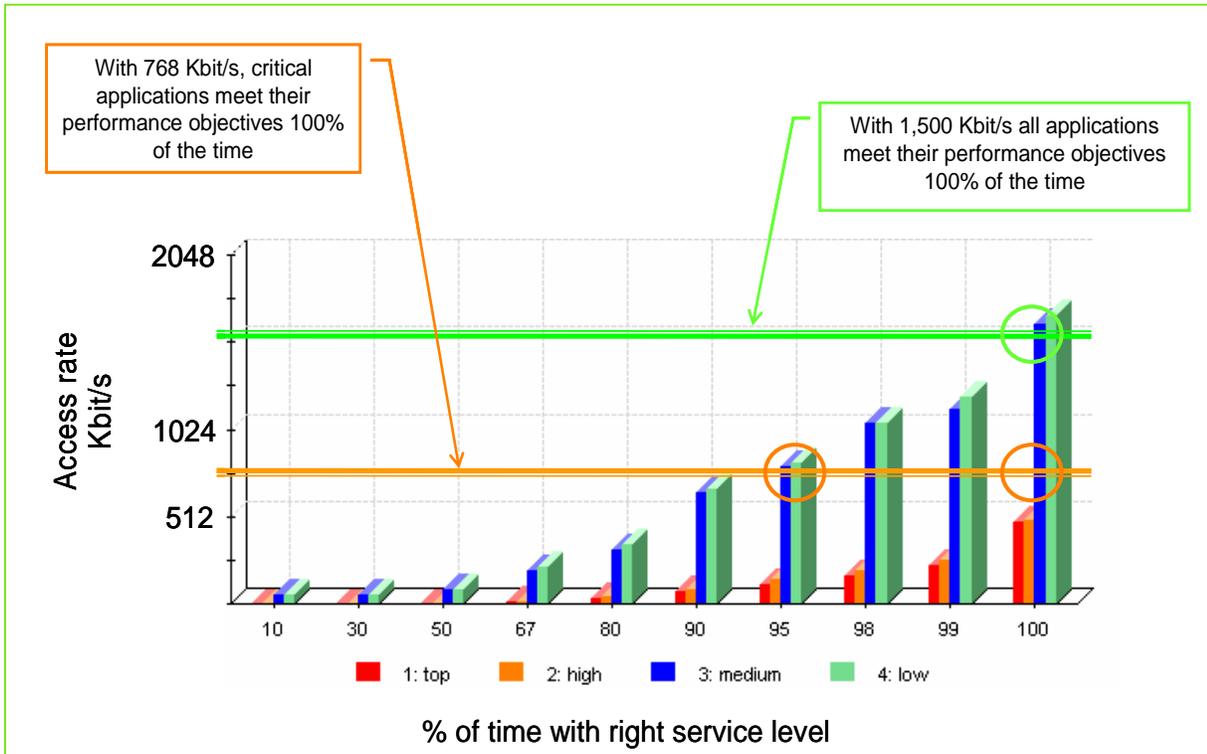Figure 4. Defining application performance objectives

Figure 5: Bandwidth sizing according to Application SLA

Such an offering would create a new level of trust between service providers and their clients. Telcos would no longer be seen as mere bandwidth providers. Instead, they would be seen as providing a highly valuable service; a guarantee of performance for critical applications and a clear cost justification for increased capacity. The Ipanema System is the ideal technology for telcos to build Application SLAs because it:

🔸 Provides universal ways to measure application performance over the WAN through the Mean Opinion Score (MOS) for VoIP and Ipanema's proprietary universal Application Quality Score (AQS) for all other applications.

🔸 Measures and reports on a real-time basis the performance of applications over the WAN, allowing it to validate SLAs.
🔸 Precisely differentiates the performance of an application over the WAN from the performance from server-to-client, thus protecting the telcos area of responsibility.

🔸 Optimizes applications flows according to how business critical they are, allowing SLAs to always be met for critical applications.

🔸 Delivers a direct linkage between application performance and bandwidth size, allowing telcos to define validation rules for their SLAs.

# DIFFERENT PATHS TO MARKET FOR TELCOS

The Ipanema solution can be marketed by telcos either as a separate managed service or as part of a VPN offering to create a premium network.

1. **The Ipanema System As a Managed Service**
2. **The Ipanema System Bundled With a VPN Offering**

## 1. The Ipanema System As a Managed Service

Telcos can adopt the Ipanema System to offer application control as a new kind of managed services offering. They can sell these managed services in a consulting/outsourcing model and price them accordingly.

In this approach, telcos would help clients determine their critical applications and what their performance objectives need to be. They would then offer 24/7 optimization and monitoring services. They would provide proactive helpdesk support, detecting and correcting application performance issues before they impact the entire organization. Telcos would provide monthly reports and analysis suggesting evolution to the WAN if needed. This approach allows network operators to provide upfront and regular network consulting services as well as recurring services such as WAN optimization and monitoring. It is particularly appealing to clients that want to outsource the management of their network and that have limited resources.

For telcos, offering a managed service can be a source of product differentiation and "customer stickiness", it might also be an organizational challenge. Indeed, today in most traditional telcos the sales force is not trained to sell consulting services. In addition, telcos might not yet have enough skilled resources available to provide application-centric network managed services.

## 2. The Ipanema System Bundled With a VPN Offering

An alternative to selling a standalone managed service consists of bundling the application traffic management features with a VPN offering. In such an offering, the telco will provide its client's access to the traffic management features through a web interface, thereby letting clients operate the service themselves.

This approach is particularly interesting for enterprise clients that do not want to invest in an application traffic management tool but enjoy keeping "control" of their WAN. It allows telcos to sell high-value services without the need for investment in consulting-like resources while selling a premium network. It also simplifies the sales process because it becomes just "another" access product to sell. The ability to meet customer application performance expectations creates increased customer stickiness, allowing telcos to reduce churn and create long-term brand loyalty.

# CONCLUSION

Ipanema has gone beyond the limitations of CoS and has created the Business Network Optimization solution that provides telcos with a scalable, carrier-class technology to offer enhanced services to enterprise customers. Ipanema has created the technology that will finally allow telcos to safely offer much-awaited Application SLAs. Telcos that innovate and offer application-centric network services will benefit tremendously. They will offer a service that is at the heart of their clients concerns while:

- Increasing their revenues and margins.

- Shifting the competitive playing field from price to value.

- Improving customer loyalty.

- Reducing churn and building longer-lasting client relationships.

If telcos fail to offer application-centric services, they face the danger of IT outsourcing and integration firms capturing enterprise customers and reducing the role of a telco to that of a commodity provider of bandwidth.

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## About Ipanema Technologies

Founded in 1999, Ipanema Technologies is a provider of advanced application traffic management solutions that maximise network application performance. Its solutions are utilised by organisations deploying VoIP, ERP applications and other bandwidth-hungry projects as well as those embarking on ITIL projects. Network integrators market the Ipanema system to enterprises, while telecom service providers and network managed service providers offer it as a service.

The Ipanema system is simple, automated and scalable and is unique in guaranteeing critical application performance regardless of network conditions. It enables this by providing full visibility of application flows over the network, optimising network resources through a combination of integrated technologies and rightsizing bandwidth according to application performance objectives. Ipanema's solutions are deployed in more than 75 countries; its customers include large organisations such as the French Army, L'Oreal, Sanofi, Europcar, Rhodia and Lexmark. Ipanema is based in France, U.S, Germany and UK. . For more information, please visit www.ipanematech.com

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