GUARANTEE APPLICATION PERFORMANCE OVER HYBRID NETWORKS

SOLVE THE CHALLENGES OF HYBRID NETWORKS WITH LOCAL INTERNET BREAKOUTS. REPLACE DISCRETE, STATIC, TRAFFIC MANAGEMENT MECHANISMS WITH IPANEMA'S DYNAMIC SOLUTION CREATED FOR HYBRIDS.
EXECUTIVE OVERVIEW

Solve the challenges of hybrid networks with local Internet breakouts. Replace discrete, static, traffic management mechanisms with Ipanema’s dynamic solution created for hybrids.

- Guarantee business application performance and business continuity;
- Control any mix of private and public cloud applications;
- Increase network efficiency;
- Simplify IT management;
- Improve IT agility.

In today’s increasingly mobile and connected world, IT departments are experiencing an application revolution which demands less expensive and more reliable bandwidth. In fact, companies are tapping into the benefits brought by Unified Communications, personalized devices, SaaS applications, private and public clouds, social media and virtual desktops. In this context, combining traditional MPLS networks with Internet accesses is a highly cost effective alternative.

Today, enterprises have essentially three options to connect their users to the Internet:

- Centralized Internet access from main datacenters managed by the enterprise;
- MPLS-based Internet peering managed by the MPLS telecom provider;
- Local Internet breakout at the branch managed either by the enterprise or by the Telco.

While, local Internet breakouts provide a direct access to the Internet and to public cloud applications, they can be used to increase available bandwidth for branches and data centers.
Ipanema’s Dynamic Hybrid Networking solution solves the challenges of more cost effective bandwidth while guaranteeing that both critical business applications and other applications can efficiently coexist, even during strong growth traffic trends. With its dynamic and integrated approach, Ipanema can simultaneously and automatically monitor, control, accelerate and select the best paths for business applications and other applications across two or more networks.

With Ipanema, enterprises can:

- Guarantee business application performance and business continuity;
- Accelerate enterprise Digitalization;
- Control any mix of private and public cloud applications;
- Increase bandwidth available;
- Simplify IT management;
- Improve IT agility.

About this publication

Ipanema has created this publication as an informative resource for enterprises that are deploying or planning to deploy an MPLS/Internet hybrid network to meet the high-bandwidth requirements of emerging business technologies. Contents of this publication are intended to inform CIOs, IT directors, network directors and network operations managers about the impact of Cloud applications, Big Data, Unified Communications, real-time video and other technologies on corporate networks and how to ensure successful deployments with guaranteed application performance.

BUSINESS, SOCIAL AND IT TRENDS PUT NEW DEMANDS ON NETWORKS

Continuous application performance is mandatory in today’s fast moving business environments. Technologies empower employees and customers in unprecedented ways. While network traffic loads become greater, more complex and more difficult to manage, new and pre-existing applications are expected to perfectly perform at all times. Against this backdrop, business drivers for Ipanema’s Dynamic Hybrid Networking include:

- New business applications that multiply bandwidth requirements;
- IT transformations to SaaS and cloud application delivery models;

Frank Meyer,
Technical Project Lead,
Henkel

Our hybrid network delivers its promises. It allows us to cost effectively benefit from the best of MPLS and Internet. The objective-based application performance management strongly reduces complexity and enables us to dynamically guarantee the applications’ performance to the end-users anytime,
• New user behaviors that further complicate the application traffic mix.

New business applications multiply bandwidth requirements

Big Data: from Giga to Yotta

Kilo, Mega, Giga: IT people are familiar with these orders of magnitude and many are also familiar with Tera (1012) and Peta (1015). However very few people are able to correctly name 1018 (Exa), 1021 (Zetta) or 1024 (Yotta). Is there a use for knowing these units? The answer is yes if we consider that the data universe is growing from a few Zettabytes in 2012 to a Yottabyte by 2030. All this data is created, transferred, combined, classified, stored and archived, crossing public and private networks several times.

Big Data involves rapidly moving large volumes of data. 68% of IT managers indicated that Big Data is a strategic priority for their enterprise and will be for the next five years. 48% percent of them expect their network loads to double and 23% to triple in the next two years. The incentives are clear: for example a retailer using Big Data could increase operating margins by 60%. Moving such large volumes of data to the right place at the right time requires an intelligent and powerful network infrastructure.

Unified Communications (UC)

UC includes many services like voice, email, instant messaging as well as audio, web and video conferencing. While replacing multiple discrete solutions, UC delivers everything across the network and substantially increases the traffic by fostering greater usage of productivity applications, such as desktop sharing and peer-to-peer video.

The unpredictable nature of UC traffic puts tremendous pressure on the network, threatening the performance of pre-existing business applications like ERPs. Each type of communication within the UC umbrella behaves differently and the applications matrix can change massively from one second to the next. Voice and real-time desktop video are the main applications that impact network performance, because few business technologies are as sensitive to performance and so demanding on networks.

Cloud applications

Cloud applications are enabling enterprises to regain agility and simplify their IT organization. They allow a rapid adoption of new technologies such as UC or Big Data. Office 365 and Google Apps are familiar choices for email and collaboration. ERP, BI and financial applications are being migrated off-premises for the same advantages that Salesforce.com initiated with CRM. According to Gartner, enterprises using BPaaS (Business Process as a Service, for example HR applications, on-line payment, payroll management, etc.) currently exceed 60%.

As more business critical applications are moving to the cloud, applications performance


issues are on the rise and cracks are beginning to appear.

New user behaviors transform the traffic mix

Social Media

Facebook, YouTube, LinkedIn and Twitter have become important sales, marketing and public relations tools. Postings help to reach broader audiences with corporate and product messaging and to respond instantly to market events. Most corporate websites are very interactive with animations, videos, online demos, ROI calculators and portals for customers and partners as extensions of customer service functions. The new dependence on social media combined with website enhancements load the network with raising bandwidth and performance requirements.

Bring Your Own Devices

Driven by employees’ insistence to use modern and appealing devices, BYOD (Bring Your Own Device) policies are now common. By 2015, the number of employees using mobile applications in the workplace will double. By 2017 half of enterprises will require employees to supply their own device at work.

Additional devices running numerous private and business applications will stress the network. From photo sharing to social networking, employees operating on their own devices are more likely to use “at home” applications while at the office, competing with the business applications like ERP or UC. A recent study conducted by Vanson Bourne found that 79% of enterprises experience application performance problems such as slowness or unresponsiveness and BYOD threatens to make these problems even worse.

Digital Consumers

People no longer just shop online: using smartphones, they conduct in-store product

and price comparisons, purchase items at one store location for pick-up at another, view product demonstration videos and interact with online digital assistants anywhere, anytime. Retailers continually communicate with customers through online promotions, order processing status and customer experience surveys. The delivery of real-time marketing, in-store experiences and on-line staff to assist customers are very demanding on the IT and the network.

AN OPPORTUNITY WITH ITS OWN CHALLENGES: HYBRID NETWORKING

The public Internet is becoming essential to address in a cost efficient way the fast rising traffic demand and the move of business and private applications to the cloud, creating a new art of combining private MPLS networks with the public Internet: hybrid networking.

Companies have essentially three options to connect their users to the Internet:

- **Centralized Internet access**, which is managed by the enterprise itself and is usually located at the main datacenters;
- **MPLS-based Internet peering**, which is managed by the telecom provider, where the Internet traffic uses the same access line as the MPLS traffic and is diverted to a few colocation points within the MPLS network;
- **Local Internet breakout at the branch**, which might be managed either by the enterprise or the telecom provider.

**Local Internet Breakout is an appealing solution**

**A shortcut to the cloud**

Users of business critical SaaS applications and social media need to have an abundant, good and reliable access to the Internet. Local Internet breakout provides a direct access to the Internet and to cloud applications, offering the best possible experience to users.

**Bandwidth is abundant and flexible**

It is usually easy to get large Internet

"We looked at several solutions including WAN Optimization and Classes of Service. Ultimately, we opted for BT Connect Optimization based on Ipanema Technologies because it could give us full control of our application performance over the global network, protecting applications according to their business criticality and dynamically using all resources of the hybrid network to maximize business continuity. Thanks to BT Connect Optimization, we can now easily adapt to changes in network traffic that might occur due to our IT transformations. From 2011 to 2013, our comparable telecom costs have been reduced by 30%.

Vincent Best
Global WAN Manager, Solvay"
bandwidth and deploying internet access with a local ISP is faster than for a global Telco to provision an MPLS access. This might be an advantage to speed up the rollout of a new application or reduce the time to connect new sites.

A cost effective resource

Internet has become less and less expensive during the last 15 years. Today, 1 Mbps is tens of times less expensive than in the latest 90s. While the pricing gap might be reduced for domestic networks, the difference reaches an order of magnitude in the case of international networks.

Always-on connectivity

Local Internet remains a good option to provide always-on connectivity via a VPN to applications hosted in the private Data Center. The Internet line might be configured as a static backup to the MPLS access or with traffic load sharing to provide permanent additional capacity.

Local Internet Breakout brings its own challenges

Uncertain Business Continuity

Generally, local Internet is supplied through an ISP that provides the same level of service as for its residential customers. Technical support is very limited with no reliable time-to-repair guarantee.

The lack of guarantees in continuity does not match business critical location requirements and demands multiple accesses to the branch.

Lack of Performance Guarantees

Internet does not provide any performance guarantee. The amount of bandwidth access is an indicative and could vary significantly during peak times of usage. There is no similar traffic engineering mechanism to MPLS Class of Service (CoS), no global management and no end-to-end SLAs or anything approaching them.

The absence of a performance guarantee must be mitigated to ensure that critical applications can be delivered with a good end-user experience anytime.

Increased Management Complexity

Local Internet breakouts increase management complexity for the IT department as most branches must be equipped with several accesses (typically one Internet and one MPLS line) to mitigate the lack of continuity and performance guarantee. Moreover in many cases the enterprise would like to use the Internet to not only connect to SaaS applications but also to backhaul intensive traffic like file transfer or video to the main sites and datacenters.

Intelligently balancing the traffic among several access lines in a dynamic traffic environment is a challenge that is not efficiently addressed by classical solutions like Policy Based Routing.

Security Concerns

Security is a major concern as managing a large number of local Internet accesses is more complicated than controlling a centralized gateway. Enterprises can chose to deploy distributed firewalls in each branch, use cloud-based Web gateway services that filter and sanitize the Internet traffic or a combination of firewalls and gateway services.

The branch office security policy must be deployed without impacting application performance.
**Ipanema’s Dynamic Hybrid Networking Guarantees Application Performance and Streamlines IT Management**

Ipanema’s Dynamic Hybrid Networking solves many of the challenges of local Internet breakout. With its dynamic and integrated approach, Ipanema can simultaneously and automatically monitor, control, accelerate and select the best paths for business applications across two or more networks. By replacing discrete, static traffic management mechanisms with the Ipanema solution created for hybrid networks, enterprises can:

- Guarantee business application performance and business continuity;
- Control any mix of private and public cloud applications;
- Increase bandwidth available;
- Simplify IT management;
- Improve IT agility.

Ipanema’s Dynamic Hybrid Networking allows enterprises to benefit from all the promises of their hybrid network. Seamlessly unifying MPLS and Internet bandwidth, it turns their hybrid network into a reliable and predictable...
As a result, enterprises can provide direct access to the cloud and at affordable cost for SaaS and social media and more resources for bandwidth hungry applications.

Maximize business continuity

Ipanema’s Dynamic Hybrid Networking is capable of simultaneously controlling several network accesses, for example one MPLS access and one or two local Internet accesses. It does not only balance the traffic to maximize the usage of the available resources, but it automatically eliminates faulty accesses to ensure the maximum availability for business application to local users.

Guarantee Application Performance

Ipanema’s Dynamic Hybrid Networking combines Application Visibility, Application Control and WAN Optimization with intelligent DWS (Dynamic WAN Selection). It selects the best path for each user flow, according to the application performance requirements, its business criticality and the actual performance of every path. Application flows are monitored, controlled and optimized in real-time over each of the paths.

Ipanema’s Dynamic Hybrid Networking ensures the best possible user experience, by continually and automatically re-aligning application performance requirements with network capacities.

Streamline IT management

Ipanema’s Dynamic Hybrid Networking is totally automated and relieves the IT operation teams from the cumbersome management of static policies, application-specific rules or enterprise calendars. Working from an application-centric standpoint, it enables IT organizations (even in large enterprises with hundreds or thousands of branches) to efficiently deploy and operate hybrid networks.

Enable security strategies

Ipanema’s Dynamic Hybrid Networking is compatible with all branch security architectures like distributed full-featured firewalls, cloud-based Security Gateway services or the combination of a basic local firewall with a cloud-based Security Gateway services.

Bringing simplicity and agility to the application traffic, Ipanema’s Dynamic Hybrid Networking provides enterprises with the flexibility to choose and deploy their own security strategy without impacting the end-user experience.

Why is it so important to be dynamic?

SaaS applications, private and public cloud, social media, virtual desktops, etc. extend the requirements for hybrid networking where enterprises combine traditional MPLS networks with Internet accesses. Then, comes the next question: how to select the right network so business applications perform steadily, all the time, even when strong growth traffic trends? We touch at a fundamental difference between static-policy-based and dynamic-objective-based frameworks.

Static, policy based Path Selection

Static WAN selection is renowned for its huge maintenance workload throughout the network life cycle. While it provides acceptable availability with its fallback capabilities, static
path selection faces other strong limitations. It cannot optimize simultaneously, the applications usage over multiple lines (there is no direct link between the users’ traffic demand and the WAN selection decision). Consequently, it cannot guarantee the individual end-to-end user experience in the long run as it works with coarse bandwidth thresholds.

- **Manual**: IT managers clearly decide what are the primary and the back-up links for each application and translate that decision into local configurable policies.

- **Semi-static**: the decision is to use the primary link unless it does not work so the back-up path must be used.

- **Local**: the path decision applies whatever happens at the far end, independently from the impact on the other applications.

- **Coarse**: the decision is taken for all connections of a same application whatever the number and the activity of IT users.

**Dynamic, objective based Path Selection**

Dynamic path selection is simple to operate as it automatically adapts individual flows to constantly changing application traffic conditions. New applications, number of users, employees’ real-time activity, application criticality and network performance: all these parameters evolve all the time, so does dynamic solutions.

- **Automatic**: driven from global application performance objectives, the selection of the WAN does not require any manual configuration in the long run.

- **Dynamic**: the WAN path is selected according to the real-time dynamics of traffic evolution (WAN access load, network quality, application performance, balance between different applications, etc.).

- **End-to-end**: the WAN path is chosen accordingly to what is happening along of the whole paths (having the local and far end state of the path).

- **Fine-grained**: WAN selection is individually performed for each user flow to guarantee the experience whatever the IT and network activity.

**Ipanema’s Dynamic Hybrid Networking in action**

The Ipanema’s Dynamic Hybrid Networking can be split in four main tasks: 1) Identifying & Classifying Applications, 2) Assessing the performance of available paths, 3) Controlling Application Flows and 4) Dynamic WAN selection, to choose the best path for every single application-flow.

For the sake of conciseness, see below a simple scenario on Fig. 2. The scenario consists of two Ipanema engines which are connected through two paths, a MPLS and an Internet path. You can see four points, where the main tasks of hybrid networking are performed. We focus on the engine on the left.

1. **Identifying & Classifying Applications**

At point 1 of Fig. 2, the Ipanema appliance identifies all application flows which cross the network. Ipanema relies on DPI (Deep Packet Inspection) to analyze traffic up to Layer 7 and identify holistic patterns of applications flows. Then, those flows are classified, by matching Application Performance Objectives (APO). APOs are centrally-defined by the enterprise priorities. For instance, in Fig. 3 we can see that we have 10 application groups
with a criticality that ranges from Top to Low. SAP and UCC-voice applications groups have Top criticality, which means that every single flow of these two application groups will be protected before other flows with other criticalities. In other words, the performance objectives (Bandwidth, D/J/L, Delay, Jitter and Loss) on the right table will always remain steady, even in a strong congestion episode. In contrast if necessary, Webcam traffic and YouTube will be delayed, limiting its assigned bandwidth. When congestion is not present, all applications take advance of the whole available bandwidth.

<table>
<thead>
<tr>
<th>Application name</th>
<th>Criticality</th>
<th>Obj. BW (Kbps)</th>
<th>Link 1</th>
<th>Link 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>ERP</td>
<td>Top</td>
<td>30 Kbps</td>
<td>Main</td>
<td>Dynamic Backup</td>
</tr>
<tr>
<td>UC-VoIP</td>
<td>Top</td>
<td>80 Kbps</td>
<td>Main</td>
<td>Dynamic Backup</td>
</tr>
<tr>
<td>SaaS</td>
<td>High</td>
<td>50 Kbps</td>
<td>Dynamic Backup</td>
<td>Main</td>
</tr>
<tr>
<td>Email</td>
<td>High</td>
<td>40 Kbps</td>
<td>Quality-Based Dynamic Selection (Link 1 is Preferred)</td>
<td>Quality-Based Dynamic Selection (Link 2 is Preferred)</td>
</tr>
<tr>
<td>File Sharing</td>
<td>Medium</td>
<td>100 Kbps</td>
<td>Quality-Based Dynamic Selection (Link 1 is Preferred)</td>
<td>Quality-Based Dynamic Selection (Link 2 is Preferred)</td>
</tr>
<tr>
<td>UC-Screen Sharing</td>
<td>Medium</td>
<td>100 Kbps</td>
<td>Quality-Based Dynamic Selection (Link 1 is Preferred)</td>
<td>Quality-Based Dynamic Selection (Link 2 is Preferred)</td>
</tr>
<tr>
<td>Recreational Traffic, Video</td>
<td>Low</td>
<td>200 Kbps</td>
<td>Never Used</td>
<td>Main</td>
</tr>
</tbody>
</table>

Fig. 3 Application Performance Objectives
2. Assessing the performance paths

At point 2 of Fig. 2, we can see both WAN segments, the one associated to the MPLS path and the one associated to the Internet path. As it is shown in Fig. 3, the applications groups are characterized by performance objectives (traffic metrics). Thus, to select the best path for every flow it is needed to assess those metrics in each path. So, both Ipanema engines transmit between them, periodically, its performance state of ingress and egress interfaces and queues. This allows measuring available bandwidth, and D/J/L metrics in an end-to-end manner. On this way, a state-full correlation of path performance is available all time.

3. Controlling Applications Flows

At point 3 of Fig. 2, the state-full knowledge of the paths in addition with the Ipanema DPI application recognition allows to the Ipanema engine associating the correct queue to every application flow. In this way, when congestion is experimented, the Ipanema engine schedules application packets, enforcing the performance objectives of the different application groups. The shaping rate is done by starting from the lowest critical applications to the highest as necessary to ensure the minimum bandwidth objectives, see Fig. 4.

It is worth mentioning that, Ipanema’s Application Control is not only compatible with MPLS CoS but also streamlines its management by coloring packets for the CE router, when required. It is a great benefit when we consider the complex process of updating CoS statically.

4. Selecting the best path for every single flow

At point 4 of Fig. 2, for each flow with its specific Application Performance Objectives, the Ipanema engine decides:

- The predefined network path preference, when both paths perform correctly;
- The best of the paths that matches the flow performance objectives (Bw, D/J/L), when the preferred path is degraded.

![Fig. 4 Congestion Management Strategy](image-url)
For example, UCC voice will usually look for the fastest path (MPLS in this case) while Webcam, might prefer the path largest available bandwidth. DWS works simultaneously with Application Control, and continually decides the best network paths for application flows to avoid traffic congestion.

Other criteria can define the selection of the best path. For instance, for certain applications, it can be decided to never use Internet even when MPLS is not available (this usage is driven by “security constraints” to not send sensitive information through the Internet). Other options can be set centrally per application, such as to use or not use the same path for a whole IP session.

Defining these objectives and preferences by application centrally is another fundamental advantage of DWS for streamlining IT management, especially in complex IT environments.

**Beyond WAN Optimization: Application Performance Guarantee**

Ipanema helps enterprises to guarantee their application performance, to regain control of their applications and to dynamically adapt to new usages. With Ipanema, enterprises manage their strategic IT transformations including Unified Communications, SaaS and cloud applications, Social media, Video traffic and BYOD in a simple and automated manner. They finally take full advantage of their hybrid networks while reducing their IT expenses, increasing IT agility and ability to deliver more value with less resources.

**“With Ipanema’s Dynamic Hybrid Networking, we guaranteed the performance of Google Apps and other business apps over MPLS + Internet network. We also divided by three the transfer cost of each Gbyte over our global network.**

*Alain Meurou, Infrastructure and Network Manager, Valeo*

It is time to move beyond WAN Optimization

While classical WAN Optimization solutions provide bandwidth reduction and network delay mitigation, they are not designed to manage new traffic flows like video and social media that will soon represent the majority of network usage, forcing IT managers to make choices like email or Salesforce? SAP or desktop video? Office 365 or YouTube?

Choosing is not an option anymore. The business requires all applications to run at the same time with the right performance, raising the need to move beyond WAN Optimization to Application Performance Guarantee solutions.
**Five reasons to use Ipanema’s Application Performance Guarantee**

1. **Increased business continuity and productivity.** Ipanema ensures a consistent Quality of Experience at all times for all end users.

2. **Successful IT transformations.** Dynamic, self-learning, self-managing, Ipanema adapts automatically to all traffic and application changes.

3. **Maximized IT agility.** Speeding-up and securing the deployment of IT transformations, new applications and new sites.

4. **Improved IT efficiency.** Ipanema reduces application performance incidents, decrease network management workload and reduce the Mean Time To Innocence (MTTI).

5. **Reduced IT spending.** Ipanema improves infrastructure efficiency, triples the network potential and reduces service desk and IT governance expenses.

**RELATED READING**

- Ipanema white paper: “[The business case for Hybrid Network Unification](#)”
- Ipanema white paper: “[Guarantee Unified Communications performance over your WAN](#)”
- Video: “[Guarantee Applications Performance with Dynamic Hybrid Networking](#)”
Enterprises’ Digitalization accelerates. In a world that moves at web speed, IT departments have more and more difficulties to manage the complexity of their information system.

Unified Communications, cloud computing, SaaS, BYOD, social media, VDI, retail 2.0 are just a few examples of IT trends that strongly increase IT complexity.

In this case, how can you regain control and align IT with strategic corporate objectives? How can you manage more demands and usages with the same network resources to stabilize telecom costs?

**With Ipanema, (Re)discover Simplicity to guarantee your application performance.**

For more information, visit: [www.ipanematech.com](http://www.ipanematech.com)

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