Performance ISPs, the Birth of the Gateway Internet Service Provider

A case study of the latest technology, including advanced IP services delivery by selective new-generation ISPs. Known as Gateway Internet Service Providers, these G-ISP's utilize dedicated connections to an Internet Gateway that in turn makes use of the redundancy and routing advantages of multi-homed upstream connections to provide secure, high-performance Internet connectivity.

The G-ISP model makes use of the following technologies to deliver superior service at reduced cost:

1. Multi-homing
2. Route Optimization
3. Enhanced Security Measures
4. Traffic Distribution and Re-route Engineering

Let's take a look at IP service offerings within the industry. There is general agreement that most ISP's fall into one of the following categories:

1. Tier 1 ISPs: Own their own backbone networks and use them for the majority of their traffic
2. Tier 2 ISPs: Own partial backbone networks and rely on the networks of uplink Tier 1 providers
3. Tier 3 Aggregator ISPs: Do not own any networks and totally aggregate on the networks of the higher tiers

The latest category is the G-ISP, or Gateway Service Provider. Most G-ISPs fall loosely within the Tier 2 category although they commonly emphasize higher performance and backup redundancy than the standard Tier 2 service provider.

A brief exposition of the salient points of the four ISP categories:

Tier	**Performance**	**Re-route Capability**	**Look Ahead**	**Price**
1	Higher	High	Medium	High
2	High	Higher	Low	Medium
3	Low	Low	None	Low
G-ISP	Highest	Highest	Highest	Medium

G-ISPs gain their advantages in price and performance by creating network architectures that bypass the public points of exchange such as MAE's (Metropolitan Area Exchanges) and NAPs (Network Access Points).

G-ISPs rely on the following technologies to optimize the flow of traffic through the Internet Gateway:

Multi Homing:
Multi Homing is the capability of using multiple uplink providers converging on the G-ISPs single Internet Gateway, as well as the G-ISP's own routes, for increased routing alternatives, better BGP (Border Gateway Protocol) sessions and increased backup route availability.

Route Optimization:
To better understand this advanced routing technology, one needs to understand a bit about the inner workings of the BGP routing mechanism. BGP is commonly used as the inter-AS routing protocol for ISPs and large enterprises. A group of routers operating under a common administration is referred to as an *Autonomous System* or AS. Inter-AS routing is thus routing between two or more Autonomous Systems. BGP is designed to make routing decisions based on the shortest number of hops from the point of origination to the destination. While this protocol may at most times provide an efficient regime for routing a packet through a network, it fails to take into consideration other variables within the network that can adversely affect its efficiency. There are those times when the least number of hops doesn't necessarily result in the fastest travel through the network. Among the factors that can be overlooked by routing according to the least number of hops the following can have significant impact on speed and throughput:

1. Round-trip delay
2. Variation in delay (jitter)
3. Selective route-based treatments
4. Time-based treatments, traffic management
5. Application-based treatments, QoS-related effects
6. Class-of-service treatments, i.e.: Platinum, Gold, Silver

G-ISPs Internet Gateways make use of advanced routing protocols that take into account these network conditions when routing traffic.

Enhanced Security Measures:
G-ISPs are able to deliver on-net tunnels based on both layer 2 and layer 3 services of the OSI network model. These tunnels enhance security and additionally enable the enterprise to benefit from switching vs. routing efficiencies. These tunnels may consist of IPsec, MPLS, Frame and/or ATM transport protocols.

Traffic Distribution and Re-Route Engineering:
G-ISPs make use of the capability to distribute traffic between multiple Tier1 networks so that traffic is never affected should any of the uplink routes become temporarily unavailable. To effectively make use of this capability the G-ISP must provide a dependency factor of no more than 35% per uplink provider and an availability factor of at least 2 to 1 in order to guarantee both resource availability and minimal delay while the router architecture dynamically manages newly optimized routing choices.

In addition to the technical edge offered by G-ISP's, the G-ISP business model offers advantages in both economy and service. The G-ISP's economic advantages stem from the fact that it owns its primary network and can control costs there. Additionally, the G-ISP is able to pass along cost savings achieved by shopping among competing upstream providers. The G-ISPs service advantages stem from the fact that G-ISP's tend to be smaller and more agile than the legacy providers. The G-ISP is thus able to offer custom-tailored plans that meet their customers' needs and keep pace with the growth of the enterprise as opposed to the One Size Fits All solutions offered by legacy providers.

To sum up the advantages of the G-ISP over the legacy provider:

1- Convergence of diverse services over one unified network

2- Better network management due to the use of a single Network Operations Center at Access Gateway coordinating the activities of the down line NOC's of the Tier 1 providers.
3- Higher network utilization due to multi-service convergence
4- Better economics brought on in part by the recent bandwidth surplus
5- Lack of legacy encumbrances

In conclusion, considering the ever-increasing requirements of the corporate enterprise for performance, security, convergence and economy with its concomitant demands on the ISPs for agility and versatility, one must conclude that the next generation of service providers will most likely look more like the G-ISPs.

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