



Carrier Grade NAT

Mitigate IPv4 address exhaustion while maintaining network visibility

Use Cases for Carrier Grade NAT

Leveraging Sandvine's stateful processing and asymmetric traffic support

NAT Offload

Offload high bandwidth applications like streaming video from existing NAT boxes to minimize investment in single use solutions.

Full IPv4 NAT

Leverage all the analytics, traffic management, and policy enforcement capabilities of PacketLogic while adding subscriber-aware NAT services.

NAT Analytics

Maintain application and subscriber visibility through implementing NAT analytics leveraging PacketLogic's NAT bindings integration capability with NAT solutions.

SOLUTION OVERVIEW

Network operators are finding it increasingly difficult to manage subscriber growth with the rapidly diminishing IPv4 address space. While operators are attempting to launch IPv6 services to ease IPv4 address depletion, this rollout has been hindered by a variety of engineering and product-related challenges. Thus, operators are deploying Carrier Grade NAT as part of their IPv6 migration strategy. The challenge with current CGNAT products is that they lack subscriber and service plan awareness, and most are not designed to scale with transparent, asymmetric stateful processing of application traffic.

Sandvine's NAT solutions are unique in their combined support for subscriber awareness and asymmetric traffic. As many operators look to minimize the number of stateful processing systems in their network path, systems that can deliver multiple functions in a single CPU footprint deliver greater value for the operator. PacketLogic's unique combination of analytics, traffic management, and policy enforcement layered on top of CGNAT delivers superior ROI for a broadband operator over a single purpose appliance.

USE CASE TECHNOLOGY OVERVIEW

PacketLogic's implementation of CGNAT leverages the existing stateful processing and application identification engine and adds the PacketLogic platform which is already application aware and stateful, so the NAT process simply adds an additional rewrite IP address action on top of its existing stateful processing to meet carrier-class performance and scale requirements. The solution manages IP address pools and port block assignments for both small and large scale installations, and can be deployed on either PRE appliances or on PacketLogic/V. Both full cone and port restricted cone options are supported, as is deterministic or non-deterministic options.

PacketLogic enhances standard NAT implementations by adding support for subscriber awareness, including subscriber data enrichment to enable valuable analytics, sophisticated traffic management, and intelligent charging and policy enforcement. With regulatory requirements in many countries requiring logging of NAT bindings, integrating PacketLogic with existing NAT 3rd party devices can be used to provide real-time subscriber analytics where NAT has reduced subscriber-level visibility for service and quality analytics.

A unique capability offered by PacketLogic is NATSync, a technique to synchronize session state between multiple systems processing NAT traffic. NATSync is a significant advantage for asymmetric NAT deployments, as it removes the requirement for load balancing between NAT devices, saving CAPEX cost and operational complexity. Support for asymmetric deployments removes limitations that many solutions have requiring NAT to be at the extreme edge of the network to remove asymmetry or requiring multiple load balancing systems to be deployed around the NAT systems.



USE CASE COMPONENTS

Mandatory Licenses

- PacketLogic Base
- DRDL & Signatures
- Congestion Management & Filtering
- Carrier Grade NAT

Optional Licenses

- Integration for Enrichment
- Engineering Insights
- IPFix Export
- ODBC Export
- Insights Storage

USE CASES

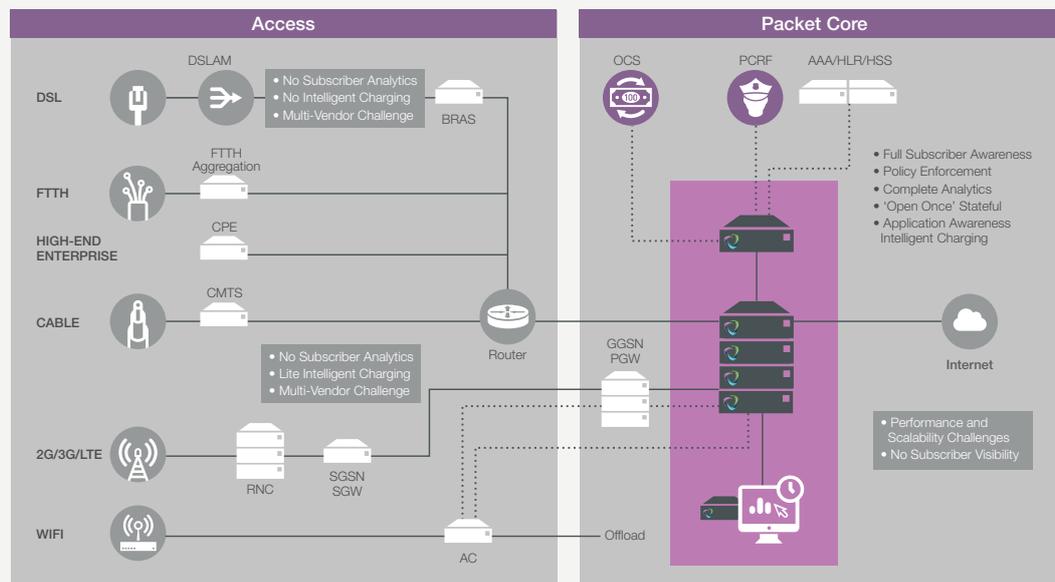
There are multiple deployment options for implementing Carrier Grade NAT with PacketLogic software. All Use Cases rely on the PacketLogic Base software, DRDL & Signatures, Congestion Management & Filtering Licenses, and the Carrier Grade NAT software module, and optional software licenses can be added to provide more subscriber and service options. CGNAT also helps operators with security issues by limiting inbound connections to subscribers based on existing connections only and not unsolicited probes through port scans and other similar attack vectors.

Full IPv4 NAT

PacketLogic implements CGNAT consistent with industry standard RFCs, so it can transparently plug into networks already performing NAT as a replacement for the existing solutions. A rewrite filtering rule is used to create the NAT policies in PacketLogic, and can be associated with any of the existing PacketLogic identifiers (subscriber, IP, application, port, etc.) and actions (enrich, accept, inject, etc.). The system can allocate fixed size port blocks to each subscriber (which is also a method to reduce exposure to DDOS attacks as this limits the number of sessions available to each subscriber) and alarm when the port blocks are exhausted. NATSync is used to synchronize connection information between members of a cluster, each cluster member is responsible for allocating/de-allocating connections from port blocks it owns. Per NAT pool options determine whether the pools will allocate public IP addresses dynamically or deterministically.

Figure 1

TYPICAL PACKETLOGIC DEPLOYMENT



Many operators are struggling to keep up with the continual increase in bandwidth usage on their broadband networks, and the corresponding performance required from their NAT solutions. PacketLogic's support for 100GE interfaces on both PRE systems and virtual COTS offerings enables operators to support high bandwidth deployments with ease, and the addition of NATSync simplifies a scale-up and scale-out deployment. In contrast to other NAT solutions that require load balancing to artificially create symmetry, adding performance to a CGNAT cluster is simply as easy as adding another instance of CGNAT. The network will automatically begin to use the additional resources, and no rebalancing of traffic or orchestration of subscriber flows is required.



Figure 2

PERCENTAGE OF ALEXA TOP 1000 WEBSITES CURRENTLY REACHABLE OVER IPv6



Although IPv6 availability is growing, IPv4 will still be needed for the foreseeable future for broadband operators

PacketLogic CGNAT also helps the operator efficiently use their existing address resources. Since the solution is application aware, connection timers for NAT bindings can be set optimally for different applications rather than at a coarse protocol level. For example, short lived applications like DNS can have their port bindings freed up very quickly, allowing them to be reused for new connections. This allows for NAT pools to be kept smaller and fully utilized as a result. Long lived application flows that do not automatically send “keep alive” packets can have their timers set longer to ensure that the application does not break when the default binding timers expire.

PacketLogic also has extensive logging and analytics capabilities embedded in the CGNAT implementation. Due to the amount of traffic expected through PacketLogic systems, the logging solution was designed to be high volume, and can support syslog or IPFix formats, each with redundancy options.

NAT Offload

As mentioned in the above section, PacketLogic’s support for 100GE interfaces on both PRE systems and virtual COTS offerings enables operators to handle high bandwidth deployments. Another option for operators is to offload high bandwidth application traffic like streaming video to PacketLogic while maintaining their investment in existing NAT solutions. These high bandwidth applications do not require sophisticated NAT processing or IPv6 NAT services, and can easily be offloaded to a PacketLogic system inserted into the network for NAT as well as other use cases (like Analytics or Traffic Management).

Subscriber and NAT Analytics

When placed close to the edge of the network, NAT services can obscure crucial subscriber information that are important aspects of Big Data analytics on network and subscriber trends. To enable broadband operators to regain that visibility, PacketLogic and eEvolution can be fed the NAT bindings from existing NAT solutions allowing PacketLogic to associate post NAT traffic to the originating subscriber. This enables PacketLogic to correlate critical network and subscriber attributes that the operator can use to forecast network capacity needs, analyze quality issues, and retain subscriber demographics information for service planning. PacketLogic’s ability to provide real-time network intelligence that can be leveraged for decisioning by Big Data solutions returns the visibility that has been lost or restricted to only certain parts of the infrastructure by NAT deployments.

In addition to subscriber analytics, PacketLogic provides real-time visibility and analytics on NAT services. With PacketLogic, engineering and customer care professionals have access to a real-time API that can display flow-level details on traffic for support instances where NAT is a suspected root cause. System level diagnostics and statistics are kept to guide capacity and usage investments that show the overall NAT resource usage for the network, including opportunities for optimization of NAT pools and binding timers.



Sandvine delivers
subscriber and
application-aware
Carrier Grade NAT
that fully supports
asymmetric
deployments and
full analytics

Sandvine's Unique Benefits for Carrier Grade NAT

- **Subscriber Aware CGNAT**

PacketLogic integrates with Policy and Charging Control (PCC) and Business and Operational Support Systems (BSS/OSS) to provide subscriber context for network traffic - turning data into intelligence. Subscriber-aware NAT provides superior flexibility and control for network operators implementing NAT by ensuring that subscriber identity and visibility is maintained throughout the infrastructure even with a NAT deployment. Subscriber visibility can be maintained even if PacketLogic is not implementing NAT natively through subscriber integration and enrichment from existing NAT solutions.

- **Superior Efficiency in Address Conservation with Application Awareness**

Application awareness enables a fine tuning of NAT configuration parameters to maximize the use of existing NAT resources. NAT bindings can be carefully adjusted for applications where the bindings timers can be drastically reduced or need to be dramatically longer than the standard timers without limiting the effectiveness of the overall address conservation.

- **NATSync for Asymmetric and Scale-up/Scale-out Deployments**

Scaling NAT deployments and accounting for asymmetric deployments has forced many operators into complex NAT architectures. NATSync enables CGNAT deployments that scale-up and scale-out as capacity is needed, and enables geographic diversity with support for asymmetric network architectures.

- **High Volume Logging and Analytics**

Regulatory requirements for NAT logging for high bandwidth networks can be challenging as bandwidth and session use grows on networks. PacketLogic supports high volume logging that scales for the most demanding networks, providing peace of mind for rapidly growing broadband operators.

CONCLUSION

Sandvine's Carrier Grade NAT solutions deliver industry-leading scalability and value to broadband operators and subscribers. Maintaining subscriber visibility for analytics, traffic management, policy enforcement, and regulatory compliance ensures that operators can continue to differentiate their network offerings from their competition and achieve maximum ROI out of their network investments.



Contact your Sandvine sales representative to find out more about this solution and how it can help you transform your business.

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ABOUT SANDVINE

Sandvine helps organizations run world-class networks with Active Network Intelligence, leveraging machine learning analytics and closed-loop automation to identify and adapt to network behavior in real-time. With Sandvine, organizations have the power of a highly automated platform from a single vendor that delivers a deep understanding of their network data to drive faster, better decisions. For more information, visit sandvine.com or follow Sandvine on Twitter at [@Sandvine](https://twitter.com/Sandvine).



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