

Anchiva Operating System White Paper

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- ▶ AnchivaOs is a brand-new software architecture specializing in optimizing TCP protocol rewriting. It's the industry's first truly complete parallel processing OS, breaking through the bottleneck of application gateway, so that SWG's performance can accelerate in a linear speed.
- ▶ Anchiva's advanced architecture integrates expertise of NetScreen, Fortinet, Trend Micro and Juniper Networks in security, anti-virus, content filtering, software and architecture with both consideration of security and architecture. Anchiva's mission is to provide world-class Web security equipments of seamless connection to network.

Behind-the-Scenes SWG technology of complete function, high performance and fine network adaptability

Overview

In Garner's report, in 2007, 75% corporations were infected by unknown targeted malwares with economical purpose which can evade traditional peripheral devices and host defense line software. This means that, besides peripheral devices and defense line software, gateways which can defend the Application Layer are required in network security to block Web threats at the border of the network.

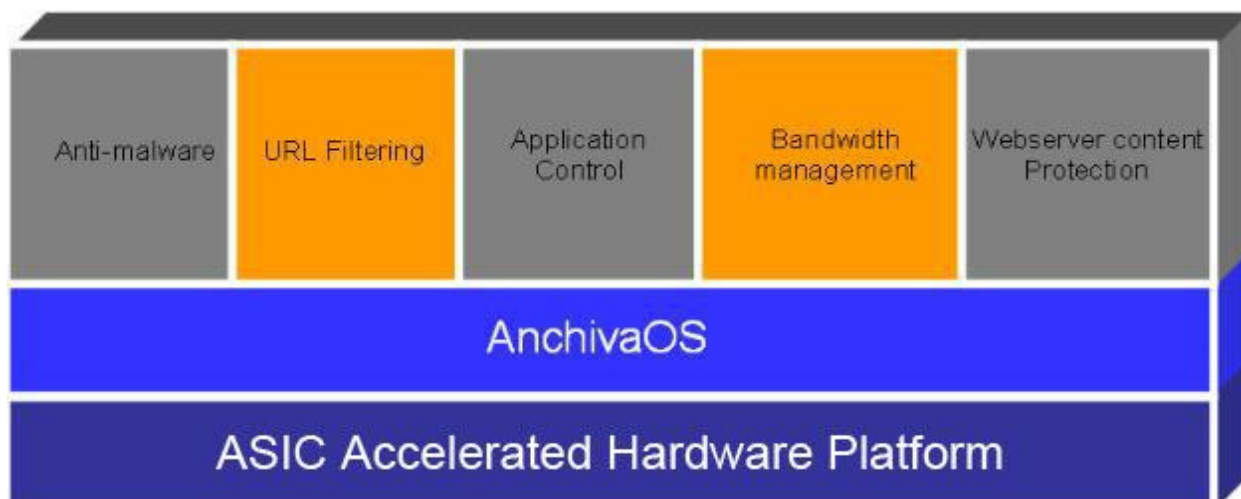
However, IT administrators may find that the market is filled with devices of incomplete function and low performance which are also difficult to operate and deploy when they try to choose a suitable secure gateway for application layer.

Therefore, the market needs application security gateways expendable in functionality and performance on demand and can be deployed in a flexible framework of the existing network, in order to ensure that even in large-scale virus outbreaks or network threat occurs, the application security gateway still have super protective function, and at the same time have very high processing performance and network applicability.

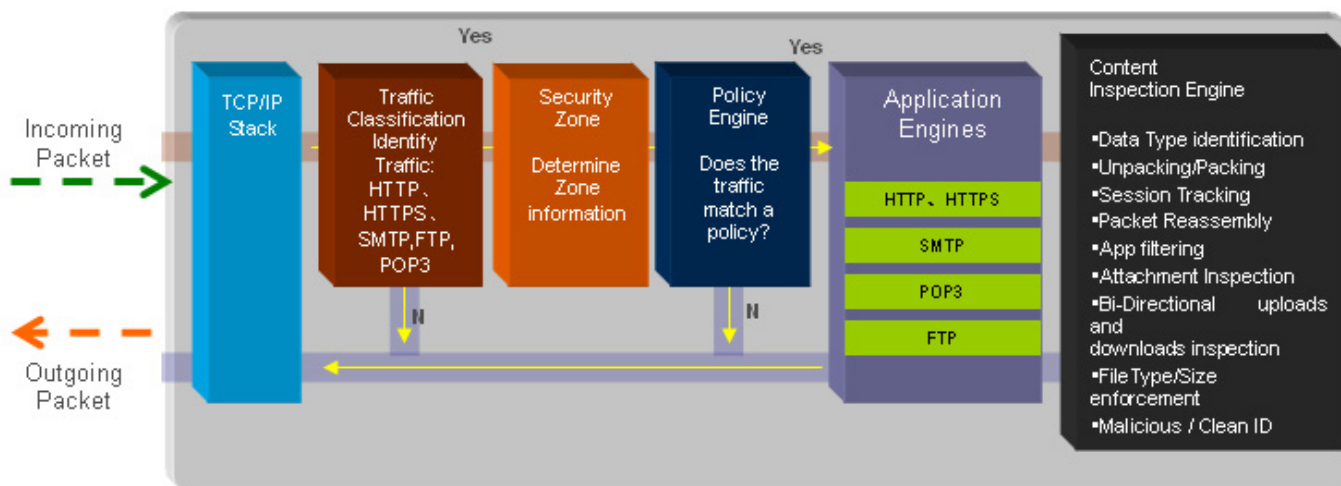
To this end, with consideration of both its reliability and security, Anchiva took one year and a half, and then introduced the industry's first full-functional, high performance and easy deployment SWG to meet the functionality and performance demand of Internet applications security gateways, and the technology behind the scenes is AnchivaOS.

Full Function's Secrets -----Function scalability

To achieve SWG's super application protection function, Anchiva's proprietary operating system adopts the application process architecture with extended modules which can be integrated according to the demand of Internet application security. AnchivaOS has built a solid base for function extension, making it possible for parallel processing of multiple engines.



As it shows in the chart above, Anchiva Web secure gateway is not a simple combination of every function module, but is a dedicate result of Anchiva proprietary operating system designing, which ensures an orderly coordination and data processing among all application engines. See the Anchiva data packets processing chart as below:



Secret A of High Performance
---Extensible hardware architecture

AnchivaOS owns the unified support of two hardware elements: multi-core and ASIC.

Behind-the-scenes Technique of Multi-core Support

To utilize multi-core in a SWG is not simply to combine CPUs together, but requires all-directional support from hardware to software. For this purpose, Anchiva specially developed a parallel multi-core controller to manage and dispatch kernel tasks. As it shows in the chart below, data packets from the Network Layer go into the parallel multi-core controller which balances the packet data and dispatches them to different CPU for future processing.

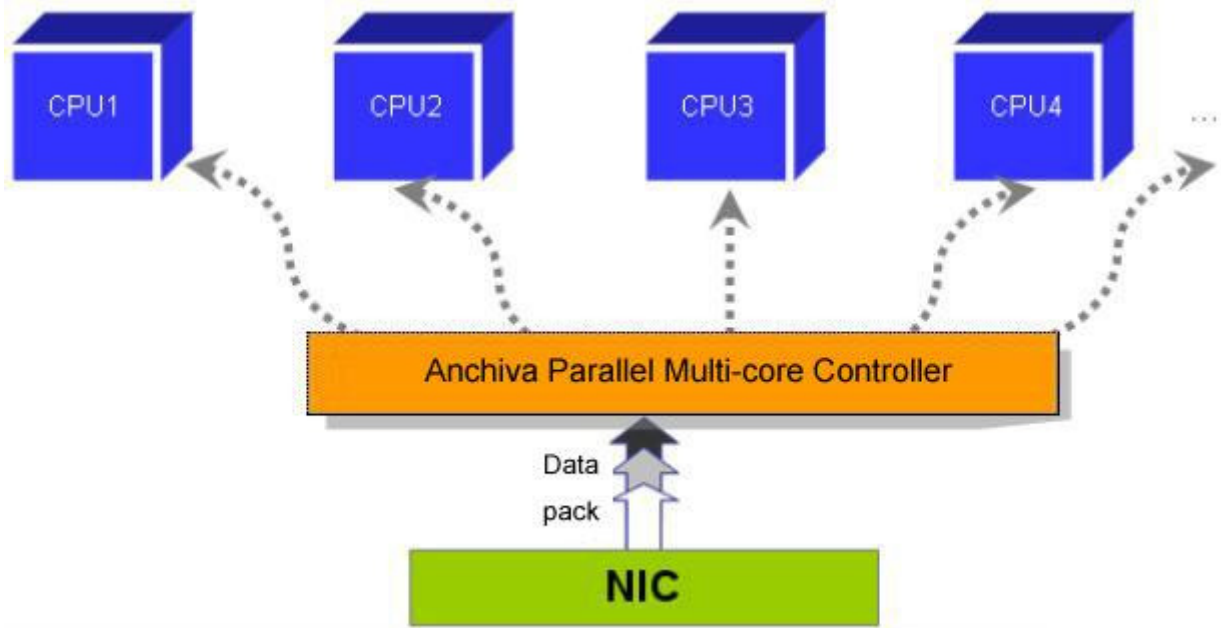
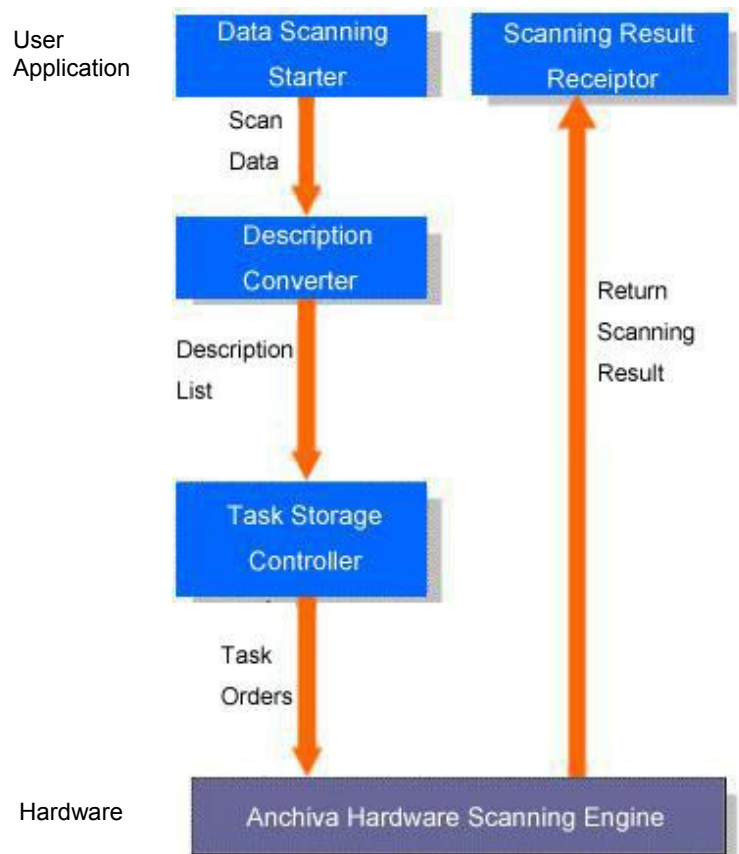


Fig: Parallel Multi-core Controller Dispatches Data to Different CPU

Behind-the-scene Technique of ASIC Accelerator Card Support

ASIC hardware accelerator card is not an independent gadget, but needs an OS to support. As shown in the picture right beside this text, in Anchiva's proprietary ASIC driver technology, the Application Layer data scanner transmits data to description converter which turns the scanned data into a description list and writes it on the task storage controller, which, in turn, gives working order to ASIC hardware scanner engine. The ASIC scanning engine scans the data and matches them with signatures before returning the scanning results to the scanning receiver on the Application Layer. (Refer to *Anchiva Hardware Scanning Engine White Paper* for detailed technical support on ASIC Accelerator Card).



Secret B of High Performance

-----Behind-the-scene technology of wire-speed performance growth

Traditional optimized transparent transmission OS architecture, as shown below, can perform multi-threading parallel processing in the user space, but the Kernel-based TCP protocol stack has shared locks. When CPU is in transaction processing, it is necessary to wait for TCP to release the lock, so the parallel speed is limited to the TCP protocol stack shared locks, and can not execute completely parallel transaction processing.

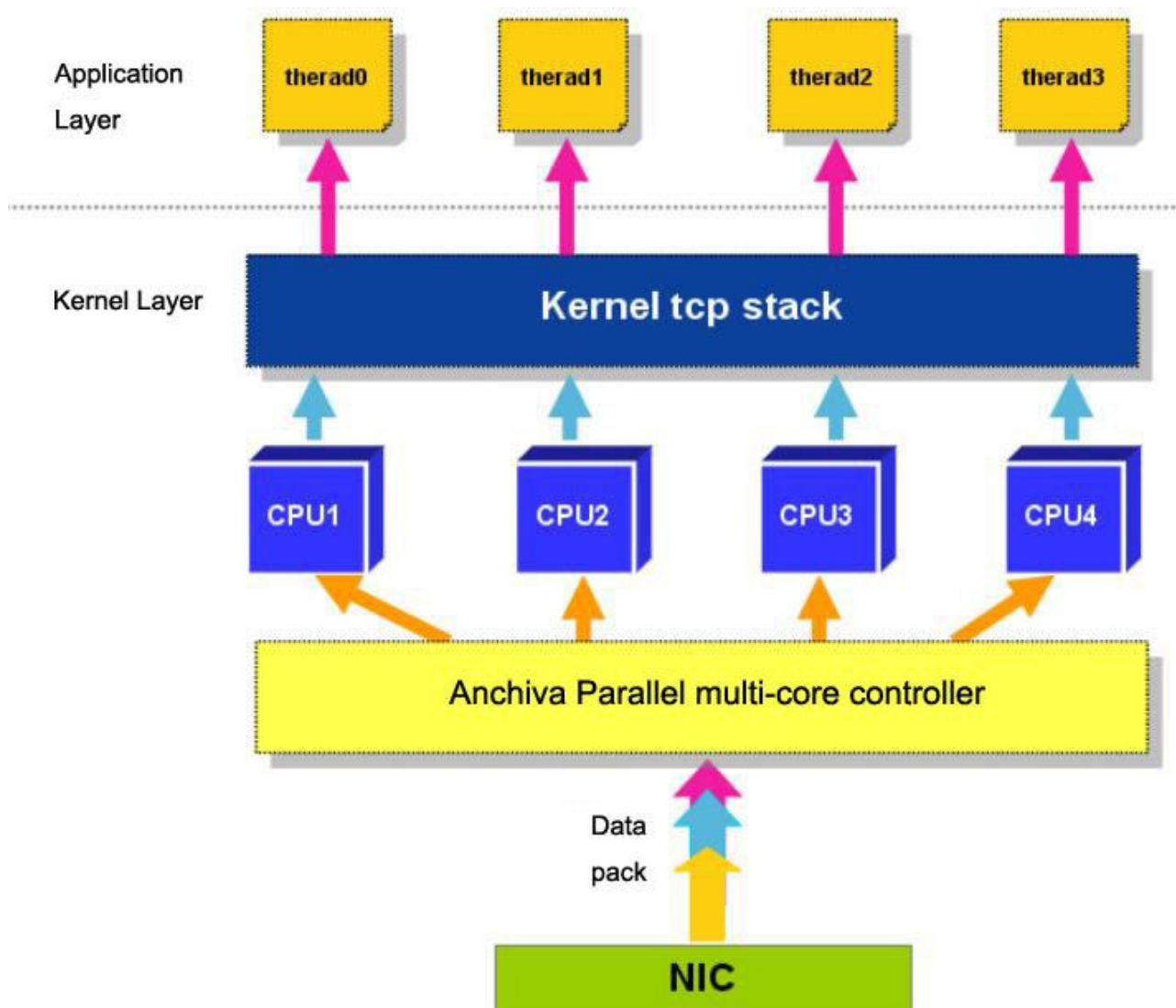


Fig: Traditional optimized transparent transmission OS architecture

Analysis of Traditional optimized transparent transmission OS architecture

Advantages:

- Multi-core parallel processing
- Multi-threading parallel processing

Existing problems:

- Kernel TCP Stack has shard locks
- Transaction processing waits for the release of TCP stack shared locks

Disadvantage: forwarding plane cannot reach a complete parallel transaction processing

Anchiva company in its early days had decided to rewrite an optimization version of TCP protocol stack. Taking security into account, it developed a TCP protocol stack based on user space, as shown below, the TCP protocol stack were written into more than one parallel processing proxies of user space, which broke the constraint of TCP protocol stack shared lock basing on Kernel. Therefore, Anchiva developed the industry's first truly multi-core completely parallel processing system -- AnchivaOS, which can perform parallel processing in both the forwarding plane and the application plane, fully breaking through the bottleneck of Web Security Gateway performance, and with the acceleration of the hardware configuration, Anchiva Web Security Gateway performance grows in a similar-to-linear speed.

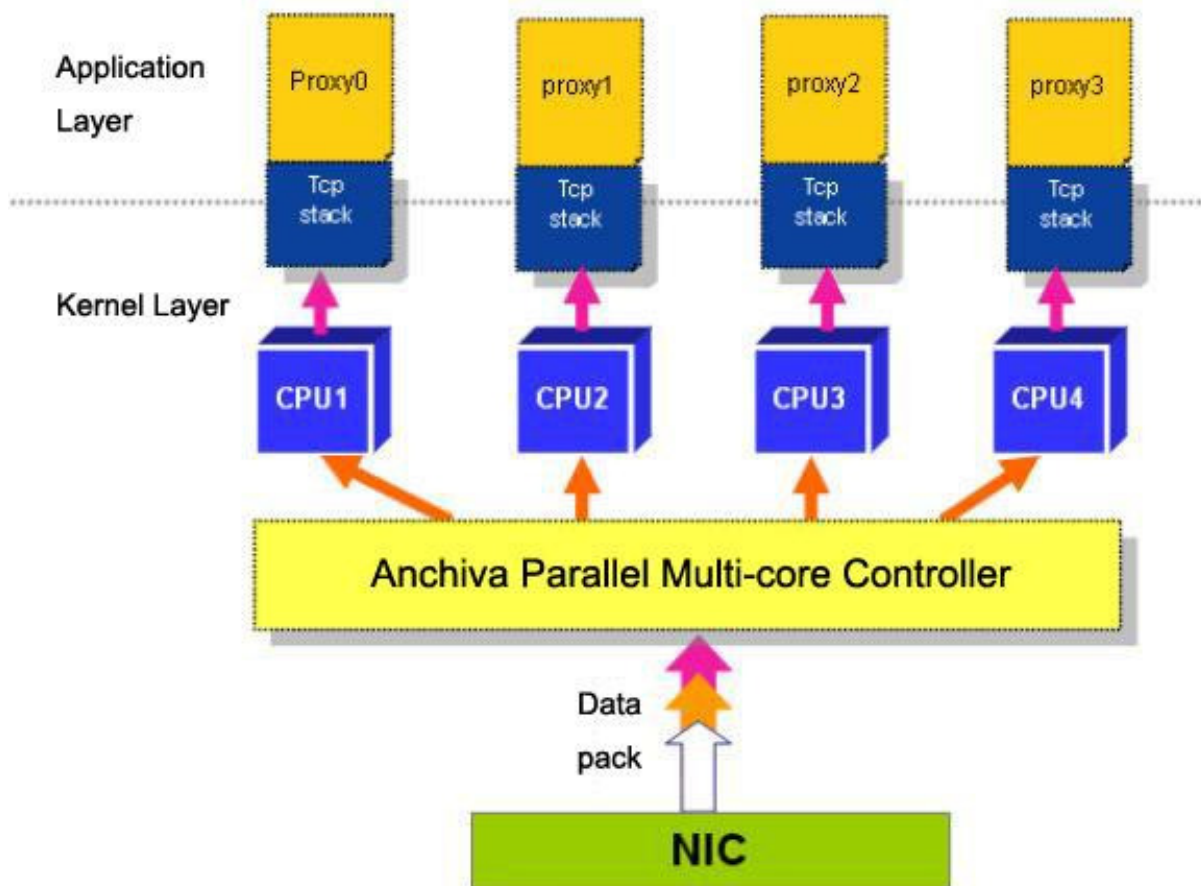


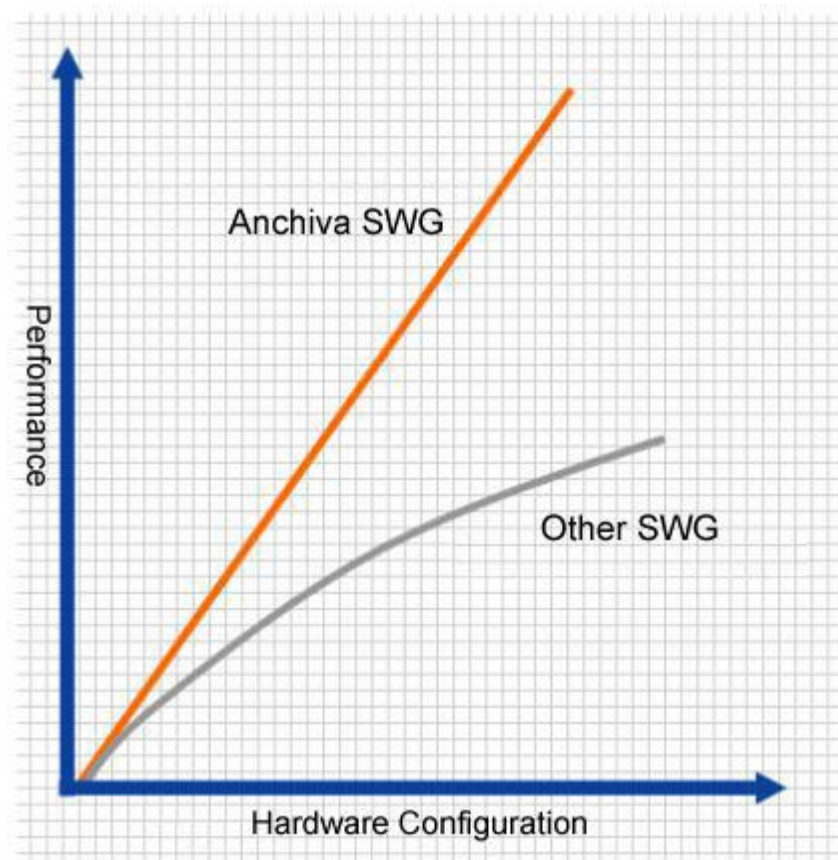
Fig: AnchivaOS Architecture

AnchivaOS advantages:

Problem solving

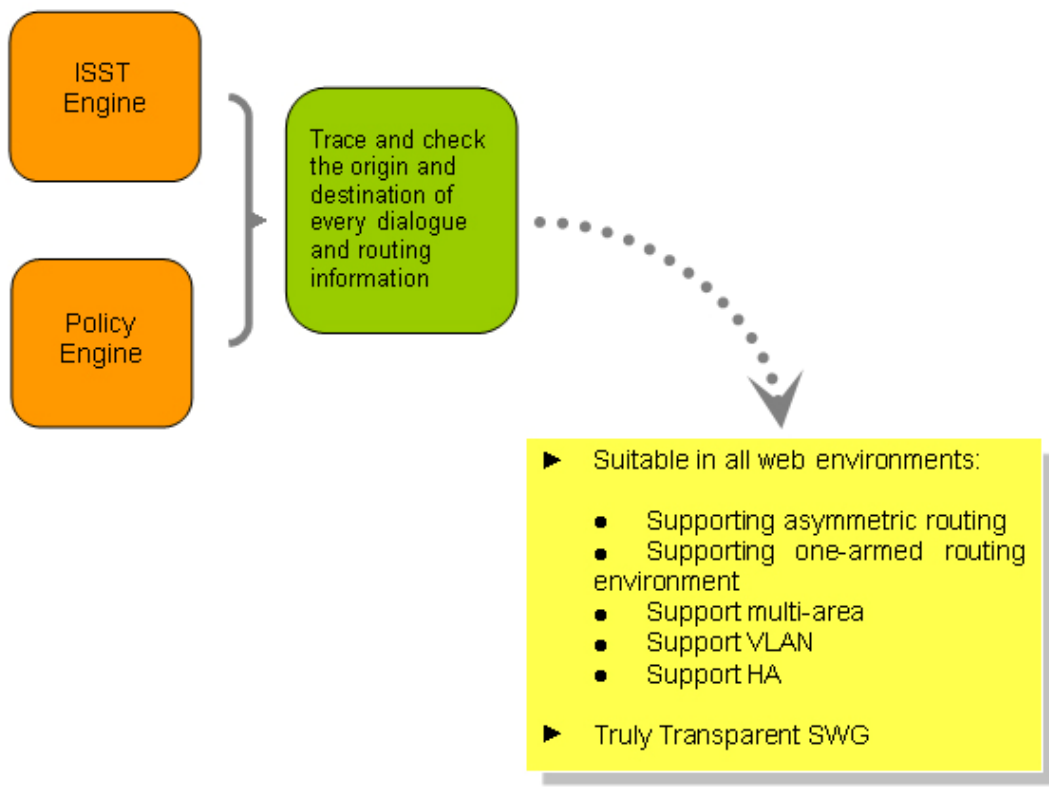
- Multi-core parallel transaction processing
- Multiple proxy engines parallel processing
- Optimized TCP protocol stack rewriting, complete TCP development

Advantage: Anchiva SWG's performance grows along with the acceleration of hardware configuration in similar-to-linear speed.

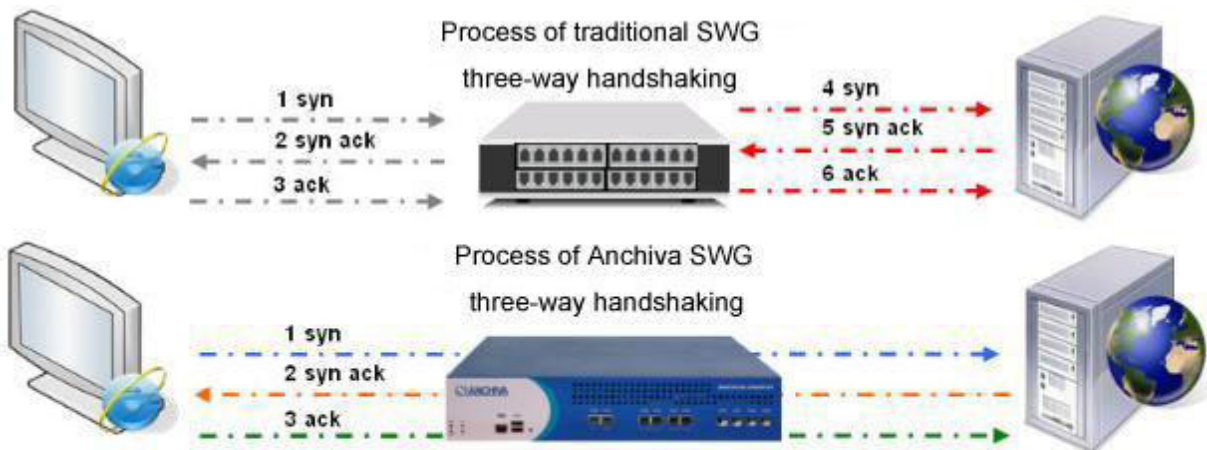


Fine Network Adaptability's Secrets

AnchivaOS dedicated session tracking engine and policy engine can intelligently track and confirm the source and target of each session and their routing information, setting a good foundation for the Anchiva Web Security Gateway's network, so that Anchiva SWG can easily achieve the network environment support of VLAN, asymmetric routing, single arm routing and High Availability. Additionally, its configuration is simple with no need to change the customer's existing network.



Anchiva Web secure gateway's fine adaptability lies in the fact that its transparency will pose no affection on existing network. As it shows in chart below:



File header information don't change when data pack is sacanned by Anchiva SWG

DST_MAC	SRC	SRC_IP	SRC_Port	DST
00-10-10-20-20-	00-10-10-20-20-	10.1.5.205	45.1.2.3	10456 80
MAC		IP	TCP	Payload / Data

As can be seen from the chart, compared to traditional Web secure gateway, Anchiva Web secure gateway by a true transparency realize the maximum degree of retention of original data information without interruption of the three-way handshaking between the client and servers. Therefore some of problems which traditional Web gateway find very difficult to resolve, such as transparent transmission of OSPF routing protocol, can be easily achieved in Anchiva Web secure gateway.

AnchivaOS's Own Reliability

AnchivaOS has a good functionality and scalable performance architecture, and it is also a security reinforced operating system.

1. Completely Anchiva-customized kernels prevent loopholes of common systems .
2. No useless port is opened for the chance of system information theft by sniffers.
3. Use of HTTPS and SSH for secure access effectively prevents attacks from the outside world.
4. Use of multi-polar administrator privileges prevents administrator privileges abuse.
5. Mandatory use of complex passwords prevents a dictionary attack.
6. Account locking feature prevents brute force break-ins.

Conclusion

AnchivaOS, with its multi-core support, ASIC hardware acceleration, multi-engine parallel processing, and optimized TCP protocol stack rewriting, greatly enhances the working efficiency of Anchiva Web Security Gateway in dealing with Internet application threats. The function improvement does not affect its processing performance; AnchivaOS intelligent session tracking engine and policy engine enables Anchiva Web Security Gateway the adaptability to a variety of network environment. Thereby Anchiva creates the industry's full-featured, high-performance network SWG products with good network applicability.

Multi-core hardware platform + ASIC Accelerator card + AnchivaOS

=High performance with linear growing ability

