

# The FS1 System-on-a-Chip

An architecture for unifying FortiASIC™ acceleration with key hardware components for increased performance

## Introduction

The FortiGate®-60C and FortiWiFi™-60C represent the first models in a new generation of desktop-based network security appliances from Fortinet. It is the inclusion of the first Fortinet System-on-a-chip (SoC), the FS1, which sets the new appliances apart from previous generations.

The goal of SoC architectures is to combine multiple processors into a single chip, simplifying the overall hardware design. Fortinet has integrated FortiASIC acceleration logic together with a RISC-based main processor and other system components to form the FS1 SoC. The advantage that this design offers, in addition to simplifying the appliance design, is that it allows FortiGate appliances that use the FS1 SoC to deliver very impressive performance numbers for smaller networks.

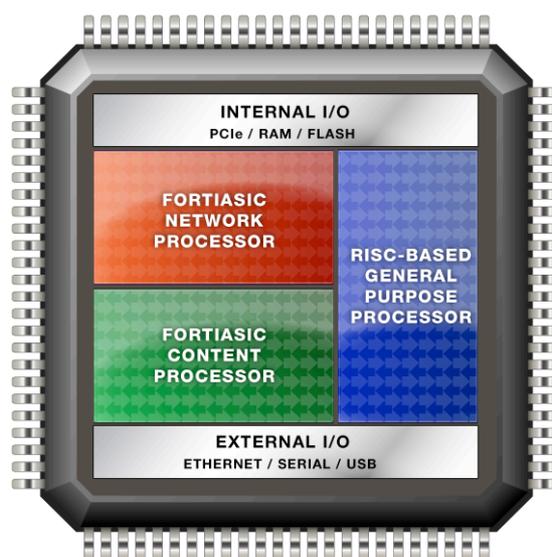


Figure 1. Fortinet FS1 System-on-a-Chip

## FortiASIC Network Processors

Designed to accelerate the firewall and VPN functions of the FortiGate range of multi-threat security platforms, the FortiASIC Network Processor (NP) has been repackaged to meet the demands of the SoC form factor's power and thermal constraints. The presence of the FortiASIC-NP logic enables us to achieve significant performance improvements over previous models in the range. The integration of FortiASIC-NP provides:

- Wire-speed firewall performance at any packet size with dynamic address translation
- VPN acceleration
- Anomaly-based intrusion prevention, checksum offload, and packet defragmentation
- Traffic shaping and priority queuing

## FortiASIC Content Processors

FortiASIC Content Processors (CP) are found in all FortiGate appliances with the exception of the FortiGate-30B. The FortiASIC-CP provides IPsec VPN acceleration and implements the Content Processing Recognition Language (CPRL) that can be used to accelerate pattern matching and other computationally-intensive tasks. Because a FortiASIC-CP has been present in previous versions of the FortiGate-60 series, incorporating it in the FortiASIC-FS1 does not provide any significant performance increase. Consolidating it with the other processing functions does, however, simplify the internal hardware design and motherboard layout, helping to contain costs without sacrificing performance. The integration of FortiASIC-CP provides:

- IPsec VPN encryption and decryption offload
- High-Speed pattern matching for improved signature-based inspection

## RISC Processor

The FortiASIC components integrated into the SoC hardware would not be useful without the presence of a general purpose CPU. Using an ARM-based CPU required us to port the FortiOS operating system to this architecture and also allowed us to maintain a key design goal of providing a fan-less desktop device, increasing reliability and eliminating possible concerns over noise.

## Performance

The inclusion of FortiASIC-NP technology in the desktop form factor has provided significant performance improvement over the previous model. The firewall performance of the FortiGate-60C is now ten times greater than its predecessor the FortiGate-60B.

Product Family	Firewall	IPSEC VPN	Anti Virus	IPS
FG-60B	100 Mbps	64 Mbps	20 Mbps	60 Mbps
<b>FG-60C</b>	<b>1 Gbps</b>	<b>70 Mbps</b>	<b>20 Mbps</b>	<b>60 Mbps</b>

**Table 1. FortiGate 60B and FortiGate 60C Performance**

## Conclusion

The SoC architecture and the resulting FS1 SoC incorporated into the new FortiGate/FortiWiFi-60C series represents a significant breakthrough in performance. The series enables large distributed enterprises to provide integrated, multi-threat protection across all points on their network without sacrificing performance.