Arista 7500R Universal Spine Platform Investment Protection

Arista Networks' award-winning Arista 7500 Series was introduced in April 2010 as a revolutionary switching platform, which maximized datacenter performance, efficiency and overall network reliability. It raised the bar for switching performance, being five times faster, one-tenth the power draw and one-half the footprint compared to other modular datacenter switches.

In 2013, the Arista 7500E Series delivered a three-fold increase in density and performance, with no sacrifices on features and functionality and with complete investment protection.

Just three years later the Arista 7500R Universal Spine platform delivered more than a 3.8X increase in performance and density with significant increases in features and functionality, most notably IP forwarding table sizes that put it in the class of router platforms.

This whitepaper details the investment protection capabilities of the Arista 7500R line cards and fabrics and how they can be used in the existing Arista 7500E chassis and interoperate with the Arista 7500E line cards and fabric modules.

The Status Quo

Many vendors promise investment protection but don't deliver on the promises.

Some provide *'ships in the night'* support – different types of line cards in the same system but they are required to operate independently.

Others say they have investment protection but require replacement of all line card and fabric modules. You get to keep the chassis sheet metal and the air inside it, but essentially the entire data-plane (and the majority of the system cost) is replaced.

Figure 1: Arista 7500R Universal Spine platform.

Neither of these scenarios is desirable, or is true *'investment protection.'*

True Investment Protection

The Arista 7500 series delivers complete interoperability and investment protection across all components that make up the Arista 7500 Series:

•   Mixing/matching existing Arista 7500E line cards with Arista 7500R line cards is supported

•   New Arista 7500R Series, including 7500R and 7500R2, line cards are backwards compatible with existing Arista 7500E fabric modules

•   Existing 7500E line cards are forward compatible with new Arista 7500R fabric modules

•   While there are new Arista 7500R Series chassis, existing Arista 7500E Series customers can continue to use their existing systems as-is – with existing supervisor, fabrics and line cards – or optionally upgrade to the 7500R Series.

•   Arista 7500R Series chassis can use the existing supervisor, fabrics and line cards.

Hardware Upgrade Considerations

Figure 2 outlines the hardware investment protection for existing Arista 7500E Series customers

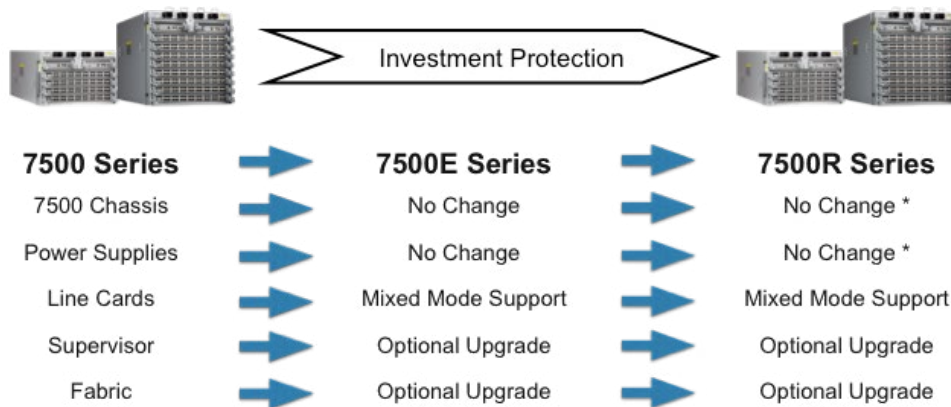| 7500 Series		7500E Series		7500R Series
7500 Chassis	→	No Change	→	No Change *
Power Supplies	→	No Change	→	No Change *
Line Cards	→	Mixed Mode Support	→	Mixed Mode Support
Supervisor	→	Optional Upgrade	→	Optional Upgrade
Fabric	→	Optional Upgrade	→	Optional Upgrade

Figure 2: Arista 7500E Flexible Migration path

For existing Arista 7500E deployments, there is no change required in the chassis or power supplies. Newer line cards can be added alongside existing line cards, the existing Supervisor can continue to be used or upgraded, and existing fabric modules can continue to be used or upgraded.

The upgrade considerations for each of these components is detailed below:

Chassis

For existing deployments, there is no change to the Arista 7500 Series chassis. Designed with future proofing in mind, the existing Arista DCS-7504 and DCS-7508 chassis are capable of supporting the higher performance 7500R line cards and fabric modules. The original Arista 7500 Series that started out with 480 Gbps forwarding throughput (48 x 10G) now supports up to 3.6 Tbps (36 x 100G) per line card slot.

For new deployments, the Arista DCS-7504N, DCS-7508N, DCS-7512N and DCS-7516N chassis provide NEBS compliance and a choice of AC and DC power options.

The newer chassis are automatically enabled with the upgraded DCS-7500-SUP2 or DCS-7516-SUP2 Supervisor and DCS-75xxR-FM fabric modules and are recommended for all new installations.

Arista 7500E line cards are not supported in the new DCS-7512N chassis.

Power Supplies

Existing DCS-75xx chassis continue to use the same PWR-2900AC 2900W gold efficiency-rated AC power supplies.

The new DCS-75xxN chassis can use the newer PWR-3KT-AC-RED 3kW titanium efficiency-rated AC power supplies or the PWR-3K-DC-RED 3kW DC power supplies.

Supervisor Modules

The newer Supervisor-2 (DCS-7500-SUP2) module for 7504 ND 7508 systems provides more than twice the control-plane performance and twice the RAM compared to Supervisor-E, and is the default for all newer systems.

While upgrading from Supervisor-E to Supervisor-2 (DCS-7500-SUP2) is optional, Arista recommends that a Supervisor-2 be deployed when 4 or more Arista 7500R line cards are in a system, or to make use of the larger scale forwarding tables enabled by Arista 7500R line cards. If neither of these is required, existing deployments can continue to use Supervisor-E with no requirement to upgrade. Supervisor-2 is also recommended for expanded VRF scale beyond the Supervisor-E support.

Note that it is not possible to run a mixed system of Supervisor-E and Supervisor2 at the same time. A dual supervisor system must have the same type of Supervisors.

Fabric Modules

Existing systems can continue to use the existing 7500E Fabric modules. The 7500R and 7500R2 line cards are backwards compatible with 7500E fabric modules and no explicit configuration is necessary.

Mixing 7500E Fabric modules and 7500R Fabric modules in the same system is not supported.

Where new 7500R line cards are being added to a system with 7500E fabric modules, it may make sense to optionally upgrade the fabric to achieve the following benefits:

- 7500E fabric modules provide up to 2.2 Tbps fabric capacity per slot (2.2Tbps receive + 2.2Tbps transmit) by running fabric links at 11.5Gbps. 7500R fabric modules increase this to 4.8 Tbps, or approximately 2.2X more.

- 7500R line cards deployed in high performance scenarios will utilize this additional fabric capacity to provide line-rate packet forwarding.

Continuing to use an existing 7500E fabric module with 7500R line cards is supported and if fabric connectivity reaches 100% utilization, the Virtual output Queuing (VoQ) architecture ensures fairness and no drops within the fabric. However, we would recommend 7500R fabrics for such scenarios.

For customers with existing 7500E fabric modules, Arista's EOS Latency Analyzer (LANZ) feature can be used to determine whether VoQ buffers are being used and what the high-water-mark on each VoQ reached. This is a valuable indicator whether fabric capacity is a concern.

7500R fabric modules can operate fabric links at three different speeds: 11.5Gbps, 23Gbps and 25.7Gbps. Running fabric links faster is preferable to slower, however the speed at which fabric links can operate depends on what additional line cards are in a system:

- If a system consists only of 7500R line cards, fabric links can operate at 25.7Gbps.

- If a system consists only of 7500E line cards, fabric links operate at 11.5Gbps

- If a system contains both 7500E and 7500R line cards, fabric modules to/from 7500R line cards operate at 23Gbps, and 11.5Gbps to/from 7500E line cards

- If there is no explicit configuration to indicate which mode to operate in, the system will determine the operating mode based on the first line card detected at startup. If the first line card detected is a 7500E line card, the 7500R fabric will operate in 23G/11.5G mode; otherwise it will operate in 25.7G mode.

The mode of operation can be explicitly configured via the following CLI commands. This would be recommended if the line card types are expected to be changed in future:

- Enable 25.7G mode – only 7500R line cards are supported:

    Arista(config)# platform sand compatibility fabric fe3600

    Arista(config)# write memory

    Arista(config)# reload

- Enable 23G/11.5G mode – both 7500R and 7500E line cards are supported:

    Arista(config)# platform sand compatibility fabric fe1600

    Arista(config)# write memory

    Arista(config)# reload

The current-operating mode of a system is available via the 'show platform sand compatibility' command. If the system is in fe3600 mode, any 7500E line cards are powered down and unavailable.

Functionality Considerations
The following section outlines considerations around features/functionality and EOS releases.

Minimum EOS Software Release
If there are any Arista 7500R hardware components (chassis, supervisor, line card or fabric modules) the minimum supported software release required is EOS-4.15.4FX-7500E3.

The first release to enable 7500E and 7500R series line cards is EOS-4.15.4FX-7500E3.1, available in April 2016.

For recommendations on the most appropriate EOS release consult the software download page of arista.com and specifically the 'Recommended EOS release' page.

Arista 7500E and 7500R Line Cards
Arista 7500E and 7500R line cards can operate in the same system at the same time, and forwarding between the two different line card types is supported.

Arista 7500R line cards provide additional features and functionality and larger table sizes ('Jericho' mode) compared to 7500E line cards. These additional capabilities are scaled back to the same table sizes and capabilities as that of 7500E line cards ('Arad' mode) if there are 7500E line cards in the system.

If there is no explicit forwarding mode configured, at startup the system will determine the forwarding mode to operate in based on the first line card type detected:

- If a system consists only of 7500R line cards, the system operates in Jericho forwarding mode.

- If the first line card type detected is a 7500E line card, the system operates in Arad forwarding mode

The mode of operation can be explicitly configured via the following CLI commands. This would be recommended if the first line card type is expected to be changed in future:

- Enable Jericho mode – only 7500R line cards are supported:

  Arista(config)# platform sand compatibility forwarding jericho

  Arista(config)# write memory

  Arista(config)# reload

- Enable Arad mode – both 7500R and 7500E line cards are supported:

  Arista(config)# platform sand compatibility forwarding arad

  Arista(config)# write memory

  Arista(config)# reload

The operating mode of a system can be determined via the 'show platform sand compatibility' command. If the system is in Jericho mode, any 7500E line cards are unavailable.

Table 1 highlights the additional features/functionality and table sizes enabled by Jericho mode over Arad mode. Since the hardware forwarding architecture of Arad and Jericho are similar and the forwarding pipeline is performed by both the input and output packet processors, the functional differences are kept to a minimum:

Please consult the release notes for an EOS release for more specific details on feature interactions.

Table 1: Forwarding mode capabilities		
Characteristic	Arad Forwarding Mode	Jericho Forwarding Mode
MAC Table	Up to 256K	Up to 768K*
Host Routes	Up to 256K	Up to 768K
IPv4 and IPv6 LPM	48 - 96K	FlexRoute Engine enables 1M+ IPv4/IPv6 prefixes

Conclusion

Where many vendors continue to promise investment protection and don't deliver, the Arista 7500R Universal Spine platform delivers complete forward and backward interoperability and investment protection across all components that make up the Arista 7500 Series.

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