


# AirWave 7.6



Server Sizing Guide

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Altering this device (such as painting it) voids the warranty.

This document provides information for selecting hardware. Note that this document is current with supported information for AirWave 7.6.

This section includes the following topics:

- "CPU, Memory, and Storage Matrix" on page 1
- "Choosing Your CPU" on page 2
- "Choosing Your Memory" on page 3
- "Choosing Your RAID Controller" on page 3
- "Choosing Your Hard Drives" on page 4

## CPU, Memory, and Storage Matrix

The following table lists the recommended specifications for optimum AirWave server performance.

**Table 1: Recommended CPU, Memory, and Storage**

Devices	CPU	RAM (GB)	Disk Config	IOPs	Storage (GB)
Less than 500		8		50	75
500	Intel Core i3-2220 @ 3.30GHz	16	6x 146GB 15k RAID 10	300	410
1000	Intel Core i5-3570 @ 3.40GHz	32	10x 146GB 15k RAID 10	600	685
1500	Intel Xeon E5-2660 @ 2.20GHz	48	12x 146GB 15k RAID 10	900	821
4000	Dual Intel Xeon E5-2660 @ 2.20GHz	80	16x 146GB 15k RAID 10	2400	1095
5000	Dual Intel Xeon E5-2690 @ 2.90GHz	96	18x 146GB 15k RAID 10	3000	1232
5000 SSD	Dual Intel Xeon E5-2690 @ 2.90GHz	96	6x 500GB SSD RAID 10	3000	1397



Ensure that the disk subsystem can sustain these 4KB random write rates. Sustained sequential write rates will not help because AirWave writes are primarily random.

The following table lists the minimum specifications required to run AirWave.

**Table 2: Minimum CPU, Memory, and Storage**

Devices	Appliance Name	CPU	RAM (GB)	Disk Config	IOPs	Storage (GB)
Less than 500			4		30	75
500		Intel Core i3 550 @ 3.20GHz	8	4x 146GB 15k RAID 10	300	273
1000		Intel Xeon E5-1603 @ 2.8 GHz	16	6x 146GB 15k RAID 10	600	410
1500	AW-HW-PRO*	Intel Xeon E5-2640 @ 2.50GHz	32	6x 146GB 15k RAID 10	900	410
4000	AW-HW-ENT*	Dual Intel Xeon E5-2640 @ 2.50GHz	64	8x 146GB 15k RAID 10	2400	548

\* These systems represent appliances that are available from Aruba Networks.

The table below includes additional testing metrics for Aruba Networks appliances. Note that doubling the wired switch/total device ratio from 20% to 40% results in a 20% decrease in the number of devices for which the system can process data. (For example, the ENT system is rated for 3200 devices at 40% wired switches.)

**Table 3: Additional Testing Metrics for Aruba Networks Appliances**

Name	Client Traps per second (continuous)	Syslog Messages per second (continuous)
PRO	50	125
ENT	100	250

AirWave includes the 64-bit CentOS operating system based on Red Hat Enterprise Linux (RHEL) and is installed by default.



If you choose to install RHEL instead of the supplied CentOS, you will need to purchase your own RHEL license and support separately.

Your hardware should incorporate margin for WLAN expansion as well as future AirWave features and modules. These recommended specifications are formulated to keep AirWave running on the same hardware platform for up to three years.

Factors which influence the processing requirements for your AirWave server:

- How many devices will the server manage?
- How often will AMP communicate with these devices?



To ensure hardware capability, purchase server hardware that is certified to be compatible with Red Hat Enterprise Linux 5 (RHEL5).

## Choosing Your CPU

For most AirWave installations, Aruba recommends selecting high-performance Xeon E-series CPUs.

Aruba performs scalability testing using Intel based hardware at this time. See [Table 1](#) in the [CPU, Memory, and Storage Matrix](#) section for recommendations on CPU selection based on clock speed and core type.

## Choosing Your Memory

AirWave's memory recommendations scale linearly with the managed device count.

With AirWave servers running at full load for those device counts with a large number of floorplans, the recommended memory usually results in best overall performance.

Best performance is defined by minimal disk reads due to sufficient caching, thus allowing for maximum disk write performance and minimal CPU I/O wait time.

## Choosing Your RAID Controller

**RAID 1+0** is the ONLY supported RAID configuration for AirWave.



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Software RAID and SATA drives are NOT SUPPORTED for any configuration of AirWave.

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### RAID Configuration Information

For RAID 1+0:

- Dedicated Hardware RAID controller with caching and battery backup or non volatile (NV) cache.
- RAID controller should be configured for Write-Back caching with battery backup (unless NVcache is selected, then Force Write-Back without Battery backup is recommended).
- Individual Drive Caching should be enabled.
- Ensure that all disks are assigned and configured to a single volume.



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Improper RAID configuration can result in drastically reduced server performance.

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### 200 Devices and Below

AirWave 100 and 200 models perform well on a single, fast (spindle speed) disk.

### 500 Devices

RAID 1+0 configuration of four (4) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 256MB of cache and battery backup.

### 1,000 Devices

RAID 1+0 configuration of four (4) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 256MB of cache and battery backup.

### 1,750 Devices

RAID 1+0 configuration of six to eight (6-8) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 512MB of cache and battery backup.

### 2,500 Devices

RAID 1+0 configuration of six to eight (6-8) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 1GB of cache and battery backup.

## 5,000 Devices - Non-SSD Drives

RAID 1+0 configuration of sixteen (16) or more 15K SAS drives in a single volume with dedicated Hardware RAID controller with minimum 1GB of cache and battery backup.

## 5,000 Devices - SSD Drives

AWMS 2,500 - 5,000 device installations with SSDs require **Single Level Cell (SLC) Enterprise class SSD drives**.



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Do not use Multi Level Cell (MLC) Consumer class drives. Use of MLC drives can result in drastically reduced SSD drive lifespan and data loss/volume failure due to write exhaustion.

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A minimum of six (6) Enterprise SSDs in a RAID 1+0 configuration are required, (Refer to "[CPU, Memory, and Storage Matrix](#)" on page 1 for minimum needed storage capacity information.) Eight (8) or more SSDs in a RAID 1+0 configuration are recommended.

The target random write 4KB IOP Performance is at minimum 3,000 sustained IOPS for 5,000 device monitoring.

The actual disk IOP requirement can vary depending on the configuration of the AirWave server.



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If you have any questions regarding hardware compatibility or selection, contact Aruba support.

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AirWave servers servicing more than 2,500 devices require 64-bit OS and AirWave 7.1 or higher. Do not use software RAID systems or SATA disk drives.

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## Choosing Your Hard Drives

15K SAS drives are the highest performance spinning platter drives available today. Serial ATA and 10K SAS are vastly outperformed by 15K SAS and should not be used in an AirWave server.

You will need to select the appropriately sized hard drive to meet your desired storage volume after taking into account RAID 1+0 reduction on overall storage capacity.

RAID 1+0 reduces your single volume available drive space by  $\frac{1}{2}$  because of the redundancy introduced. An example would be 16x 146GB 15K SAS hard drives in a RAID 1+0 volume will result in approximately 1.1 TB of storage space  $[(16*146GB)/ 2]$ .

## SSDs vs 15K SAS

Solid State Drives are becoming more affordable and are being offered as a high performance drive option by many vendors. SSDs offer performance that far outstrips 15K SAS, but at a significant cost premium.

AirWave supports deployment on SSD based storage arrays and can take advantage of the high speed disk access and stellar random write performance.

To select an appropriate SSD you'll want to ensure that the SSD is classified as "Enterprise" class. This generally indicates a drive that uses Single Level Cell (SLC) technology versus Multi Level Cell (MLC) technology. SLC technology is required for an AirWave server to avoid unexpected write exhaustion and/or poor performance due to write amplification.

Confirm with your vendor prior to purchasing SSDs that their offerings are appropriate for a 24/7 sustained high random write database server and are not a consumer-grade SSD.

In general, RAID 1+0 is still recommended for SSD deployments to allow for the best overall redundancy and performance. Any parity based RAID (5/6/etc) is not recommended.

For additional information, please contact Aruba support.

This section explains sizing information for the following topics:

- "CPU Configuration " on page 5
- "Disk Partitioning" on page 5
- "Filesystem Configuration" on page 5

## CPU Configuration

Ensure that Power Management is configured for **Maximum Performance**. By default, most vendors configure BIOS to an eco-friendly setting.

Ensure that Memory Operating Mode is configured to **Optimizer Mode**, if available.

## Disk Partitioning

AirWave automatically partitions the disk subsystem upon installation. You can override these values. [Table 4](#) below lists the default partitioning and provides guidance for more advanced scenarios.

**Table 4:** *Default Partitions*

Default Partitions	Size
boot	100 MB
swap	4 GB
/	Remainder of disk space

## Filesystem Configuration

For AirWave, the NOOP File I/O scheduler provides the best random write performance. If you are running AirWave 7.2 or later, AirWave should automatically manage this setting for you.

To check the currently assigned scheduler (if sda is not your device name, please replace with the correct device name):

```
# cat /sys/block/sda/queue/scheduler
noop anticipatory deadline [cfq] (Sample Output)
```

To configure noop as your preferred scheduler:

```
# echo noop > /sys/block/sda/queue/scheduler
```

And confirm that your change has been applied:

```
# cat /sys/block/sda/queue/scheduler
[noop] anticipatory deadline cfq (Expected Output)
```

This section includes the following topics:

- "Virtualization" on page 6
- "Scalability Assumptions" on page 6

## Virtualization

AirWave can run in a VMware and Xen virtualized environment. To ensure scalability, dedicate the processing and memory. You must also ensure that the disk subsystem can maintain the IOPS throughput as detailed below.

Most virtualized environments use a shared disk subsystem assuming that each application will have bursts of I/O without a sustained high I/O throughput. AirWave requires a continuous sustained high data I/O rate.

For virtualized environment, use dedicated hardware. If you are using the specifications outlined in the "CPU, Memory, and Storage Matrix" on page 1 section, the hardware for virtualization should exceed these specifications by 20%.




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Aruba recommends a 20% increase buffer for virtualized environments. Ensure you allocate enough extra disk space for the OS and swap when partitioning the virtual disk.

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## Scalability Assumptions

Using the specifications outlined in the "CPU, Memory, and Storage Matrix" on page 1 section, Aruba continually tests scalability based on the following assumptions. Deviations from these assumptions can impact overall scalability of your AirWave server.

**Table 5: Wireless Scalability Test Values**

Category	
AP Interface polling period	10
Device-to-device link period	5
CDP neighbor data polling	30
Ratio of switches/routers to access points	25%
Read ARP polling (hours)	4
Read CDP table for device discovery polling (hours)	4
Read bridge forwarding table polling (hours)	4
Interface Up/Down polling period	10




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Auditing more than once a day can have a tremendous impact on scalability.

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**Table 6: Wired Scalability Test Values**

Category	
Ratio of switches/routers to access points	25%
Average port density of switches/routers	36
Read ARP polling period (hours)	8
Read CDP table for device discovery polling period (hours)	8
Read bridge forwarding table polling period (hours)	8
Interface polling period (minutes)	20

**Table 7: VisualRF Scalability Test Values**

Category	
Average floor plan size (feet)	62,500
Number of access points per floor plan	20
Number of clients per floor plan	100
Number of attenuation grid cells per floor plan	2,500
Number Rogue devices per floor plan	20
AMP Synchronization timer (minutes)	15
Rogue location timer (minutes)	30
Location calculation timer (min/max/number of samples)	90/360/3

## Master Console

**Table 8:** *Master Console Specifications*

Environment Size	CPU Class	Clock Speed (GHz)	CPUs	Total Cores	Memory	Disk Subsystem
Small (2-3 servers)	Intel Xeon E5-2640	2.5	1	6	32GB	6x 146GB 15k RAID 10 (410GB usable disk space)
Large (>3 servers)	Dual Intel Xeon E5-2640	2.5	2	12	64GB	8x 146GB 15k RAID 10 (548GB usable disk space)

## Failover Server

The Failover server should be as powerful as the most powerful AMP server that it monitors to ensure smooth operation in a failover situation.