Dell PowerConnect W AirWave 7.1

Sizing Guide

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Overview

This document provides guidelines for purchasing new hardware which will host the Dell PowerConnect W AirWave Wireless Management System (AWMS). Your hardware should incorporate margin for WLAN expansion as well as future AWMS features and modules. These specifications are formulated to keep AWMS running on the same hardware platform for up to two years.

Factors which influence the processing requirements for your AWMS server:

- How many devices will the server manage?
- How often will AMP communicate these devices?
- How many wireless clients will the server monitor?
- Will this server run the RAPIDS (IDS and WIPS) modules?
- Will this server run VisualRF and provide location services?

High Level Sizing Information

CPU and Memory Matrix

Managed Devices	CPU Class	Clock Speed (GHz)	CPUs	Total Cores	AWMS Memory	RAPIDS Memory	VisualRF Memory
Pilot 1-25 APs	Quad Core Intel® Xeon **X3430**	2.4	1	4	3 GB	.5 GB	.5 GB
100	Quad Core Intel® Xeon **X3440**	2.53	1	4	4 GB	1 GB	1 GB
200	Quad Core Intel® Xeon **X3460**	2.8	1	4	4 GB	2 GB	2 GB
500	Quad Core Intel® Xeon **X5540**	2.53	1	4	4 GB	2 GB	2 GB
1,000	Quad Core Intel® Xeon **X5560**	2.8	1	4	6 GB	3 GB	3 GB
2,500	Quad Core Intel® Xeon **X5560**	2.8	2	8	16 GB	4 GB	4 GB
2,500 +	Hex Core Intel® Xeon **X5680**	3.33	2	16	24 GB	6 GB	6 GB

Storage Matrix

# of Devices	Min. AWMS Storage	Max. AWMS Storage	*IOPS 2 x random writes to reads	Storage System
100	*75 GB	75 GB	60	(1) Drive 15K RPM
200	75 GB	75 GB	120	(1) Drive 15K RPM
500	75 GB	75 GB	300	Multiple 15K RPM RAID Drives
1,000	75 GB	150 GB	600	Multiple 15K RPM RAID Drives
2,500	187 GB	375 GB	1,500	Multiple 15K RPM RAID Drives
2,500 +	300 GB	600 GB	3,000	Multiple 15K RPM & SSD RAID Drives

The 75 GB requirement on the smaller installation (100-500) accounts for the OS and swap overhead, plus it is very difficult to install a single disk with less 75 GB capacity.

Note: Please ensure the disk subsystem can sustain these random write rates. Sustained sequential write rates will not help, because AWMS writes are primarily random.

CPU & BIOS

Intel Nehalem and Westmere Architecture Information

With the advent of Nehalem, Intel makes a giant leap in the FSB to support NUMA (Non Uniform Memory Access).   In NUMA, memory on the same processor board as the CPU (local memory) is accessed faster than memory on other processor boards (shared memory), hence the "non-uniform" nomenclature. As a result, NUMA architecture scales much better to higher numbers of CPUs/cores than SMP.

- **32-bit** - ensure NUMA is **disabled**.
  - Some vendors' BIOS refer to non NUMA as "Memory Node Interleaving".   Ensure "Memory Node Interleaving" is "Enabled" on 32-bit operating systems.
  - By default most vendors disable this setting in their BIOS.
- **64-bit** - ensure NUMA is **enabled.** Some vendors' BIOS have "NUMA Enabled" or "NUMA-Aware OS" options.

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

Ensure Memory Operating Mode is configured to "Optimizer Mode" if available.

AMD Information

Dell does not actively conduct scalability testing for the AMD processor product line. These numbers are based on published performance data versus the Intel product line. See Appendix below for details in the AMD Scalability Matrix.

Operating System

To ensure hardware capability purchase server hardware that is certified to by Red Hat Enterprise Linux.

- AWMS includes the CentOS operating system based on Red Hat Enterprise Linux and is installed by default. You may choose to use Red Hat Enterprise Linux.

- AWMS supports both 32-bit and 64-bit hardware platforms.   An AWMS server servicing more than 2,500 devices requires 64-bit OS installation coupled with AWMS 7.1 or higher.

- AWMS 7.1 installs 64-bit CentOS by default.

Storage

AWMS stores most statistical data in special statistical flat files. This serves two purposes. First, it improves speed, because writing to a statistical flat file is much faster than writing to a relational database. Secondly, it provides for a known, fixed amount of storage per managed device. Last, it consumes much less space than a traditional rational database. AMP spends much more time writing to the disk subsystem than reading from it.

Here are some factors which influence storage requirements for your AWMS server.

- How many devices will the server manage?
- How much historical data will the server retain?
- How many wireless clients will the server monitor?
- Will this Server run VisualRF and RAPIDS?

RAID Configuration Information

200 Devices and Below

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

500 – 1,000 Devices

RAID configuration requires at least 4 SAS/SCSI disk drives in a RAID-10 configuration supplied via a hardware controller with at least 256 MB of cache.   All disk drives must have <u>15K RPM</u> spindle speeds. Do not use software raid systems or SATA disk drives.

1,000 – 2,500 Devices

RAID configuration requires at least 6 SAS/SCSI disk drives in a RAID-10 configuration supplied via a hardware controller with at least 512 MB of cache.   All disk drives must have <u>15K RPM</u> spindle speeds.

Above 2,500 Devices

These large servers mandate two distinct disk partitions. The first partition will require 10 SSDs (Solid State Disk) drives in RAID-10 configuration supplied via a hardware controller with at least 512 MB of cache.   This partition is the high throughput data storage area "/var" described in the partition table below.

The second partition will required 2 SAS/SCSI drives in a RAID-1 configuration supplied via a hardware controller. Both drives must have 15K RPM spindle speeds. This partition will contain the operating system.

> **Note**: Please contact http://support.dell.com when purchasing or configuring any hardware platform servicing more than 2,500 devices. AWMS servers servicing more than 2,500 devices require 64-bit OS and AWMS 7.1 or higher. Do not use software raid systems or SATA disk drives.

Disk Partitioning

AWMS automatically partitions the disk subsystem upon installation. You can override these values. The table below lists the default partitioning and provides guidance for more advanced scenarios.

Default Partitions

Default Partitions	Size
boot	100 MB
swap	Twice size of RAM
/	Rest of disk space

Advanced Partitions

Default Partitions	Purpose	Recommended Size
boot	Boot partition	100 MB
swap	Swap partition	Twice size of RAM
/	AWMS	25% of total disk space
/alternative	Database backup location	10% of total disk space
/var/log	All log from all services	5% of total disk space
/var/lib/pgsql	PostgreSQL database files	25% of total disk space
/var/airwave/rrd	Statistical flat files	25% of total disk space
/var/airwave-backup	Nightly backup location	10% of total disk space

> **Note**: Please ensure the disk subsystem can sustain these random write rates. Sustained sequential write rates will not help, because AWMS writes are primarily random.
>
> There could be upgrade or installation issues when manually partitioning your disk subsystem.

Storage System Tuning

RAID 10 Notes

- Ensure all disks are configured to "One Virtual Disk".
- If the RAID controller has battery-backed cache, ensure the Write Policy is configured to "Write-Back", otherwise ensure it is configured to "Write-Through".

Kernel I/O Scheduler Configuration

CentOS and RH Linux include four custom schedulers to handle I/O.

- **CFQ** - Completely Fair Queuing is the default algorithm
- **Deadline elevator** - uses a deadline algorithm to minimize I/O latency
- **NOOP scheduler** – is a simple FIFO
- **Anticipatory elevator** – introduces a small delay before dispatching the I/O

While CFQ works well in most installations, Dell has found changing scheduler to NOOP and allowing the hardware RAID controller to handle I/O queuing has produce significant I/O improvements. This is set via /sys/block/<device>/queue/scheduler.

Note: Contact http://support.dell.com prior to changing this setting.

Virtualization

AWMS will run in a VmWare and Xen virtualized environment. To ensure scalability you need to dedicate the processing and memory described in the table below. You must also ensure that the disk subsystem can maintain the IOPS throughput detailed below.

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

Virtualized Processing and Disk IOPS Matrix

Managed Devices	CPU Class	Clock Speed (GHz)	CPUs	Total Cores	Max Memory	Sustained IOPS
Pilot 1-25 APs	Quad Core Intel® Xeon **X3430**	2.4	1	4	3 GB	30
100	Quad Core Intel® Xeon **X3440**	2.53	1	4	6 GB	60
200	Quad Core Intel® Xeon **X3460**	2.8	1	4	8 GB	120
500	Quad Core Intel® Xeon **X5540**	2.53	1	4	8 GB	300
1,000	Quad Core Intel® Xeon **X5560**	2.8	1	4	12 GB	600
2,500	Quad Core Intel® Xeon **X5560**	2.8	2	8	24 GB	1,500
2,500 +	Hex Core Intel® Xeon **X5680**	3.33	2	12	48 GB	3,000

Note: There are always spikes that go beyond the Sustained IOPS numbers stated above. Dell 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.

Scalability Assumptions

Dell continually test scalability based on the following assumptions. Deviations from these assumptions can impact overall scalability of your AWMS server.

Wireless

Category	Value
Average density of client devices per access point	5
Device configuration auditing interval	Daily
Up/Down status polling period (minutes)	5
User data polling period (minutes)	10
Thin AP discovery period (minutes)	15
Device-to-device link polling period (minutes)	20
Device bandwidth polling period (minutes)	10
802.11 counters polling period (minutes)	15
Rogue AP and device location data polling period (minutes)	30
CDP neighbor data polling period (minutes)	60

> **Note**: Auditing more than once a day can have a tremendous impact on scalability.

Wired

Category	Value
Ratio of switches/routers to access points	20%
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)	10

VisualRF

Category	Value
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

Appendix

AWMS Appliance

Dell provides the option of purchasing a specially designed hardware appliance. There are two models listed below. AWMS-HW-PRO is designed for deployments with up to 1,000 devices. AWMS-HW-ENT is designed for deployments up to 2,500 devices.

SKU	CPU Class	Clock Speed (GHz)	CPUs	Total Cores	Memory	Disk Subsystem
AWMS-HW-PRO	Quad Core Intel® Xeon® **X5560**	2.8	1	4	12 GB	(4) 73GB, 15K RPM - Raid 10 146 GB of usable disk space
AWMS-HW-ENT	Quad Core Intel® Xeon® **X5560**	2.8	2	8	24 GB	(6) 146GB, 15K RPM - Raid 10 438 GB of usable disk space

AWMS Server Reference Sell

Dell has partnered with the leading server manufacturers to certify specific hardware platforms for capability and scalability.

IBM Servers x3650 M2 – certified on 02/15/2010

Managed Devices	Clock Speed (GHz)	CPUs	Total Cores	Memory	Disk Subsystem
2,500	2.93	2	8	24 GB	(6) 146GB, 15K RPM - Raid 10 438 GB of usable disk space

Super AMP (2,500 + Devices) BOM

This is a sample bill of material for Super AMP which can support more than 2,500 devices. Please contact

Category	Part Numbers	Description	Qty
Motherboard		18 Dimm Xeon 5520 (Tylersburg) ServerBoard - UIO, 192G	1
CPU	X5680	Westmere 6C 3.3Ghz	2
Memory		2 GB - DIMM 240-pin - DDR3	18
OS Disk	ST9146852SS	SEAGATE 2.5" 146GB SAS 2.0 15K RPM	2

Data Disk	SSDSA2SH064G1	Intel 2.5" 64 GB SSD, X25-E SLC, 7.0 mm	14
RAID Controller	AOC-USASLP-H8iR	SAS 3Gb/s Eight-Internal ports RAID Adapter	1

AMD Hardware Matrix

Managed Devices	CPU Class	Clock Speed (GHz)	CPUs	Total Cores	AWMS Memory	RAPIDs Memory	VisualRF Memory
500	Quad Core AMD Opteron™ 8387	2.8	1	4	4 GB	2 GB	2 GB
1,000	Quad Core AMD Opteron™ 8387	2.8	2	8	10 GB	3 GB	3 GB
2,000	Quad Core AMD Opteron™ 8435	2.6	2	12	12 GB	6 GB	6 GB

Note: Dell does not actively conduct scalability testing for the AMD processor product line. These numbers are based on published performance data versus