Worldwide Telecommunications, Networks, and Data Center IT

Market Trends for Wireless LAN

For IEEE ComSoc SCV
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Agenda

• Forecast
• Vendors
• Technology: 802.11ac, Controller, Cloud
• Positioning
• Verticals
• Outdoor, SOHO, SP WiFi
• Ethernet/WiFi
WLAN Revenue Forecast – July 2015 Report

Revenue in Billions

- **Enterprise (11% CAGR ‘14-’19)**
- **Outdoor (11% CAGR ‘14-’19)**
- **SOHO (2% CAGR ‘14-19)**

Forecast

- **Rev.11/30/15**
  - 2015 $9.2B
  - 2016 $9.8B

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Enterprise Wireless LAN Landscape - 2015

Forecast

• Market under plan: 2015e revenue +3%, AP growth +13%
• E-Rate disappointing
• Mix to low-end customers
• Wave 2 later than expected
• Controller revenues declining (-14% 2015e)
• Market Consolidation underway
• SP WiFi at mobile operators weak
Vendor Positioning
Total Enterprise+Outdoor Revenue (Top 5)

Revenue in $ Millions

3 vendors with >3% Rev Share
6 vendors with >3% Rev Share

Cisco
HPE Aruba
Aruba
Ruckus
UBNT
Aerohive

Vendors
Vendor Positioning
Total Enterprise+Outdoor Revenue (Rank 6-10)

Revenue in $ Millions

1Q11  3Q11  1Q12  3Q12  1Q13  3Q13  1Q14  3Q14  1Q15  3Q15

Xirrus  Zebra  Ubiquiti

Huawei  Alcatel-Lucent-Enterprise  Vendors

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Enterprise Access Points Unit Shipments

Unit Shipments in 000's

Rev. 11/30/15:
16% AP Growth ('16e)
13% AP Growth ('15e)

Wave 1 begins

Wave 2 begins

802.11a/g
802.11b
802.11g
802.11n
802.11ac
802.11ax...
Vendor Positioning Controller Revenue (Bar) and Units (Line)
The Controller Has Competition

• Cloud-Managed
• Controller-less
• Free Downloadable Controller Software
• Embedded Free Controller
Cloud-Managed Revenues

Revenue in Billions


Equipment

Services

Technology

$0.0 $0.4 $0.8
Vendor Positioning
802.11ac Percent of Each Vendors’ AP* (Top 5+ARUN)

*AP = Access Point
Vendor Positioning
802.11ac Percent of Each Vendors’ AP*(Rank 6+)

Positioning

Xirrus

Extreme

ALUe

Total

Fortinet/Meru

Zebra

Huawei

802.11ac Fraction of Total (%)

0%

50%

100%

2Q13 3Q13 4Q13 1Q14 2Q14 3Q14 4Q14 1Q15 2Q15 3Q15

*AP = Access Point

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Vendor Positioning
Enterprise ASP* vs Industry - (Top 5 Vendors + Aruba)

*Enterprise-class Average Selling Price (includes Access Point and Controller, if applicable)
Vendor Positioning
Enterprise ASP* vs Industry - (Rank 6+ Vendors)

*Enterprise-class Average Selling Price (includes Access Point and Controller, if applicable)
## Top Vendor Revenue Share and Profits - 2014

<table>
<thead>
<tr>
<th>Company</th>
<th>Rev Share ('14)</th>
<th>Corporate Profits ($M, ‘14)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cisco</td>
<td>51%</td>
<td>-</td>
</tr>
<tr>
<td>Aruba</td>
<td>12%</td>
<td>$54</td>
</tr>
<tr>
<td>Ruckus</td>
<td>7%</td>
<td>$8</td>
</tr>
<tr>
<td>HP</td>
<td>5%</td>
<td>-</td>
</tr>
<tr>
<td>Zebra (frmly MSI)</td>
<td>3%</td>
<td>-</td>
</tr>
<tr>
<td>Ubiquiti</td>
<td>3%</td>
<td>-</td>
</tr>
<tr>
<td>Aerohive</td>
<td>2%</td>
<td>($31)</td>
</tr>
<tr>
<td>Xirrus</td>
<td>2%</td>
<td>-</td>
</tr>
<tr>
<td>Meru</td>
<td>2%</td>
<td>($21)</td>
</tr>
<tr>
<td>Extreme</td>
<td>1%</td>
<td>-</td>
</tr>
<tr>
<td>Huawei</td>
<td>~1%**</td>
<td></td>
</tr>
<tr>
<td>Alcatel-Lucent (Ent)</td>
<td>1%</td>
<td>-</td>
</tr>
</tbody>
</table>

*Pure-Play publicly traded; Aruba is Jan ‘15 year-end; Huawei 4Q14 was 2%
Wireless LAN
Enterprise-Class Vertical Markets* (2014)

*As % of Access Points

Note:('11/'12/'13/'14/'15e)
### Vendor Positioning Education Vertical by Vendor

<table>
<thead>
<tr>
<th>Vendor</th>
<th>2Q11</th>
<th>4Q11</th>
<th>2Q12</th>
<th>4Q12</th>
<th>2Q13</th>
<th>4Q13</th>
<th>2Q14</th>
<th>4Q14</th>
<th>2Q15</th>
</tr>
</thead>
<tbody>
<tr>
<td>Huawei</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fortinet</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HPE Aruba</td>
<td>100</td>
<td>75</td>
<td>50</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Extreme</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cisco</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Xirrus</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>25</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Aerohive</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>100</td>
<td>75</td>
<td>50</td>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>
Vendor Positioning Retail Vertical by Vendor

% Share of Access Points in Vertical

0% 25% 50% 75% 100%

Verticals

Xirrus
Ubiquiti
Ruckus
Extreme
Fortinet
HPE Aruba
Cisco
Aerohive
Vendor Positioning Outdoor Revenue

Revenue in $ Millions

- Cisco
- Ericsson
- RKUS
- Tropos
- HPE Aruba
- Zebra

1Q11  3Q11  1Q12  3Q12  1Q13  3Q13  1Q14  3Q14  1Q15  3Q15
Vendor Positioning Outdoor Average Selling Prices

Average Selling Price ($) vs. Time (Quarterly)

- Ericsson
- Tropos
- Cisco
- Zebra
- HPE Aruba
- RKUS
SOHO Unit Shipments

802.11n

802.11g

802.11ac
Wireless LAN
Service Provider WiFi Revenues

Vendor Revenue ($ M)

$120

$60

$0

1Q11  3Q11  1Q12  3Q12  1Q13  3Q13  1Q14  3Q14  1Q15  3Q15

Ruckus
HPE Aruba
Ericsson
Cisco
Others

SP WiFi
# 802.11ac and xTBASE-T Scenarios

<table>
<thead>
<tr>
<th>WLAN Radio</th>
<th>Max Throughput (Gbps)*</th>
<th>Ethernet Technology</th>
</tr>
</thead>
<tbody>
<tr>
<td>802.11n</td>
<td>300</td>
<td>1 x 1 Gbps</td>
</tr>
<tr>
<td>802.11n ‘Array’</td>
<td>2,500</td>
<td>1 x 1 Gbps or 1 x 10 Gbps</td>
</tr>
<tr>
<td>802.11ac Wave 1</td>
<td>1,000</td>
<td>1 x 1 Gbps</td>
</tr>
<tr>
<td>802.11ac Wave 1</td>
<td>1,000</td>
<td>2 x 1 Gbps</td>
</tr>
<tr>
<td>802.11ac Wave 2</td>
<td>2,500</td>
<td>1 x 1 Gbps or 2 x 1 Gbps</td>
</tr>
<tr>
<td>802.11ac Wave 2</td>
<td>2,500</td>
<td>1 x 2.5/5 Gbps</td>
</tr>
<tr>
<td>802.11ax</td>
<td>&gt;3,000</td>
<td>1+ x 2.5/5 Gbps or 1 x 10 Gbps</td>
</tr>
</tbody>
</table>

*Practical estimated throughput estimates by Dell'Oro Group. 802.11ax refers to technologies that follow 802.11ac such as 802.11ad.
Vendor Positioning
Enterprise Edge (From Enterprise Edge Report)

Revenue in $ Millions

Cisco

HPE Aruba

Huawei

Aruba

Ruckus

Ethernet

4Q13  1Q14  2Q14  3Q14  4Q14  1Q15  2Q15  3Q15
Campus Switch Ports (From Enterprise Edge Report)

Port Shipments in 000's

- 0.1 Gbps
- 1 Gbps
- 5 Gbps
- 10 Gbps
- 40 Gbps

2014

2015

Ethernet
2.5 / 5 Gbps Switch Ports (From Enterprise Edge Report)
Wave 2 & Wave 1 APs (From WLAN Forecast Report, July 2015)
Questions?

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