### Femtocell Solutions Panel Session
**Wednesday 10:00-11:15**

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<tr>
<th>Panellist</th>
<th>Company</th>
<th>Position</th>
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<tbody>
<tr>
<td>David Chambers</td>
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<td>Amdocs</td>
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<td>Airvana</td>
<td>VP Marketing and Consumer Applications</td>
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<td>Dan Troshynski</td>
<td>Acme Packet</td>
<td>Technical Director</td>
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<td>Barlow Keener</td>
<td>Keener Law Group</td>
<td>President</td>
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What is a femtocell anyway?

- Complete mobile phone basestation shrunk to size
- Connects to mobile network via broadband internet (cable, DSL)
- Excellent coverage and capacity within the home/office
- Works with existing 2G or 3G phones
What problems do they address?

Coverage

Capacity

Applications
Current state of the market?

**Volumes**
2009: 200K units
2013: 12M units?

**Standards**
- GSM 3G
- CDMA 3G
- LTE

**Geography**
- North America
- Europe
- Japan
- China
- Rest of World
3G CDMA paves way for 4G femtocells
Enables IMS early

Key:
- **CDMA Core Network**
- **GSM Core Network**
- **IMS Core Network**
David Nowicki

VP Marketing and Consumer Applications

Airvana
Air Interface Evolution Delivers Incremental Gain

Next Generation of Air Interfaces (LTE/WiMax) Will Deliver Modest Gains in Spectral Efficiency
For Dramatic Gains, We Need to Look Elsewhere

Dramatic Gains in Spectral Efficiency Requires New Radio Network Architectures Such As Femtocells
The Femto Forum

Aims

- Promoting & enabling femtocells
- Not-for-profit, founded in 2007
- Independent, Inclusive, International

Members

- 43 operators covering 1.308 billion mobile subscribers
- 17 of the top 20 mobile operators
- 61 providers of femtocell technology and fixed line operators
- All of the top 5 mobile infrastructure vendors
Service concept: Family with teenagers (Europe)
Service Concept: 5 GB Data Card User, Free Femtocell

This simple scenario, stripped of all complex assumptions, shows how a “free” femtocell pays for itself through network cost savings, in the home of a very heavy data user.
Figure 14: Mobile broadband connections in Europe by service usage type, 2007–2014
[Source: Analysys Mason, 2009]
## Deployment Topic Summary

<table>
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<th>Topics</th>
<th>Status</th>
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<td>Cost/Business Case</td>
<td>Business case puts this in perspective</td>
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<td>Compatibility</td>
<td>FF collaboration leading to standards-based products in 2010</td>
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<tr>
<td>Interference</td>
<td>FF collaboration resulting in white paper defining techniques to mitigate interference</td>
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<tr>
<td>Health</td>
<td>FF document addressing key concerns</td>
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<td>Consumer Proposition</td>
<td>Coverage, Performance, Discounted Services, Femtozone Services, HD voice/cutting the cord, etc.</td>
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<td>Product Readiness</td>
<td>FF membership shows well-established ecosystem</td>
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Security considerations for femtocells

Don Troshynski
Technical Director
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Why SIP-based femtocells?

Better service
- Going beyond the R99 phone
- New and innovative services
- Higher quality

Lower cost Infrastructure
- Reduce load on MSCs
- Reduce dependence on application-specific gateways
- Leverage existing or emerging IMS network architecture

Femtocells represent early ROI for IMS evolution
With SIP comes needs for controls

- Service element overloads & signaling resource availability
- Regulatory compliance
- DoS attacks
- Latency sensitive traffic
- Signaling & transport protocol incompatibilities

**Signaling Control & Interworking**

- Aggregation PoP
- Core transport
- Access
- Premises

**IP address incompatibility**

- SIP signaling
- RTP media
- Packet data
- Legacy UE Signaling
- DIAMETER/RADIUS
Change in access = change in security challenges

Security impacts to MNOs
- Service interruption
- Operator reputation / trust
- Subscriber churn
- Lost revenue
Consider the entire security solution

Security threats

**IP solution**
- Authentication
- IKEv2 rate limiting
- IPsec encryption/decryption

**Layer 5**
- IMS
- S-CSCF
- SBC
- MSG
- Internet

**Layer 3**
- Data
- AAA

**Signaling rate limiting, ACLs, dynamic trust binding, topology hiding**
- Unauthorized access & service theft
- SIP DoS attacks & overloads
- Unauthorized access & service theft
- Malware and viruses (SIP)
- Subscriber ID theft & interception
- Unauthorized access & service theft
- IKEv2 DoS attacks

**ACLs, dynamic trust binding, topology hiding**
- Authentication, bandwidth policing
- SIP header inspection and manipulation

**Unauthorized access & service theft**
- Malware and viruses (SIP)
- Unauthorized access & service theft
- Layer 3
- Layer 5
- Security threats
Legal and Regulatory Hurdles to be Addressed for Mass Market Deployment of Femtocells

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Femtocell: Regulatory Framework

FCC – Staffers taking notice but no rulemaking or decisions

> 1st Mention of “femtocell” by FCC: Feb 2008
    > Discussion of Sprint’s Airave product
    > Prior mention of picocells for trials in airplanes

> FCC Definition VoIP: Does it apply to Femtocell Use?
  “Interconnected VoIP services” are services that
  (1) enable real-time, two-way voice communications;
  (2) require a broadband connection from the user’s location;
  (3) require IP-compatible customer premises equipment; and
  (4) permit users to receive calls from and terminate calls to the public switched telephone network.

> Femtocell looks like VoIP but CRMS providers are fully regulated
Femtocells - 911 Issues

More than 140,000 911 calls made each day from wireless phones

FCC: Any phone near a carrier tower must have 911 access
- Applies to femtocells that now have subscriber limitations – users at the home
- Applies to all phones that can use the spectrum – not just customers
- If femtocell powered up out of the “approved” location or licensed territory area, should 911 calls be required to be made? Yes.

FCC 911 Antenna location regulation

- Phase I FCC's Order (94-102) require that carriers to deliver location of cell site
- Phase II mandates that carriers must pinpoint a customer's actual location
- 2007 FCC 911 NPRM – proposed the idea of a hybrid location requirement using GPS location and tower location in the network

Problem with GPS Femtocell location inside buildings

FCC Requirement for carriers to provide 911 even in areas with weak signals

- Automatic A/B Roaming-Intelligent Retry (with some modifications), Adequate/Strongest Signal, and Selective Retry.
Femtocells: Roaming charge issues

Customers get excited about femtocells for 3 reasons
1. Poor cell phone service at home 10-15% of the homes
2. Taking advantage of the bundle package of “free” calls
3. Taking the femtocell to the vacation home without cell service

There are 90 smaller cell phone companies in the US
> Femtocells can be created without GPS or user restrictions
> Customers can move their femtocell to another carriers
> U.S. customer could be charged by a foreign carrier where US customer locks on to foreign Femtocell – Mexico example

Roaming Issues are created
> Carrier A customer moves femtocell to Carrier B’s licensed territory
> Femtocell is used by customers of Carrier B in the new territory
> Call through femtocell shows up as delivered by Carrier A
> Carrier A bills for roaming charges for call originated Carrier B’s territory
> Difficult to monitor and detect
Parasitic Use Problems

> Carriers will be transmitting calls through a customer’s internet
> VoIP carriers like Vonage have regularly been called “parasitic”
> The voice call is carried on unrelated 3rd party’s service
> New opportunities for listening and interfering with calls

> “Wiretapping” by customers at home?
> Assumption is that femtocell will have encryption
> Assumption that femtocell will restrict non-family from use
> But if not, potential for “sniffing” and listening to other cell callers
> Sniffing is not limited to enterprise internet systems

> Blocking: Internet providers have blocked VoIP, P2P

> Sniffing Deep Packet Inspection: Allows ISPs to see/listen to all traffic
> IPSec tunnel provides limited security
Q&A Session
Useful Links

> **ThinkFemtocell.com**
>  > News, views and analysis of femtocells worldwide
>  > Signup for free monthly newsletter

> **Femto Forum**
>  > Industry body promoting femtocells
>  > Many useful white papers available for download

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