
Femtocells and their consequences for HSPA and LTE

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“No problems ahead”

What is a femtocell?

In telecommunications, a **femtocell**—originally known as an **Access Point Base Station**—is a small cellular base station, typically designed for use in residential or small business environments. It connects to the service provider's network via broadband (such as DSL or cable); current designs typically support 2 to 4 active mobile phones in a residential setting. A femtocell allows service providers to extend service coverage indoors, especially where access would otherwise be limited or unavailable. The femtocell incorporates the functionality of a typical base station but extends it to allow a simpler, self contained deployment; an example is a UMTS femtocell containing a Node B, RNC and GPRS Support Node (SGSN) with Ethernet for backhaul. Although much attention is focussed on UMTS, the concept is applicable to all standards, including GSM, CDMA2000, TD-SCDMA and WiMAX solutions

Source: Wikipedia 3/2009

My Explanation

Femtocell =



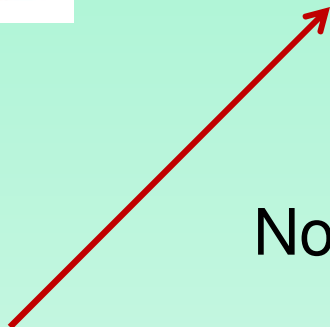
~~Wi-Fi~~

+

UMTS or
CDMA or ..

Access point is fully compatible with the mobile phone

Differences in the Handset?

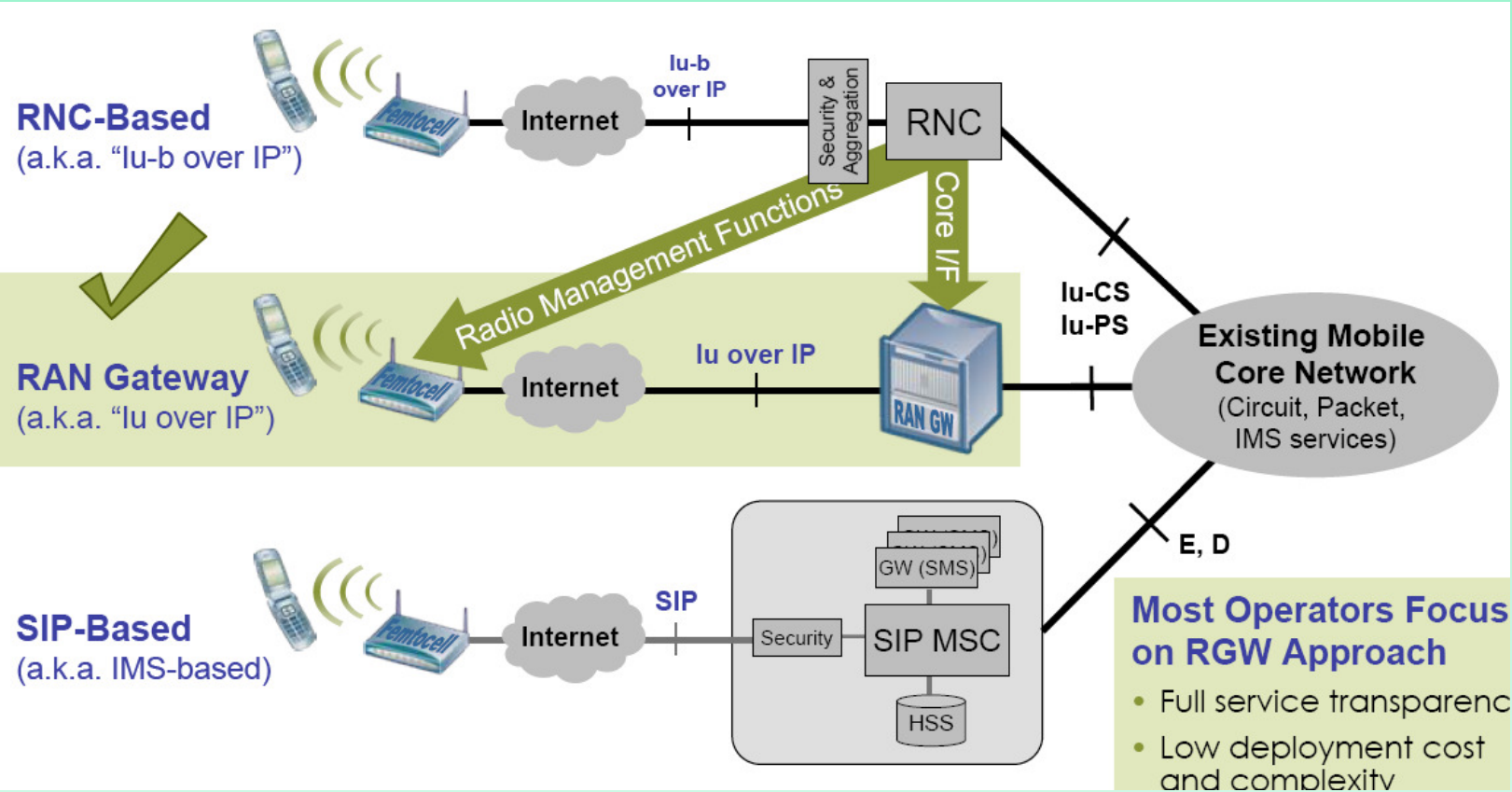


No difference for the mobile:

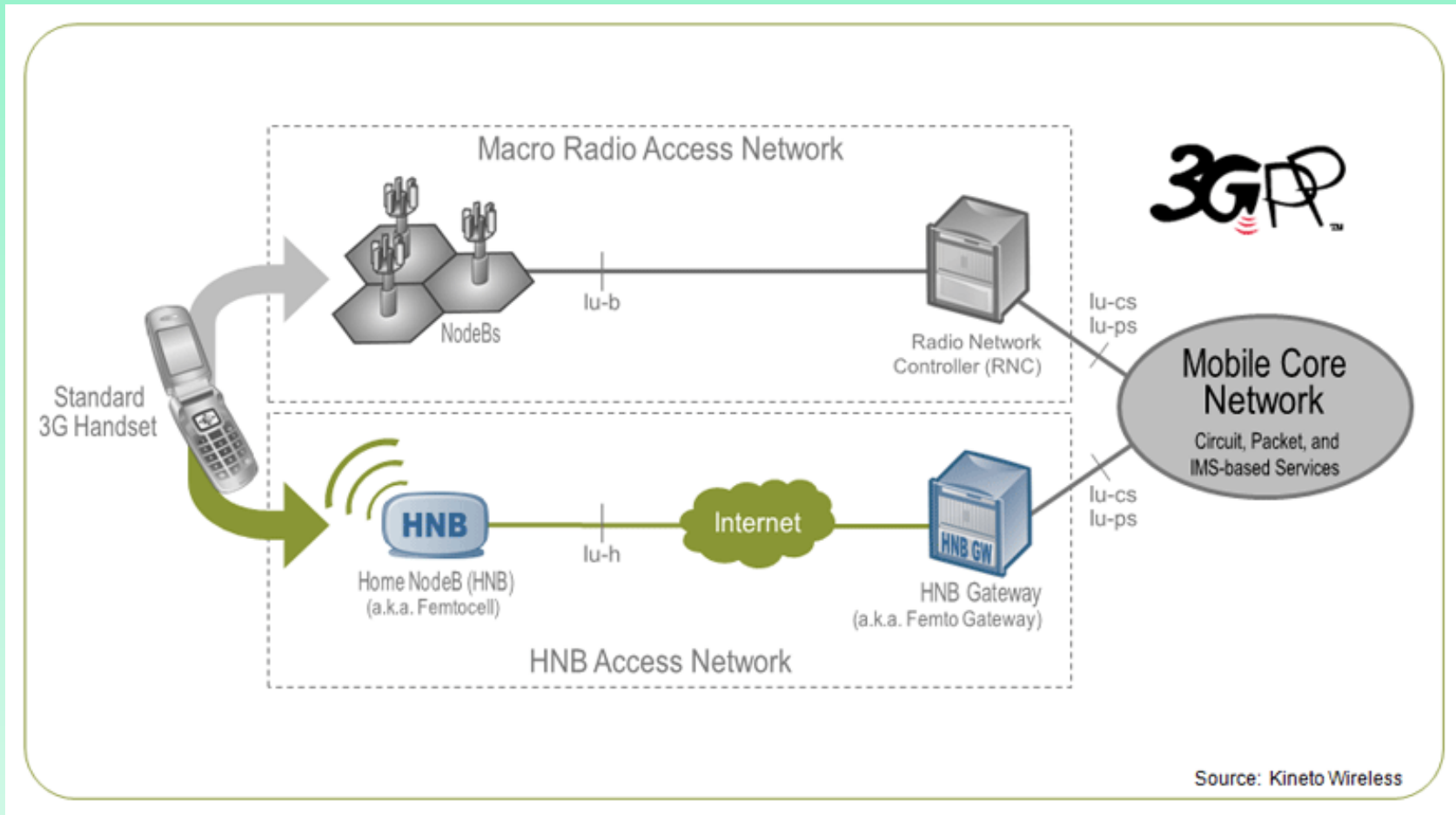
Just a matter of output power
and path loss

→ No changes in the handset!

HSPA Femtocell Network Interfaces

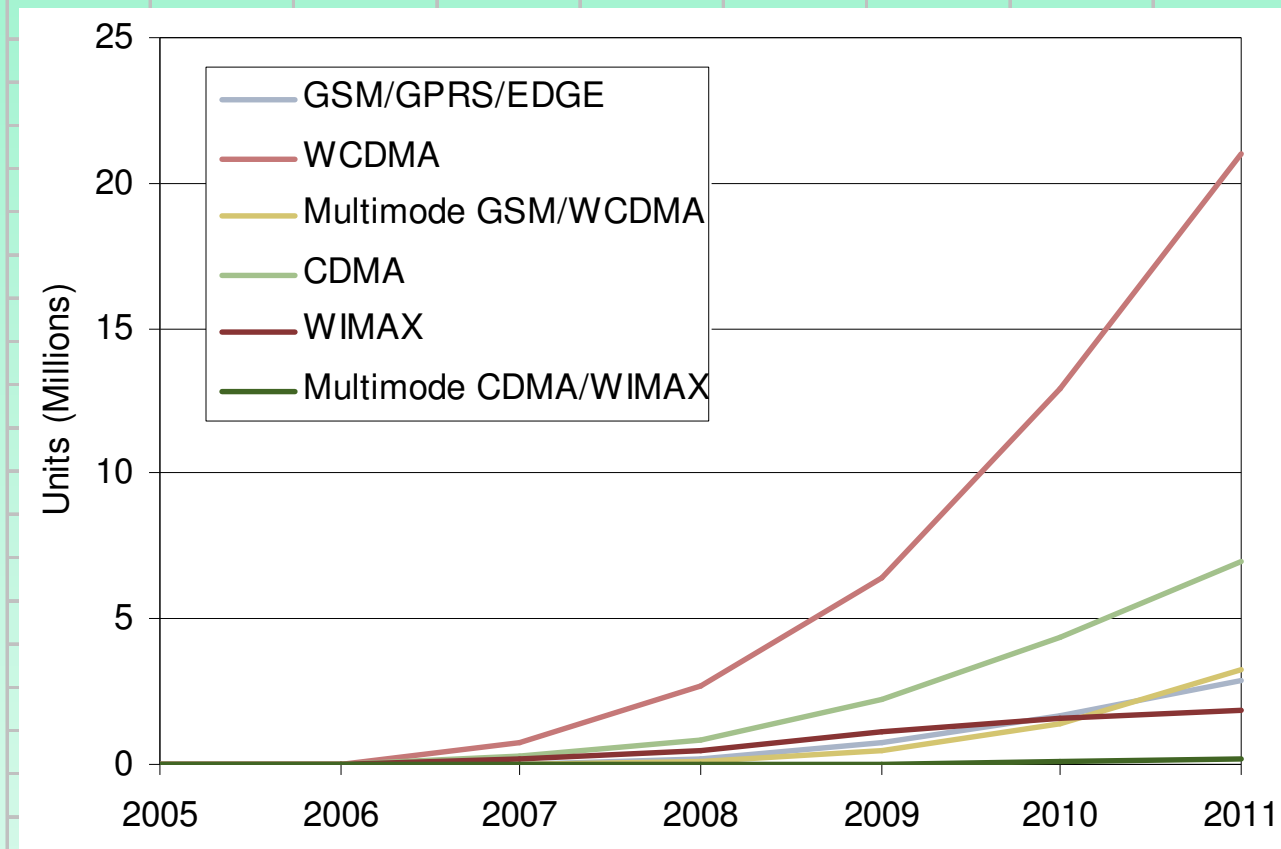


HSPA Femtocell Network Interfaces



Air interfaces

Chart 7-3
Femtocell Shipments
2005 to 2011



Source: ABI Research

Competing Technologies




- UMA (Wi-Fi based)
- Repeaters
- Macro Base Stations
- Do nothing

UMA Wi-Fi versus Femtocell

UMA WiFi service

T-Mobile HotSpot @Home



Our Wi-Fi-enabled phones

 <p>BlackBerry Curve</p> <ul style="list-style-type: none"> • Mobile/Wi-Fi calling • Bluetooth® 2.0 • 2.0 megapixel camera • Music and video player • Compact QWERTY key pad • Personal and work e-mail • Wi-Fi and real time browsing <p>Buy Now Store Locator</p>	 <p>Nokia 6086</p> <ul style="list-style-type: none"> • Mobile/Wi-Fi calling • Bluetooth • VGA camera • Video • Speakerphone • EDGE • Vibrant full color screen • Vibrating alert <p>Buy Now Store Locator</p>	 <p>Samsung i409</p> <ul style="list-style-type: none"> • Mobile/Wi-Fi calling • Bluetooth • Camera 3.0 megapixel • Network address book • Speakerphone • EDGE • Vibrant full color screen • Vibrating alert <p>Buy Now Store Locator</p>
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HotSpot @Home Check It Out How It Works What You Need

[Buy Now](#) [Store Locator](#) [FAQ](#) [Downloaded Space](#) [Go To Jenny's HotSpot](#)

Wi-Fi Routers

 <p>T-Mobile Wireless Router by Linksys</p> <ul style="list-style-type: none"> • Optimizes handset battery life • Prioritizes voice calls over data • Enhanced troubleshooting • Get security key feature • Easy set-up with CD installation • 2 external antennas <p>Return Buy Now Store Locator</p>	 <p>T-Mobile Wireless Router by D-Link</p> <ul style="list-style-type: none"> • Optimizes handset battery life • Prioritizes voice calls over data • Enhanced troubleshooting • Get security key feature <p>Return Buy Now Store Locator</p>
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- \$19.99 per month for unlimited calls at home
- WiFi routers \$49.99
- Choice of 3 phones

Femtocell service (CDMA 1X)

Sprint Airave

Experience Life at SprintSpeed

Bring the magic of enhanced coverage and unlimited calling home with AIRAVE.

[Tell Me More](#) [FAQ](#) [Availability](#)

AIRAVE
Broadband access (cable or DSL only), an available Ethernet port (either on your modem or optional router) is Sprint phone, and voice plan required. Device works with Sprint phones and services; does not work with phones or services operating only on the Nextel/National Network. Only three phones can utilize the AIRAVE simultaneously.

Unlimited Calling
Unlimited feature only extends to voice calling initiated while on the AIRAVE device; excludes calls initiated outside of the AIRAVE coverage area. Standard rates apply for other products and services accessed within the AIRAVE coverage area (e.g., Video-Link, text messages, downloads and ringtones). Calls transferred to the nationwide Sprint Network will be billed according to your rate plan. International calls excluded.



[Replay Video >](#)



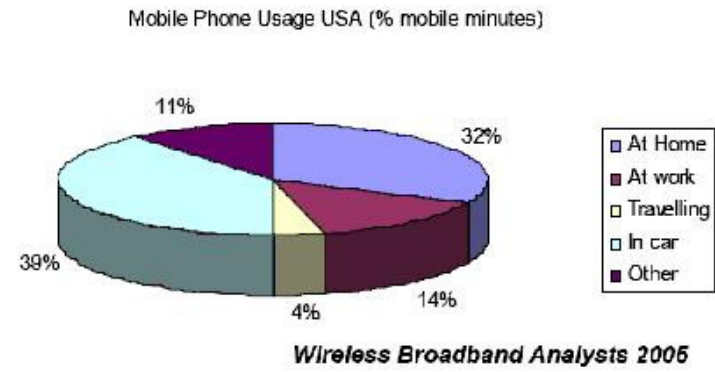
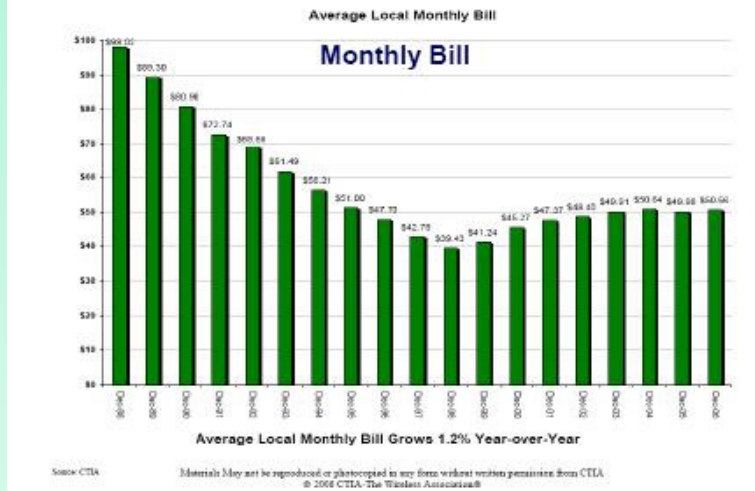
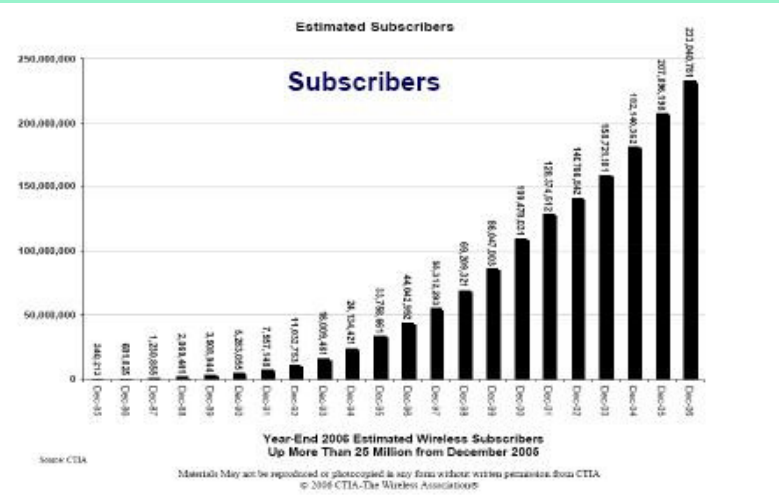
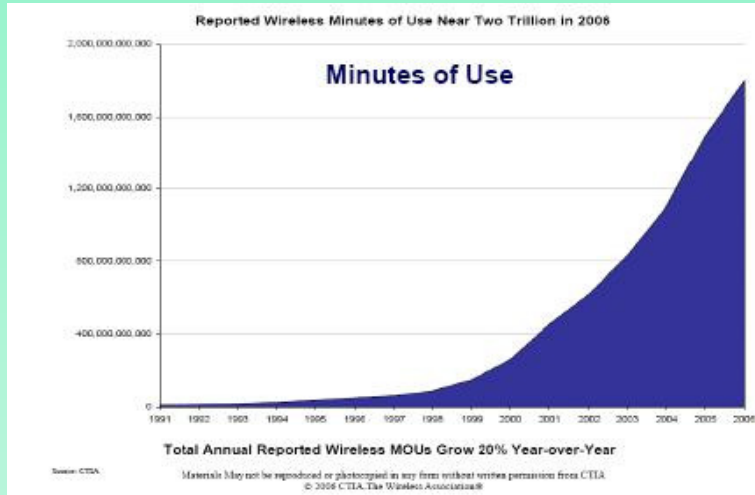
- \$15 per month for unlimited calls at home
- Airave femtocell \$49.99
- Any Sprint phone

Source: ip.access 2007

3GPP Releases

Version	Released	Info
R 99	2000 Q1	Specified the first UMTS 3G networks, incorporating a CDMA air interface
Release 4	2001 Q2	Some IP core network functions
Release 5	2002 Q1	IMS, HSDPA
Release 6	2004 Q4	Integrated Wireless LAN, HSUPA, IMS
Release 7	2007 Q4	HSPA+, EDGE Evolution, QoS for VOIP
Release 8	2009 Q1	LTE, All-IP Network (SAE). Release 8 constitutes a refactoring of UMTS as an entirely IP based fourth-generation network, up to 300
Release 9	2010 Q1?	WiMAX and LTE/UMTS Interoperability, LTE voice
Release 10	2011?	LTE Advanced, LTE Repeaters, 1 GB/s

Operator's Business Case



Source: Airvana 2007

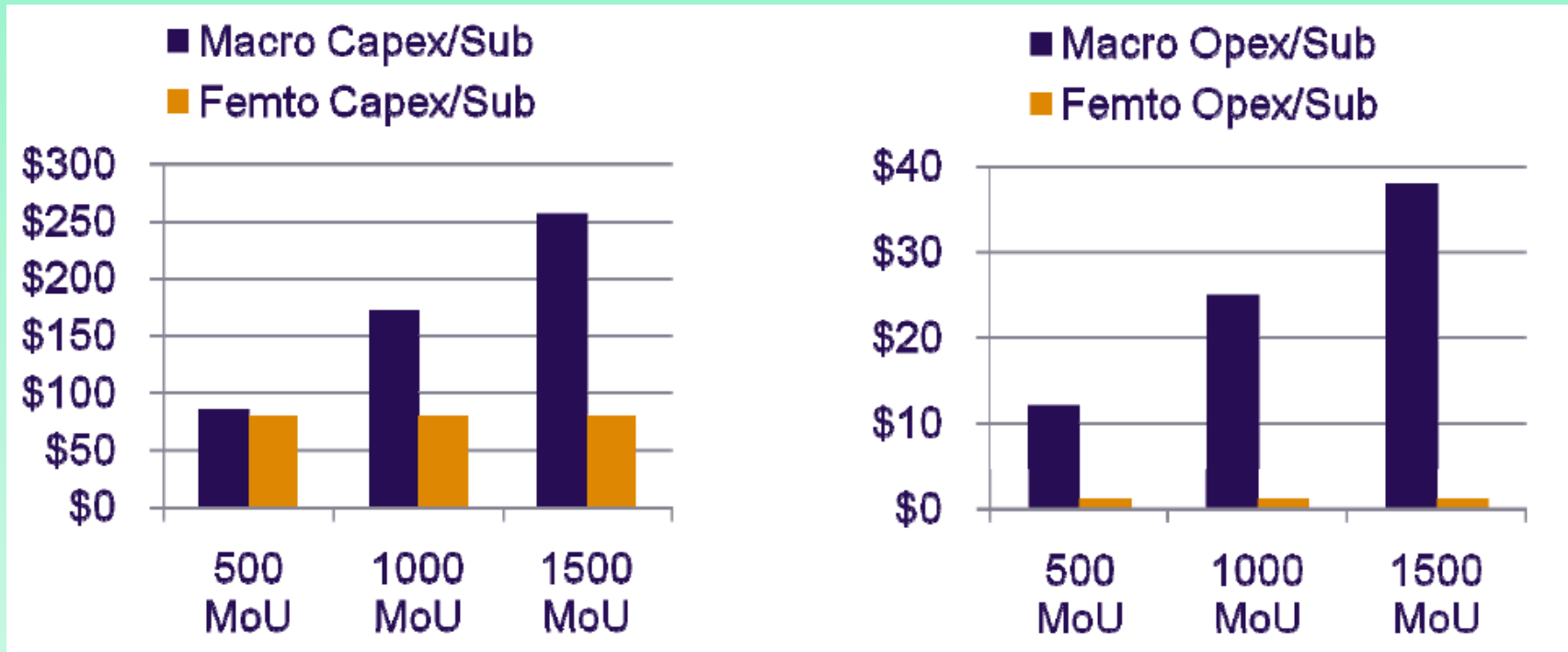
Home Zone ..

- O2 – “Genion”
- T-Mobile – “@Home”
- Vodafone – “Zuhause” = “At Home”
- SFR – “Happy Zone”
- TIM – “Maxi Tim Casa”
- Orange – “unik”
- Neuf Telecom – “TWiN”
- British Telecom – ‘BT Fusion’
- TeliaSonera – “Home Free”



But .. loading the Macro Network with flat fee traffic

Operator's Business Case



Source: Airvana 2007

Operator's Business Case

- ▶ **3G HSPA / LTE indoor coverage, massive spectrum re-use**
 - Eliminate outdoor-to-indoor propagation loss
 - Easy 3G network capacity scaling (3G is taking off ..)
- ▶ **Significant CAPEX / OPEX savings**
 - Installed by customers, Free backhaul via the internet
 - Macro network offload
 - Avoid special WiFi handsets (cost, logistics)
- ▶ **A strategic presence in the home, new revenues**
 - Increased use of mobile phones, Increased customer loyalty
 - Move up in the value chain with new services
 - Triple / Quad-play bundles, “Femtozone” tariffs to capture the whole family
- ▶ **Protect Macro Network revenues**
 - Limit flat rate to the “home area”

But, what's in it for Consumers ?

- All existing cellular handsets will work with Femtocells
 - Use all existing handsets
 - Unlimited choice of new models
- Tariffs rivaling wireline & VoIP / Skype
 - “All you can eat” subscription for all family members
 - Attractive mobile Quad-play bundles
- Superior range, coverage & quality
 - Indoor range exceeding DECT and WiFi experience
 - Seamless handover to cellular networks
- One person, one phone, one number
 - Anytime, anywhere
 - Will replace current DECT (cordless) phones

Femtocell Ecosystem

Technology Providers



Femtocell Ecosystem

Operators



Critical Success Factors

- Femto Box cost (ASP) to be substantially less than \$ 100
- Regulatory requirements to be fulfilled
 - Femtocells use licensed spectrum, requiring location awareness
- Macro network interference requires dynamic interference management
 - Femto network sniffer for field-strength measurements of neighbouring cells
- Security and integrity of Femto traffic over the public internet
 - Public internet will be used as Femto backhaul (unsecure)
- Zero Touch Plug & Play
 - Auto-configuration at power-up
- Architecture convergence: integration in the mobile core network
 - June 2008 3GPP agreed on the new lu-h interface