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Femtocell

(What, Why, Where & When)

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Dec 2008





Overview

- Paradigm Shift
- In-building Options
- Introduction to Femto Cells
- Business Case – Value proposition
- Opportunities & Challenges
- Femto Forum

Advisory



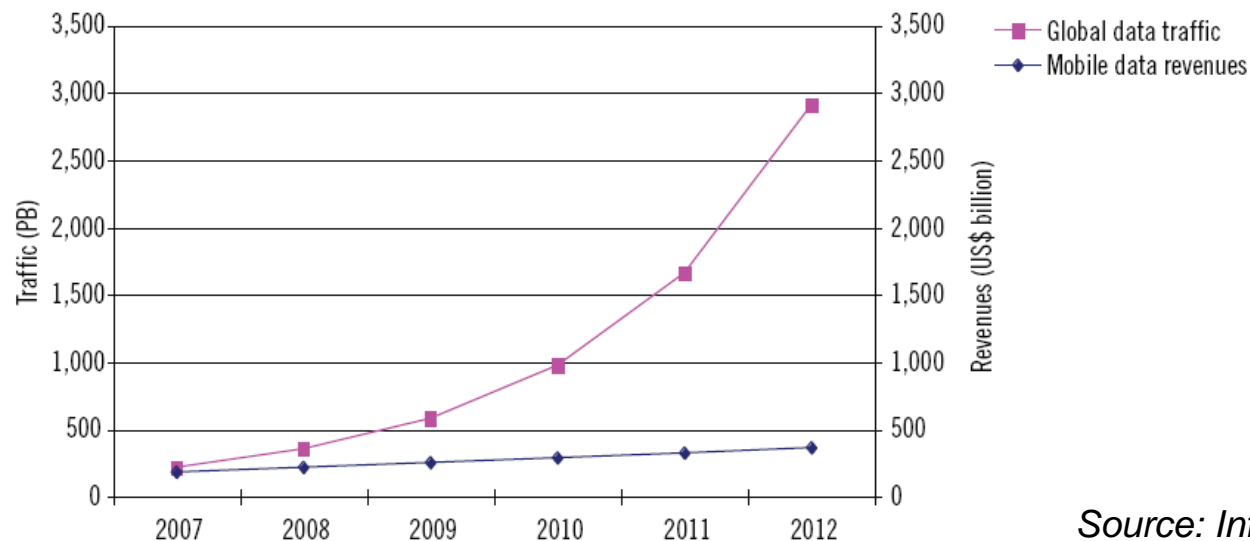
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A compelling and urgent need

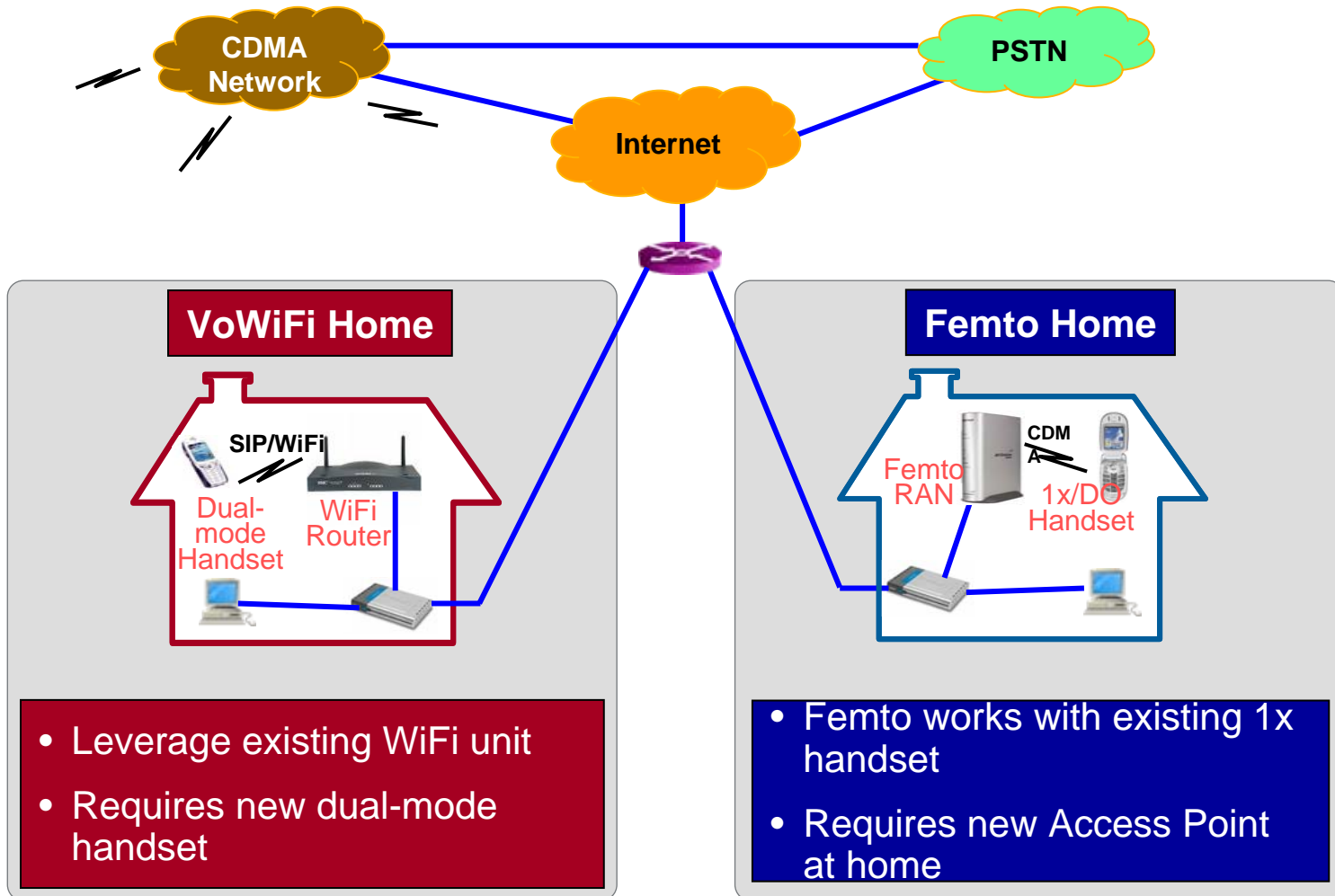
- Substantial growth in mobile broadband data revenues
- But much faster growth in data volumes
- Must find ways to dramatically reduce cost-per-bit
- Paradigm shift from Macro cellular coverage to inbuilding coverage

Figure 1.4: Global mobile data revenues and traffic, 2007-2012



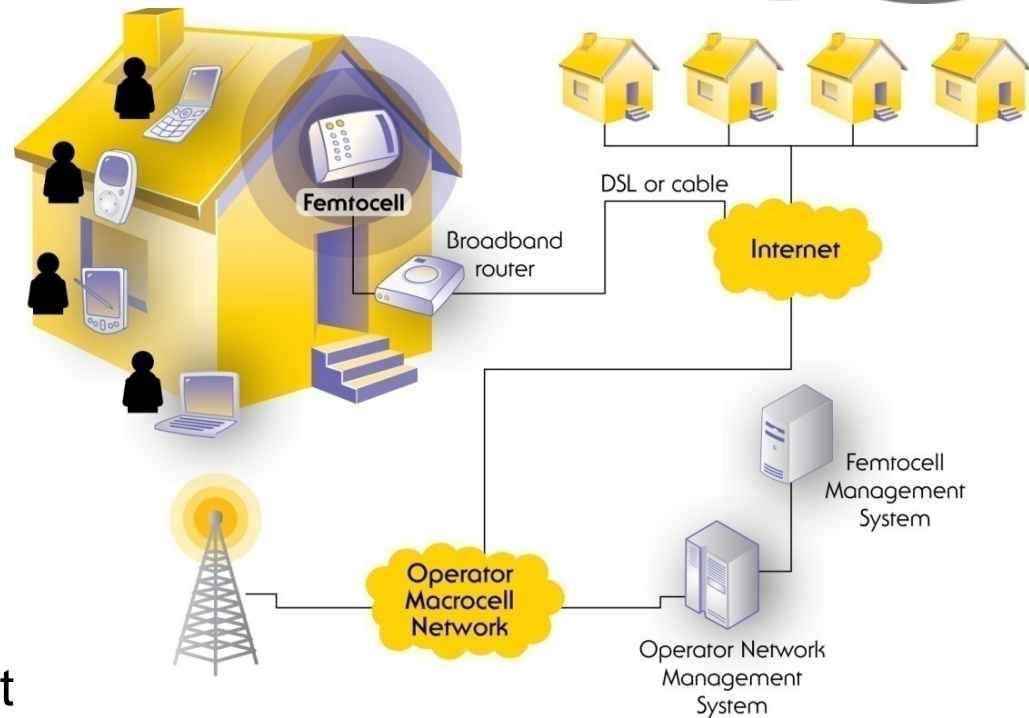
Source: Informa, 2008

In-Building Segment - Alternatives



What are femtocells?

- Low-power domestic access points...
 - ...using mature mobile technology
 - ...in licensed spectrum
 - ...generating coverage and capacity
 - ...over internet-grade backhaul
 - ...at low prices
 - ...with full operator management



Generic Femto Network Architecture

Technology that works with Legacy Handsets

Where does it Fit ?



Macro (18W)	Micro (5W)	Enterprise (<1W)	Consumer (<50mW)
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Macro cellular coverage



Metro Cell Indoor



Compact Metro Cell Outdoor



BTS 3030/3031

Coverage fill; Repeater replacement



BTS 3011

Large, Medium & Small Businesses, Repeater/DAS replacement

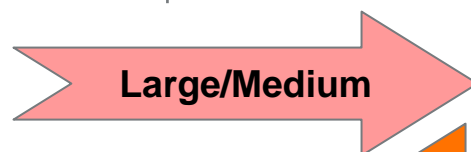


picocell

Residential coverage



femtocell

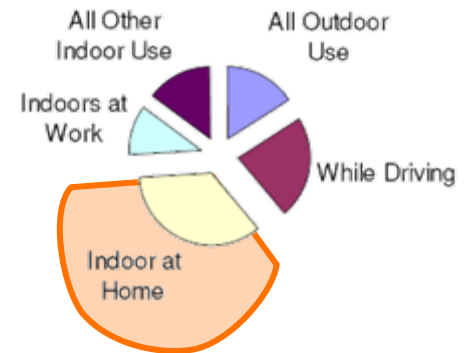


Why femtocell?



- Subscriber Benefits
 - signal quality
 - voice quality & data speed
 - longer battery life
 - cheaper minutes (operator offers will vary)
 - subscriber's mobile "1 phone, 1 number"
 - no worries over minutes
 - eliminate 2nd line
 - family calling plans
- Operator Benefits
 - Improve residential coverage at low cost
 - reduce churn due to coverage issues
 - improve CSAT
 - increase overall use
 - low impact to macro BTS capacity or backhaul
 - Reduced opex and capex
 - subscriber provides femto backhaul
 - does not consume macro RF
 - lower costs enable special femto rate plans
 - increase "stickiness" of cellular services
 - defense from VoIP competition

35% of all mobile phone usage happens at home



Femtocell Target

Femtocell: Carrier expectations



- Must work with existing (already sold) devices
- Easy to deploy – No truck roll, consumer device like
- Don't want femtocells, want an end-to-end solution
- Quality/reliability comparable to macro systems
 - No impact to Macro KPI's
- Much more feature-rich
- Cost/subscriber comparable to that in macro network

Femtocells: End-user expectations

- Easy to set up
- Fits into home network easily
- Works out of the box
- Improved cellular experience in the house
 - Better coverage, good voice quality, faster downloads
- Looks good
- Physically unobtrusive
- Low box cost
- Reduced monthly bills
- Security



Femtocells: Vendor requirements



- Ease of manufacturing, provisioning, shipping
- Ability to support multiple operators with minimal (no) hardware changes
- Minimize the number of supported software loads
- Keep proprietary features segregated between customers
- Easy upgradeability
- Show me the money baby!

Opportunities & Challenges



Challenges

- Interference
- System selection
- Idle mode ping pong
- Backhaul QoS

- Femto Access Control
- Handoff
- Femto cost
- Subscriber value prop

Opportunities

- Better indoor coverage
- Churn reduction
- Existing handsets
- Bundled pkg @ lower rates

- Increased capacity
- Reduce Capex & OpEx
- Increased ARPU
- One phone One Number

Roadmap to success



Subscriber Pull

- Low cost Device
- Integrated, multi-function Device
- 1 # , 1 Phone
- Home zone rates
- Value added applications
-

+

Operator Push

- Low cost device
- Low CapEx & OpEx
- Reduced Churn
- QoS – ability to maintain user experience
- Flexibility

=

Widespread
Deployment

Balanced “Pull” & “Push” factors = widespread acceptance



femtoforum

driving convergence worldwide

Overview

- Introduction to Femto Forum
- Femto Forum and standards
- What have we achieved?
- What are we working on?
- What lies ahead?



driving convergence worldwide

The Femto Forum

- A not-for-profit membership organisation founded in 2007 to promote femtocell deployment worldwide
- Independent - Technology agnostic
- Inclusive
 - operators (mobile and fixed)
 - hardware, software & silicon vendors
- International
- A portal for public information, press briefings, white papers, technical studies, market data
- Four working groups established to address the key enabling factors



“The introduction of open standards will be critical in enabling an economy of scale that will better enable the OEM and semiconductor communities to meet very aggressive price points and stimulate the market. The Femto Forum provides the ideal vehicle for driving this process.”

Stuart Carlaw,

ABIresearch[®] Principal Analyst, ABI Research,

Femto Forum Aims

Aims

Ecosystem
Development

- Large number of members
- Geographical and technological spread

Market Education

- Spreading awareness
- Increasing informed coverage

Driving open
standards

- **Not** a standards-setting body
 - Building voluntary consensus
 - Close interactions with standards bodies
-

Implications



driving convergence worldwide

Femto Forum Members

57 providers of femtocell technology





driving convergence worldwide

Femto Forum Members

34 operators covering 865 million subscribers



Board members

Welcome to 11 new members since June



Femtocells and Standards

- Need the right standards at the right time, reflecting experience, encourage innovation
- Accelerate via voluntary consensus amongst operators and vendors
- Many standard contributions already produced and in preparation
- Femto Forum is supporting and encouraging the standards development process
 - Worldwide femtocell expertise in one place
 - Addressing the issues ahead of time to provide mature contributions quickly



Challenges

Market – WG1

- **Public awareness and concerns**
- **Business cases**

Radio – WG2

- **Interference management between femto and macrocells**
- **Handover management**

Network – WG3

- **Architectures and interfaces**
- **Management and provisioning**

Regulatory – WG4

- **Understanding Benefits**
- **Spectrum issues**
- **Service issues**

WGI - Market and Promotion: Achievements

- Specifying detailed use cases for application in other groups, including wide range of potential customer propositions
- Providing information of general interest (e.g. 'Femtocells and Health' brochure)
- Setting a programme of promotional activities to broaden knowledge of femtocells and of the Forum's progress
- Identifying key market challenges and proactively addressing these ahead of time



WGI – Market & Promotion: Ongoing Activities

Business modelling

Femtozone services

Environmental issues

Consumer research

Market evolution

Femtocells for fixed-line operators

Femtocells beyond the home

WG2 – Radio & Physical - Ongoing activities

Interference management

- WCDMA
- OFDMA (LTE and WiMAX)
- CDMA

Standard performance tests

Internal Physical Interfaces

- Radio-baseband-modem

Network monitoring receiver performance

Mobile standby time

Radio co-existence tests

Network configuration guidelines

WG3 Network & Interop Activities

Network Requirements

OSS/BSS Requirements & Evolution

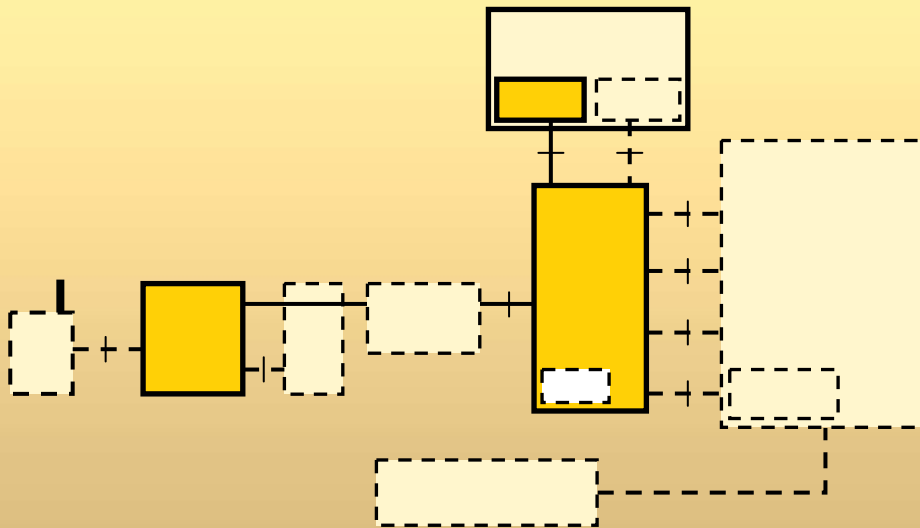
Interoperability Testing

E2E Security

Architecture Evolution

Device Management

Reference Functional Femto Architecture



Hot Topics:

- Mobility
- End-to-end Security
- Quality of Service management
- Home indication
- Emergency calls
- Location retrieval/locking
- Cell-ID management
- ...

... driving voluntary consensus

WG3 – Network & Interoperability

ongoing activities

Operation and management requirements and procedures

Network architectures

- Including IMS-based

End-to-end interoperability

Looking Ahead...

Next-generation Femtocells

- The role of femtocells beyond 3G

Radio Management

- Managing macrocells and femtocells together to maximise system capacity and performance

Operation & Management

- Consistent, scalable methods for looking after millions of femtocells

Femtocell Economics

- Support for a wide range of business cases

Interoperable Femtocells

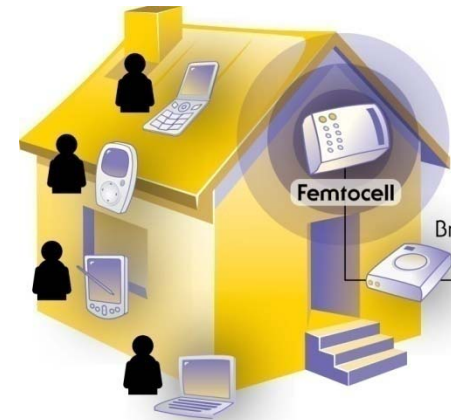
- How to assure full interoperation

Femtozone Services

- Applications and femtocells
-

Conclusions

- Interest in femtocells has continued to grow rapidly
- Femto Forum is leading the way, supported by membership which is:
 - Large and growing
 - Representative of the whole ecosystem
- We have succeeded with our aims to date and have a clear set of priorities for the future
- We are delighted to see
 - Increase in market visibility
 - Real standards progress
 - First commercial steps





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