



Invisible Networks

The Cambridge Broadband Ring

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Introduction

- Richard Nuttall
 - PIPEX
 - Flute
- Neville Hawkins
 - Radio / Wireless Background
 - GSM network management
- Invisible Networks
 - founded 15-Nov-01
 - 2 Networks live Aug-02

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Community Broadband

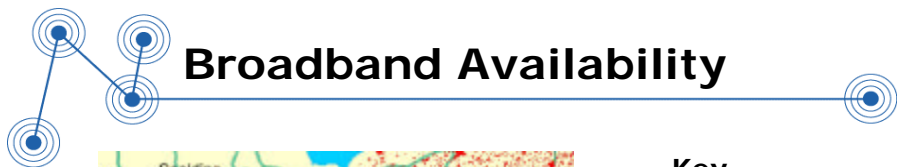
“Broadband is not about fast Internet,
it is about...

connecting the Community”

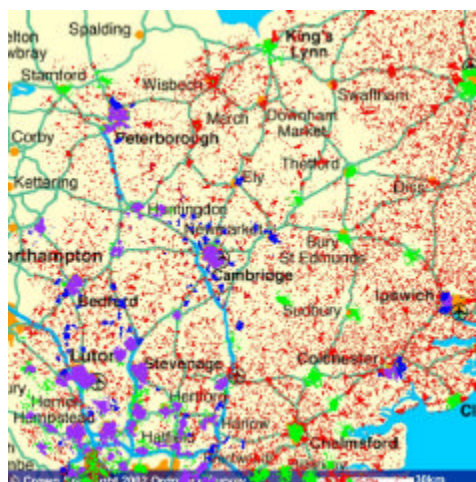
- Community ? Penetration ? Profit

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Broadband Availability



Key

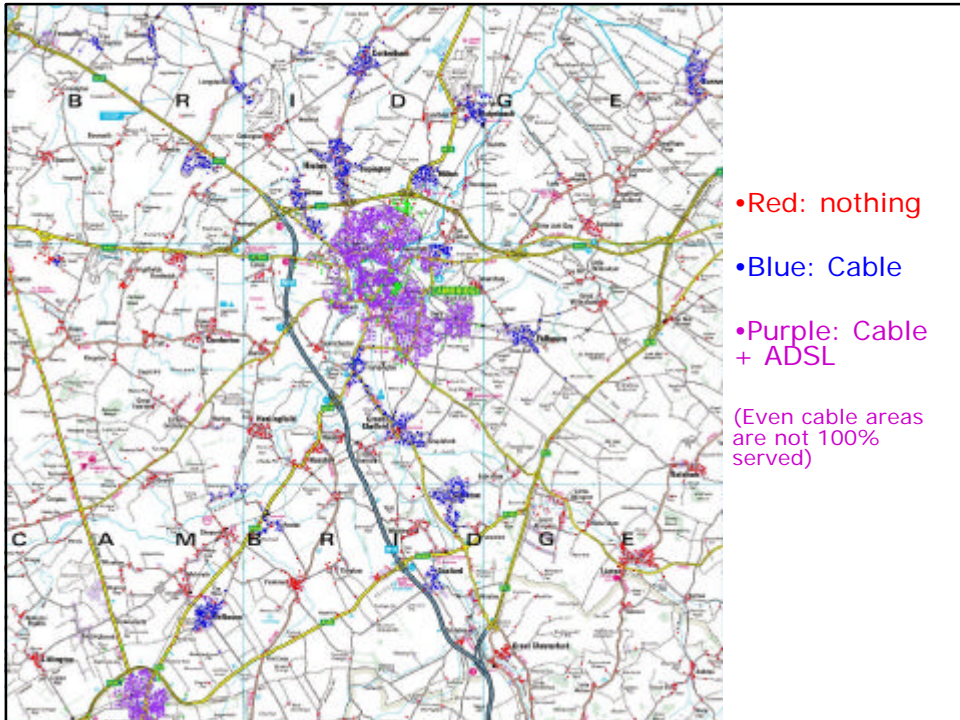
- BT ADSL
- NTL Cable
- Both
- Neither

Availability

- UK ? 65%
- Eastern Region ?? 50%

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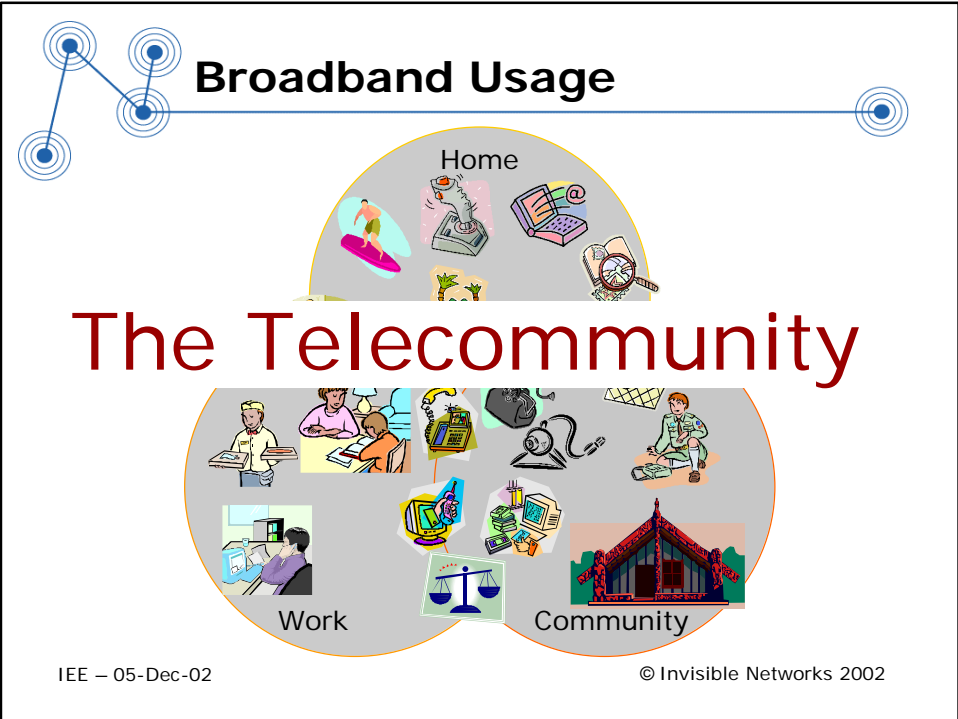
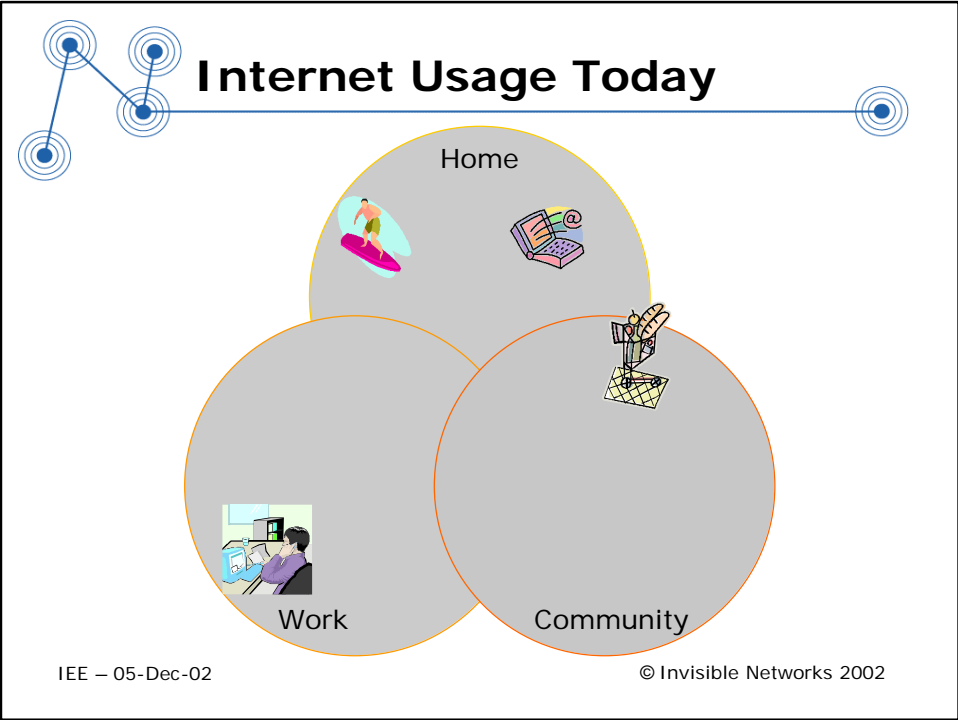
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Target Market

- UK Homes 24m
- 70% Internet usage within 2 years 17m
- 35% of them will move to Broadband 6m
- 35% of Homes can't get ADSL/Cable 2.1m
- And, schools, businesses, etc.

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Getting the Community Involved

- Leaflets
- Awareness
- Local Articles / Magazines
- Local Contacts
- Local Meetings
- Marketing
- Community Content and Applications

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Getting the Community Involved

- Community LAN / Intranet
 - 6Mbit/s throughput within village (802.11b)
 - Local hosting of bandwidth-hungry stuff
 - First community site: playgroup (lots of pictures)
 - Webcams for traffic monitoring /security
 - Incremental off site Backup

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US & the Community



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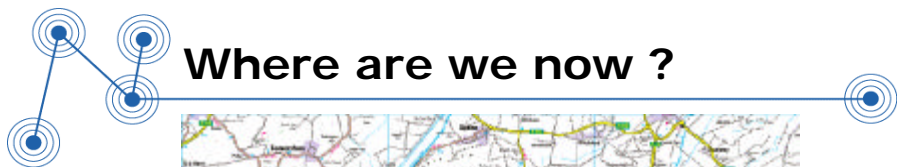
- Commercial
- Network
- Equipment
- Customer Facing
- Contribution ?
- Economies of scale

Community Co.

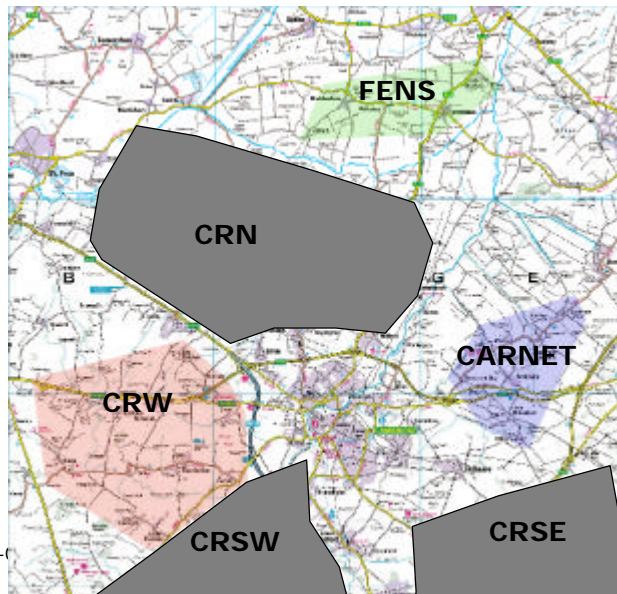
- Not for Profit
- Marketing
- Local PoC
- Local Awareness
- Fund Raising
- Community LAN content

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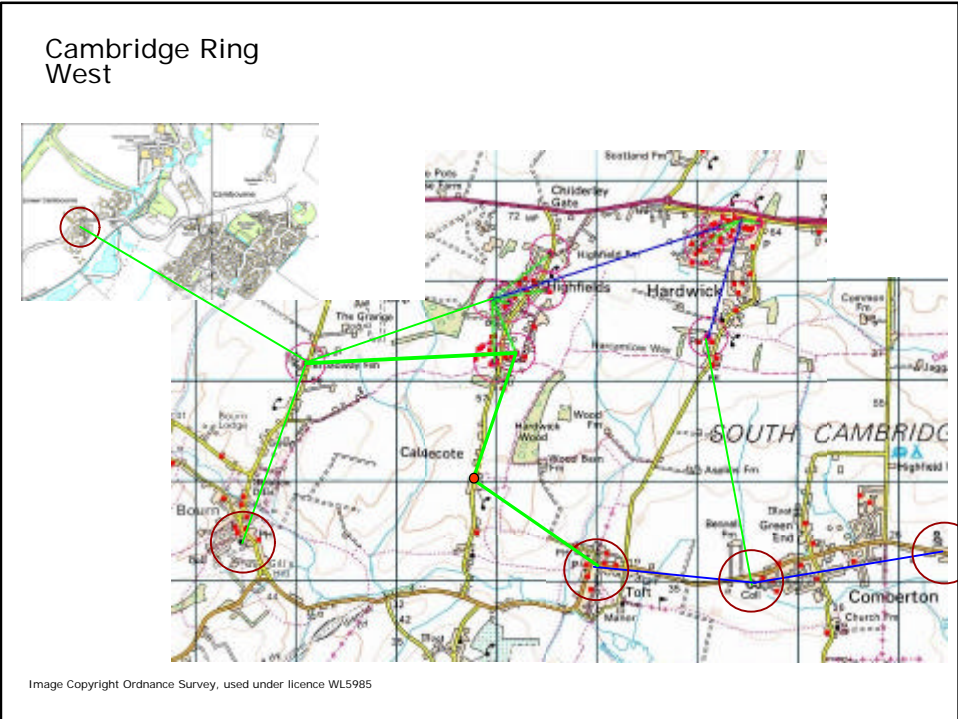
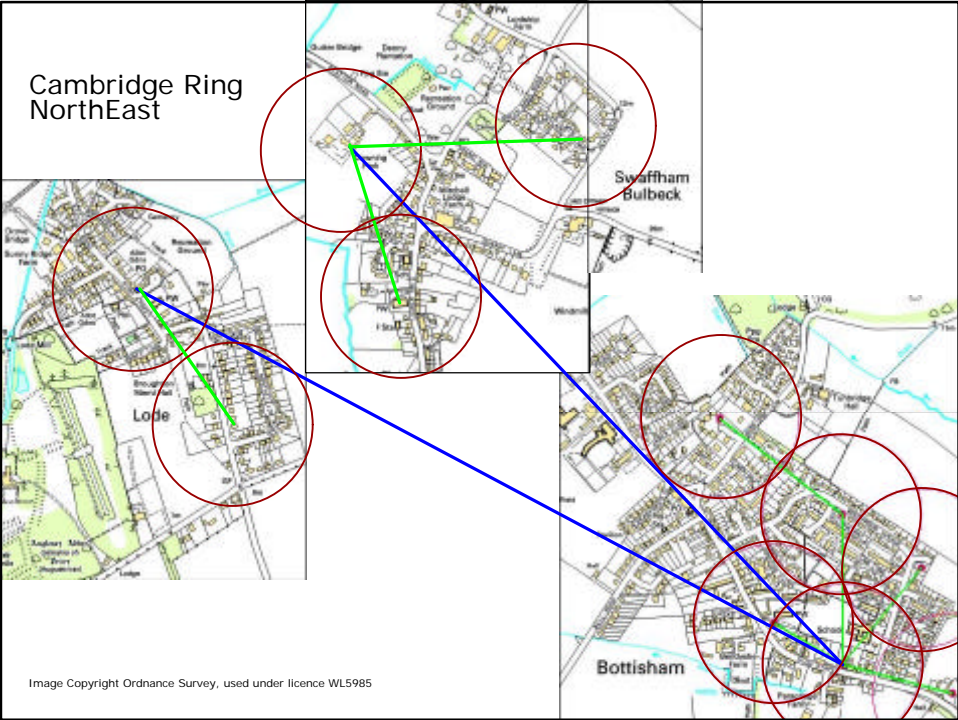
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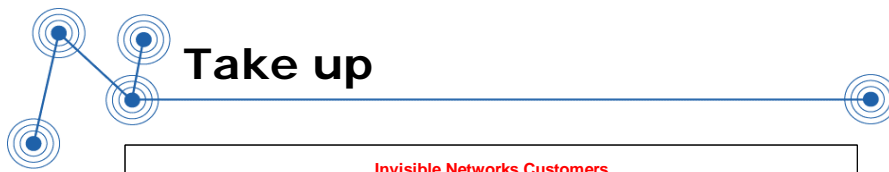


Where are we now ?

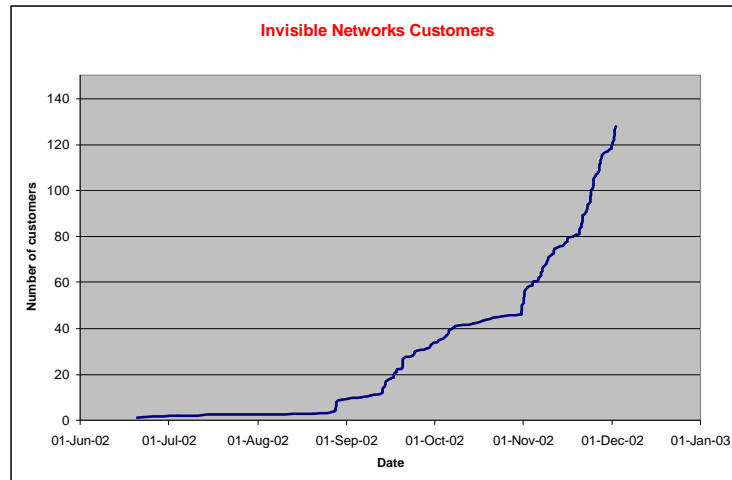


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Take up



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Services

- **Standard Service**
 - £199 Setup
 - £23.99 - £29.99/month
- **Premium Service**
 - £299 Setup
 - £36 - £45/month
- **Small Company**
 - £500 Setup (+ VAT)
 - from £150/month (+ VAT)

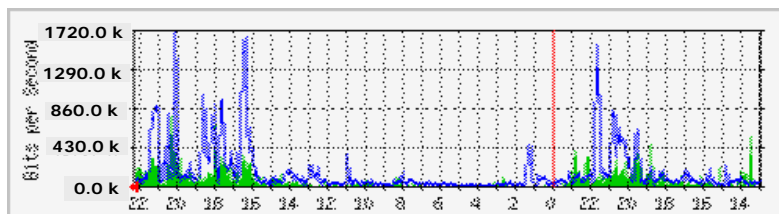
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Service level

- Contention ratio?
 - BT, 50:1 for 512k ADSL
 - Regardless of usage?
 - Key is traffic dimensioning



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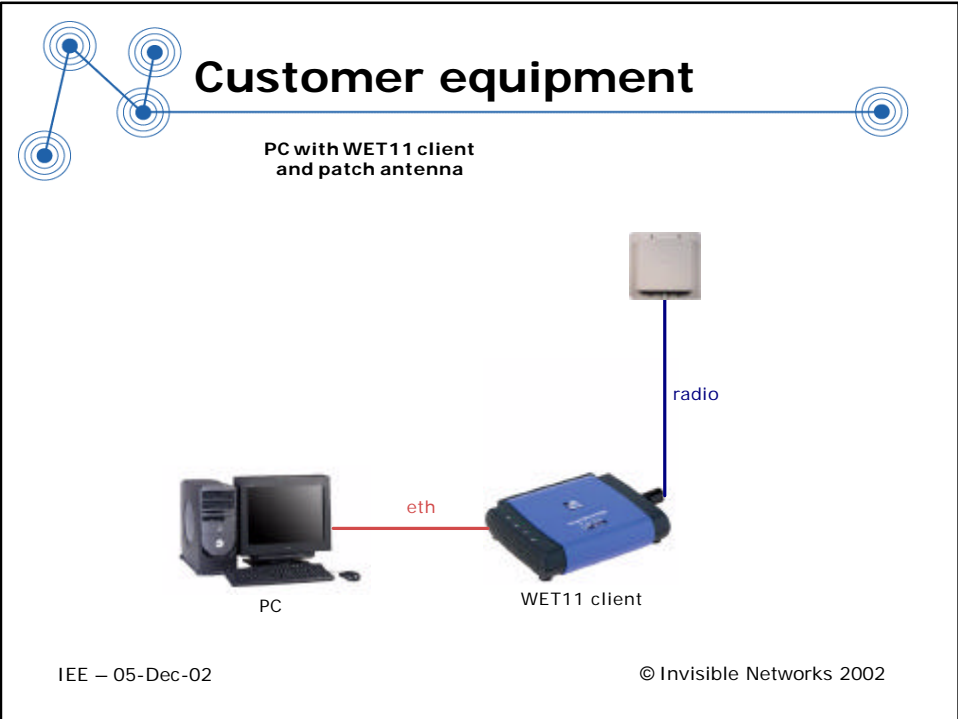
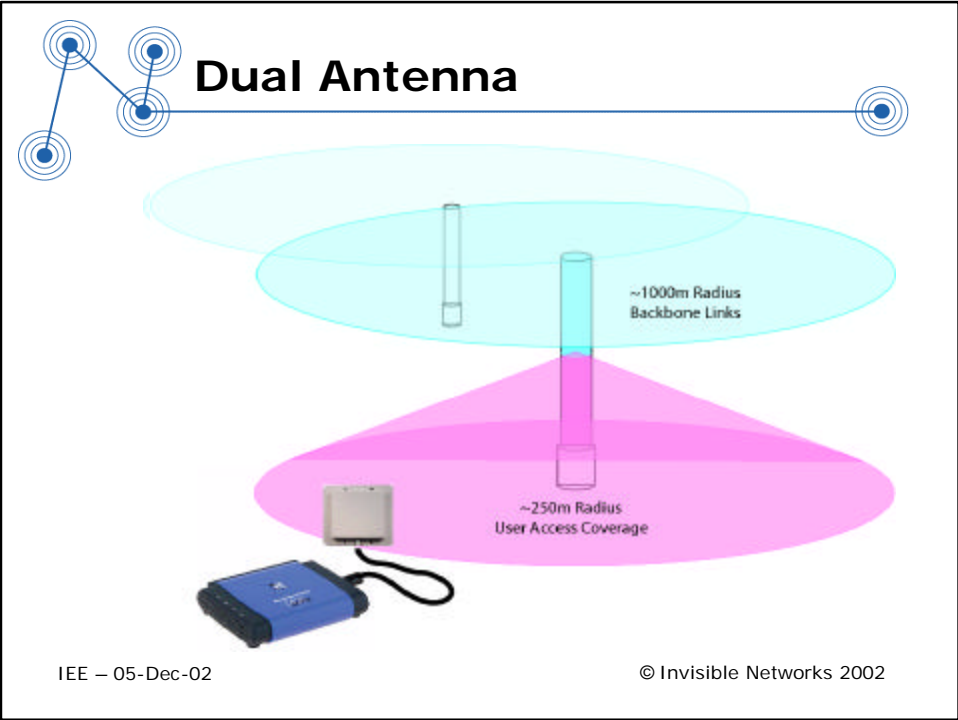
Nodes (Access Points)

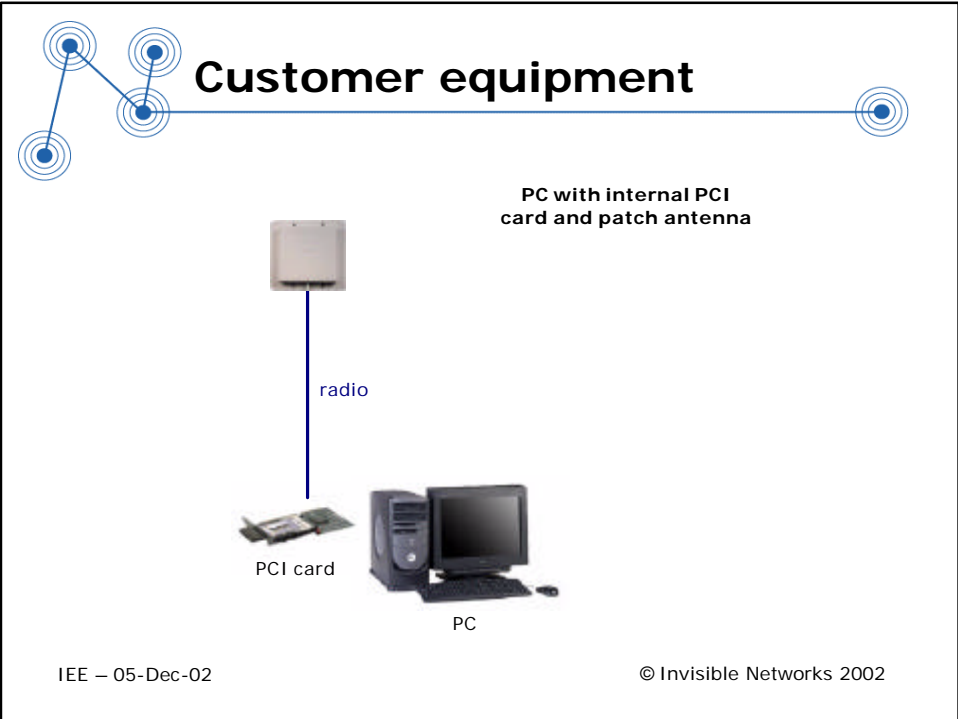
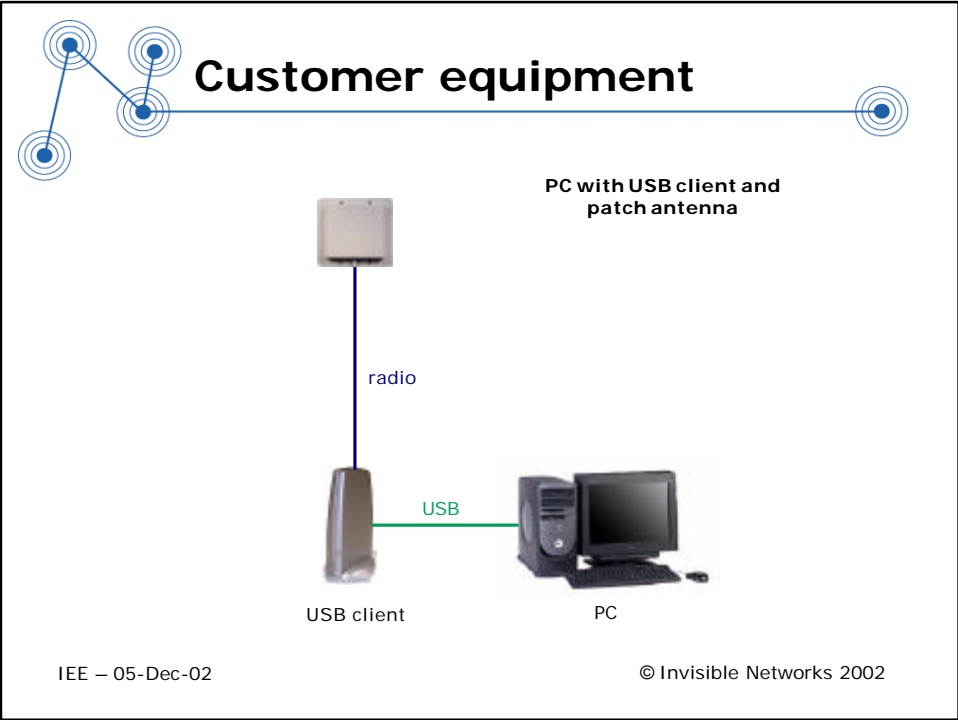


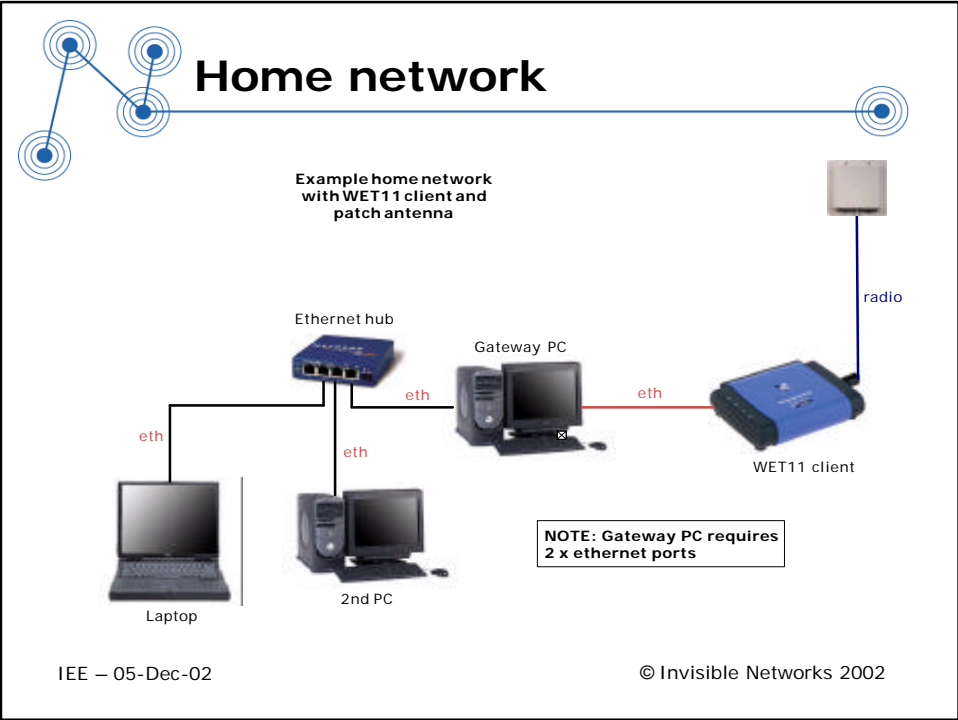
- Access point or Node antenna installation on existing TV aerial pole.
- Inside loft installation for conservation areas etc
- One node covers the 200m "cell"

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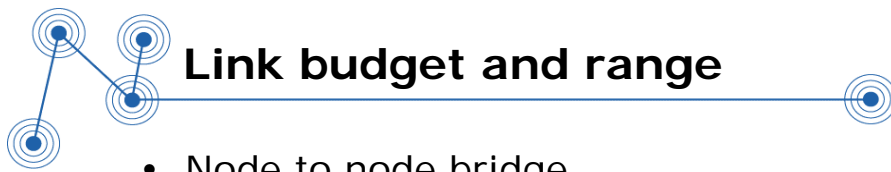
Link budget and range

- Access point to CPE

Tx Power	13 dBm	13 dBm
Pigtail loss	-3 dB	-3 dB
Main Cable loss	-2.5 dB	-0.5 dB
Tx Antenna gain	8 dBi	8 dBi
EIRP	15.5 dBm	17.5 dBm
Rx antenna gain	8 dBi	8 dBi
Cable loss	-0.5 dB	-2.5 dB
Pigtail loss	-3 dB	-3 dB
Rx sensitivity	-83 dBm	-83 dBm
Maximum path loss	103 dB	103 dB
Range (free space)	1405 m	

•Range in reality about 200m

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Link budget and range

- Node to node bridge

Tx Power	1.5 dBm	1.5 dBm
Pigtail loss	0 dB	0 dB
Main Cable loss	-0.5 dB	-0.5 dB
Tx Antenna gain	19 dBi	19 dBi
EIRP	20 dBm	20 dBm
Rx antenna gain	19 dBi	19 dBi
Cable loss	-0.5 dB	-0.5 dB
Pigtail loss	0 dB	0 dB
Rx sensitivity	-83 dBm	-83 dBm
Maximum path loss	121.5 dB	121.5 dB
Range (free space)	11822 m	

•Range depends on terrain, trees and buildings

•In USA max EIRP = 10dB more.

•USA ranges 2 to 3 times further

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Other Technologies

- Baseband/ADSL
 - WiFi & variants (802.11a,g etc)
 - Other frequencies (licensed or not)
 - Long haul bandwidth
-
- We are Technology agnostic

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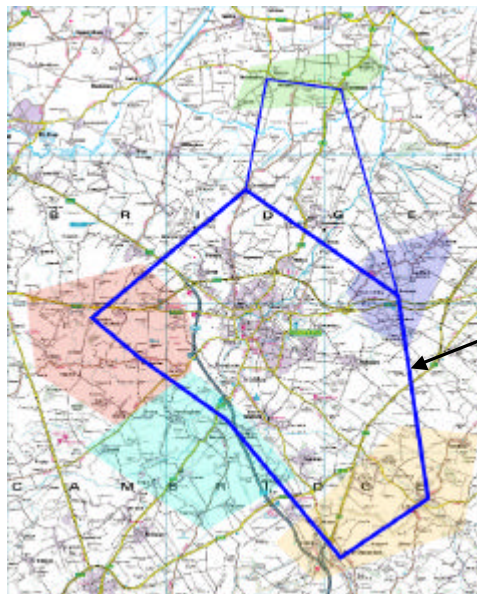
Legal Issues

- 802.11b
 - US allows up to 1W EIRP
 - UK restricted to 100mW EIRP
- 802.11a
 - US allows full use of 5GHz spectrum
 - 54Mbit/s
 - UK currently needs a licence
 - Likely to remain illegal for outdoor use

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The Cambridge Ring



100Mbit/s

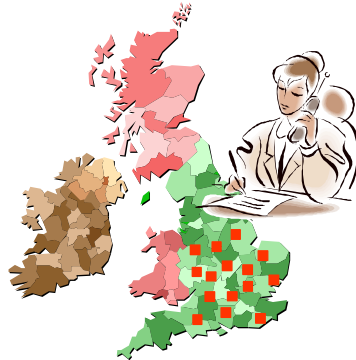
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Other Areas

- Numerous other communities interested

— Need to be self financing

- RDA grant
- Pre-orders
- Local investor



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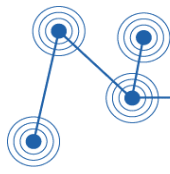
Longer Term Future

- Formal Franchising Model
- Evolving the technical model
- Community Broadband is the key
- Roaming with hotpot operators (& 3G?)
- IPv6

True Broadband needs to be FIBRE
or Gbit/s radio (mm wave/ laser)

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Further Information

- www.invisible.uk.net
- www.bbb.uk.net
- www.carnet.uk.net
- www.crw.uk.net
- www.crse.uk.net
- www.fens.uk.net