BWA Network architectures

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Outline

• Why BWA?

• BWA networks
  P-P, P-MP & MP-MP networks
  Applications & protocols

• Conclusions
BWA overview

ISP Service Network
Corporate Networks
Internet

• Point-to-Point
• Point-to-multipoint
• Multipoint-to-multipoint

Wireline
Wireless

Backbone Network

Corporate
SME
SOHO
Residential

Wireline
Wireless

Corporation

Nokia
Point to point BWA

- Proprietary systems
- Long range up to 30km
- High capacities up to 155Mbits/s
- No upfront investments in equipment
- Network planning except for 58GHz short range radios
- Applications mainly circuit based
  - Leased lines
  - Backhaul for cellular and BWA networks
Point to multi-point

- Proprietary systems. Standards under development
- A single base station for a number of subscriber stations
- Sectorized antennas
- For metropolitan and urban areas with several customers per sector
- LMDS bands in US, 33 or 42 GHz in Europe.
- Bandwidth on demand offers significant statistical multiplexing gain in capacity for packet services
Applications for PMP

- Corporate customers, s
  - Leased lines e.g. E1/T1
  - LAN interconnection
  - IP VPN access

- Residential multi-dwelling units
  - Internet access
  - VoIP
  - Multimedia services

- Cellular transmission

- PMP radios are a true service convergence platform!
PMP radio protocol stack

• Similar stack adopted in IEEE 802.16 TG1 and ETSI/BRAN/HA

• Regardless of 'payload' protocol the air interface is connection oriented

• This allows higher efficiency and QoS control

![Protocol Stack Diagram]
Cost of PMP vs PP

Intersection point is affected by
- Equipment costs
- Site costs
- Licence costs

Number of customers / base station vs Price
- Point-to-Multipoint
- Point-to-Point
MP-MP BWA networks

Technologies

Nokia RoofTop Wireless Routers

Applications

IP access including VoIP

Easy deployment. Little upfront investment. Customers install their own radios.

LOS required only to a neighbouring terminal.
Positioning

Customer Size

- Corporate
- Interconnect
- Multi-Tenant
- SME
- SOHO
- Residential

Number of Customers / km²

- Point-to-point
  - Best for high speed dedicated corporate connectivity & backhaul interconnects
- Point-to-multipoint
  - Easier to deploy -- well suited for SME and backhaul links
- Multipoint-to-multipoint
  - The only way to reach mass markets cost effectively
Combining PP and PMP

• Combining PMP and PP can be combined for extended range and overcoming LOS problems

• PP attractive backhaul for PMP systems
Nokia MP- MP solution

Metropolitan Area: High Speed Edge
- RF engineered links
  - Unlicensed or licensed
  - PTP or PTMP
- Existing wired infrastructure

Internet Core: Fixed Wired Access
- High speed fixed access points

Neighborhood: Ad-hoc Routed Mesh Networks
- MP-to-MP, Unlicensed RF
Conclusions

• Typically more than one network technology involved in BWA network

• No 'one size fits all' technology.

• Multiple applications and protocols are run simultaneously in the network

• BWA networks are not only a competing technology to other access technologies such as xDSL. It is also a complementary technology!

• For multidwelling residential users BWA turns the 'last mile' issue to a last 300' issue'