



Airspan Networks

April 2012
v4



Airspan Networks: Overview

- Leading provider of Wireless Access solutions since 1995
- ~250 people in 12 locations, R&D centric organization
- Headquartered in Boca Raton, Florida, USA
- Focused on 4G Carrier and Vertical markets
- R&D in the UK, Israel and Finland
- Scalable global supply chain
- Sales and Support Offices in Australia
- Major shareholder: Oak Investment Partners



Airspan: All About Connectivity



Smart Utilities

<ul style="list-style-type: none">• Smart Grids• Electric Utilities• Water/Hydro• Natural Gas	<ul style="list-style-type: none">• Distribution Automation• Demand Response• AMI• SCADA
Serving 	For 



Carriers & Operators

<ul style="list-style-type: none">• Residents• Businesses• Mobile Users	<ul style="list-style-type: none">• Internet• Telephony• Video• 4G Mobility
Serving 	For 



Oil & Gas

<ul style="list-style-type: none">• Oil Rigs• Oil Refineries• Pipeline Networks	<ul style="list-style-type: none">• SCADA• Networking• Fleet Management• Surveillance
Serving 	For 





Municipalities

<ul style="list-style-type: none">• Cities• Townships• Government• Public	<ul style="list-style-type: none">• Inter-Agency• Remote Access• Traffic Control• Surveillance
Serving 	For 





Public Safety






<ul style="list-style-type: none">• Law Enforcement• Emergency Response• Defense	<ul style="list-style-type: none">• Inter-Agency Commun..• Surveillance• Border Patrol• 24/7 Data Access
Serving 	For 



Transportation

<ul style="list-style-type: none">• Metros/Railways• DoT• Fleet Management• Buses	<ul style="list-style-type: none">• Fleet Telematics• Real-Time Data• Surveillance• On-Board Access
Serving 	For 





4G Radio Access Networks

	MicroMAX 	AirSynergy 	Air4Gs 	Air4G (MacroMAXe) 
Base Station Type and Interfaces	Compact Pico Base Station 16d WiMAX	Pico Base Station 16d, 16e WiMAX and LTE	Micro Base Station 4G WiMAX (LTE later)	Macro Base Station 4G WIMAX and LTE
Tx power and Typ. EiRP	1x27dBm or 1x30dBm ~20 Watts	2x27dBm or 2x30dBm 40 Watts	2 x 33 dBm 160 Watts	Up to 2 x 40 dBm 1-2 kW
Frequency Bands	650 MHz to 6 GHz, inc. 1.4 GHz, 1.8 GHz, 2.3 GHz	400 MHz to 6 GHz, inc. 1.4 GHz, 1.8 GHz, 2.3 GHz	1.4 GHz, 2.3 GHz and 3.x GHz	700 MHz, 1.4 GHz, 1.8 GHz, 2.x GHz, 3.x GHz
Tx and Rx Paths	1 / 1	2 / 2 or 4	2 / 2 or 4	2 / 4
Typical Antenna Configuration	Vertical	Dual or Quad Slant	Dual Slant	Quad Port or Dual Slant
MAC/PHY per sector	1 x MAC/PHY	2 x MAC/PHY	Single MAC/PHY	Dual MAC/PHY
Channel sizes	1.5 to 10 MHz	3 to 10 MHz	3 to 10 MHz	3 to 2*10 MHz

Comprehensive 4G Product Portfolio designed for implementing 4G-Advanced Networks



4G Devices and CPE Products

	MiMAX Pro 	Mobile Radio Terminal 	Embedded Modules 
End Point Type	Outdoor CPEs, designed for Residential, Business, Enterprise and Vertical Apps, Wi-Fi Option	Rugged Mobile Terminal for Vehicle based Applications, supports Wi-Fi and Ethernet	Modules for embedding inside other devices / Terminal Stations
Tx power and Typ. EiRP (W)	2x24dBm Up to 20 Watts	2 x 24dBm ~4 Watts	2x24dBm Up to 20 Watts
Frequency Bands	400 MHz to 6 GHz, inc. 1.4 GHz, 1.8 GHz, 2.3 GHz, and 3.65 GHz	400 MHz to 6 GHz, inc. 1.4 GHz, 1.8 GHz, 2.3 GHz, and 3.65 GHz	1.4 GHz, 1.8 GHz, 2.3 GHz, 2.5 GHz and 3.65 GHz
Tx and Rx Paths	2 Tx and 2 Rx	2 Tx and 2 Rx	2 Tx and 2 Rx
Typical Antenna Configuration	X-Pol or Dual Omnis	Dual Omnis	X-Pol or Dual Omnis
Peak Thru-Put (DL/UL)	35Mbit/s / 10 Mbit/s	35Mbit/s / 10 Mbit/s	35Mbit/s / 10 Mbit/s
Channel sizes	3 to 10 MHz	3 to 10 MHz	3 to 10 MHz

Different form-factors support a range of applications

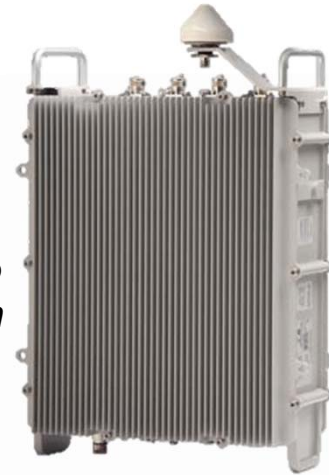


Introducing Air4G



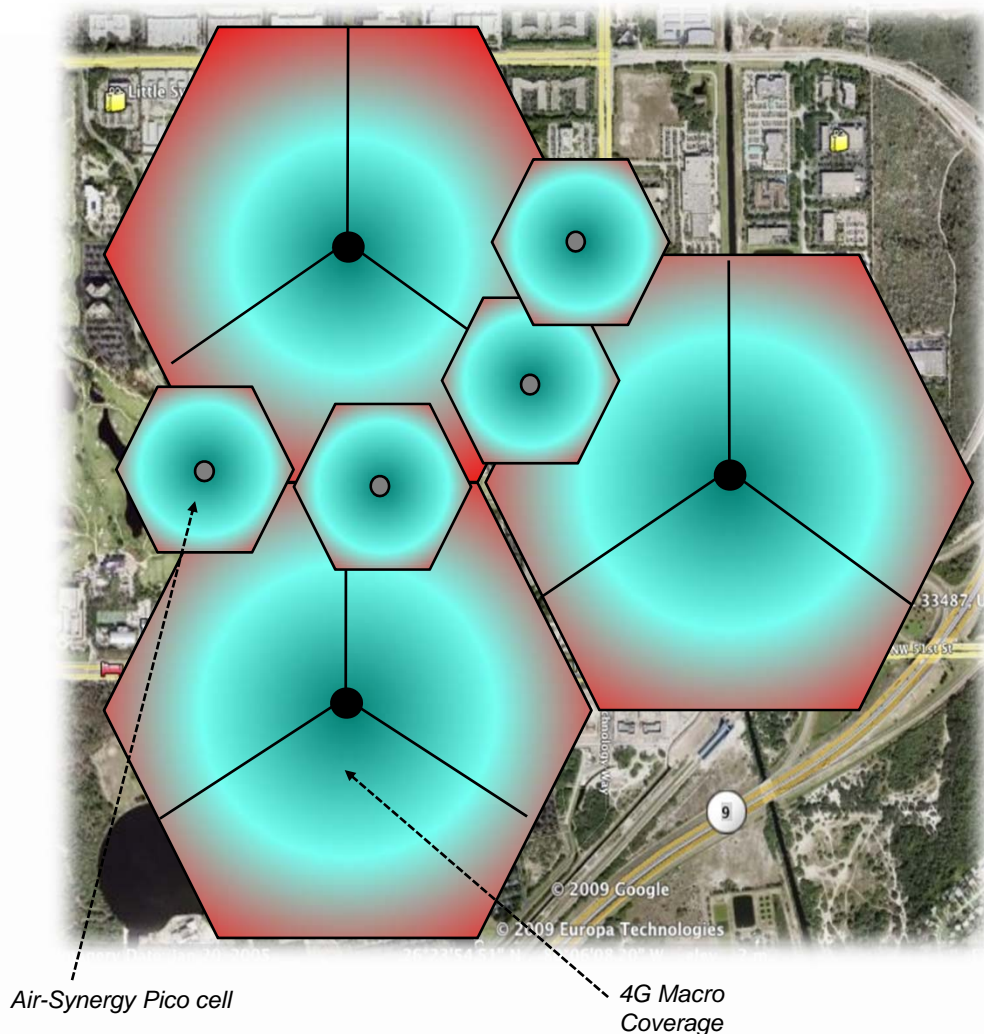
- **Air4G** is a Compact, All-in-One, All-Outdoor, High Power, **4G LTE** and **4G WiMAX** Base Station
 - Dual Mode and migration to/from WiMAX/LTE is supported
- Industry leading “Size to Tx Power” Ratio
 - RF + Baseband + GPS + Power Supply + Sector Data Aggregation
 - 2 x 40dBm (10W) in 2.x GHz Bands
 - 2 x 43dBm (20W) in 700/800 MHz Bands
 - 17kg per sector
- Advanced MAC and PHY capabilities
 - 3 or 4 separate MAC/PHY engines
 - Supports up to 3 x 20 MHz (FDD or TDD)
 - MIMO and SFR/FFR (field proven)
- Beyond the “Standard”
 - Ethernet and IP CS
 - VLAN tagging / pass through
 - Stand Alone mode for fixed application
 - Extended Range

Air4G Macro Base Station



Air4G-W24 2010	Air4G-W24 2011	Air4G-WL24 2012	Air4G-WL44 2013+
45 Mbps	90 Mbps	150 Mbps	600Mbps

Macro Cell Networks augmented with Pico cells



- Macro Base Stations provide "day 1" coverage
 - Typically Tri-sectored cells, running from existing macro cells sites
- These cell sites provide footprint coverage for low bit rate voice services, but are not spaced to provide high capacity broadband services
 - In 3G and 4G deployments the capacity at the edge of cell is up to 10 times lower
- Air-Synergy Pico cells complement the Macro coverage and increase capacity at the cell edge
 - Where Macro capacity is low
- Combinations of Macro and Pico nodes massively increase the aggregate Mbit/s available in the network

Covering Rural Broadband Not-Spots

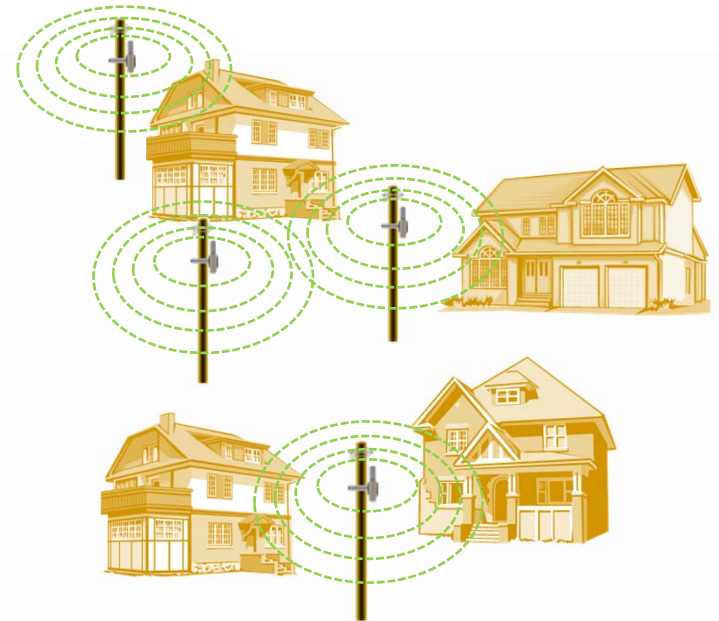
- Fibre and wire-line technologies require a certain customer density and up-take to make them economically viable.
- As you move into rural broadband not-spot regions, the customer density reaches a point where a wireless extension is the only cost effective solution.
- A wireless solution that extends the reach of an existing fibre/wireline network can be a powerful component within an operators “toolkit” when looking to cover low density rural broadband not-spots.
- The solution should be easy to deploy (low CAPEX) and provide a sustainable OPEX business model as part of an overall broadband service offering.

Air-Synergy directly addresses this challenge.



The Need For Small Cells

- Airspan recognizes how the deployment of small cells can improve a users wireless broadband experience by enabling a Rural Broadband Carrier to deliver broadband service where it's needed:
 - Locating nodes close to users enables usage of high order modulations and MIMO techniques present in 4G technologies.
 - Off-loading data traffic from the macro network to relieve congestion.
 - Deploying on existing street furniture (eg. telegraph poles) to save site acquisition costs and ongoing OPEX.
 - Solving coverage constraints due to challenging terrain in rural applications.
- Air-Synergy is Airspan's new multi-standard, multi-frequency outdoor picocell solution with two key characteristics to overcome the challenges of getting small nodes close to the user base:
 - Deployable form factor & low skill installation.
 - Embedded wireless backhaul.



Introducing AirSynergy



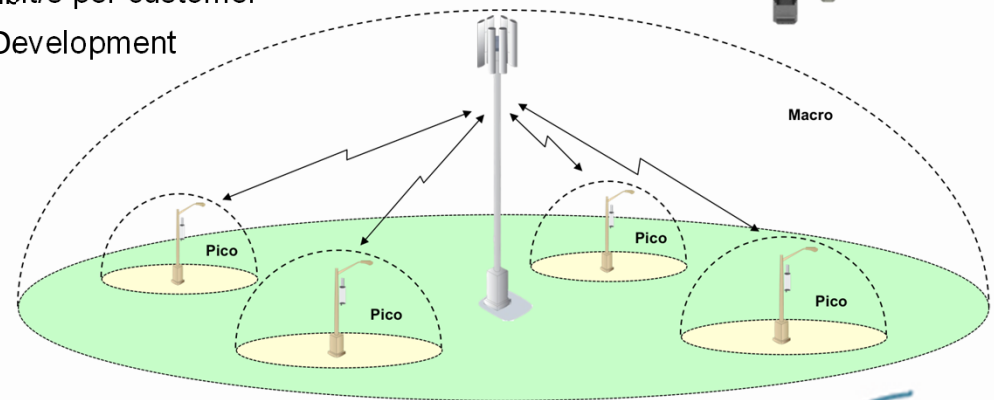
- Air-Synergy is an economic & sustainable solution for coverage in rural broadband not-spots
- Multi-Standard SDR enabling a flexible future proof deployment
- Integrated Wireless Backhaul & Relay enabling the use of any installation location.
- Simple form factor and smart plug-n-play features provide low skill deployment.
- Choice of form factor for rural application.
- Covers Licensed and “Whitespace” spectrum allocations.
 - Deployment options include 700MHz WiMAX Access plus 3.x or 2.6GHz TDD for iBridge backhaul/relay
 - NMS integration with Spectrumbridge

Introducing AirSynergy



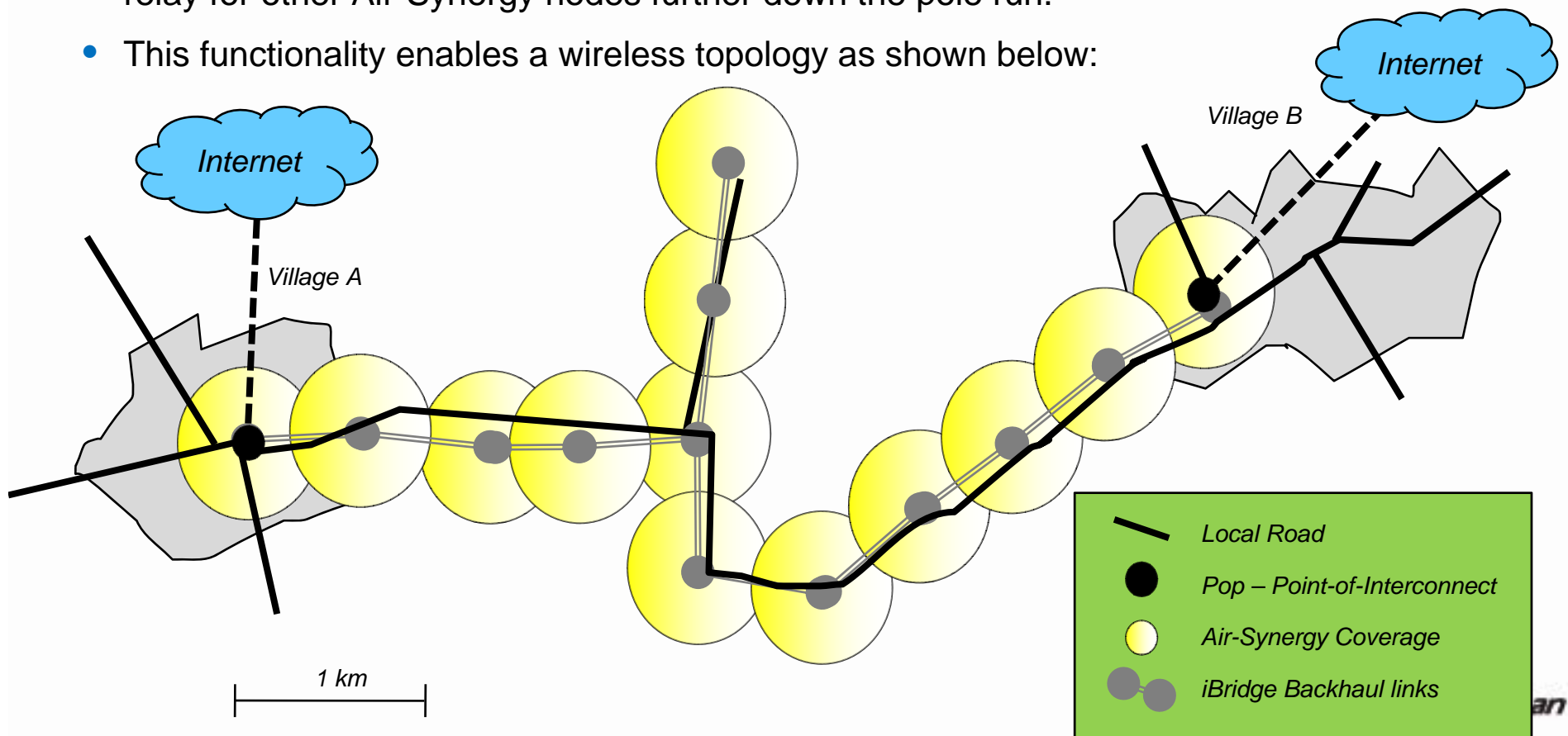
- **AirSynergy** is a new generation of Software Defined Base Station
 - An evolution of Airspan's commercially deployed Macro SDR technology (Air4G)
- Optimised for mounting on Utility Poles, Lamp Posts, Vertical Assets
 - Avoids expensive site builds and cell-site rentals
- Integrates Access and Backhaul into single product
 - One node contains two radio systems,
- Operates in Licensed Spectrum (400 MHz to 6.0 GHz)
 - Free from interference providing high levels of service availability (FDD and TDD)
- Supports multiple RAN Standards
 - 4G **WiMAX** and 4G **LTE** for delivering 10's of Mbit/s per customer
 - 2G & 3G (HSPA) optional SW loads - * Future Development
- Low power consumption
 - 120W per node - Access and Backhaul Node
- Supports various deployment topologies
 - Pico layer of a heterogeneous network
 - Point to Multipoint
 - Relay distribution topologies

**AirSynergy
Pico Base
Station**

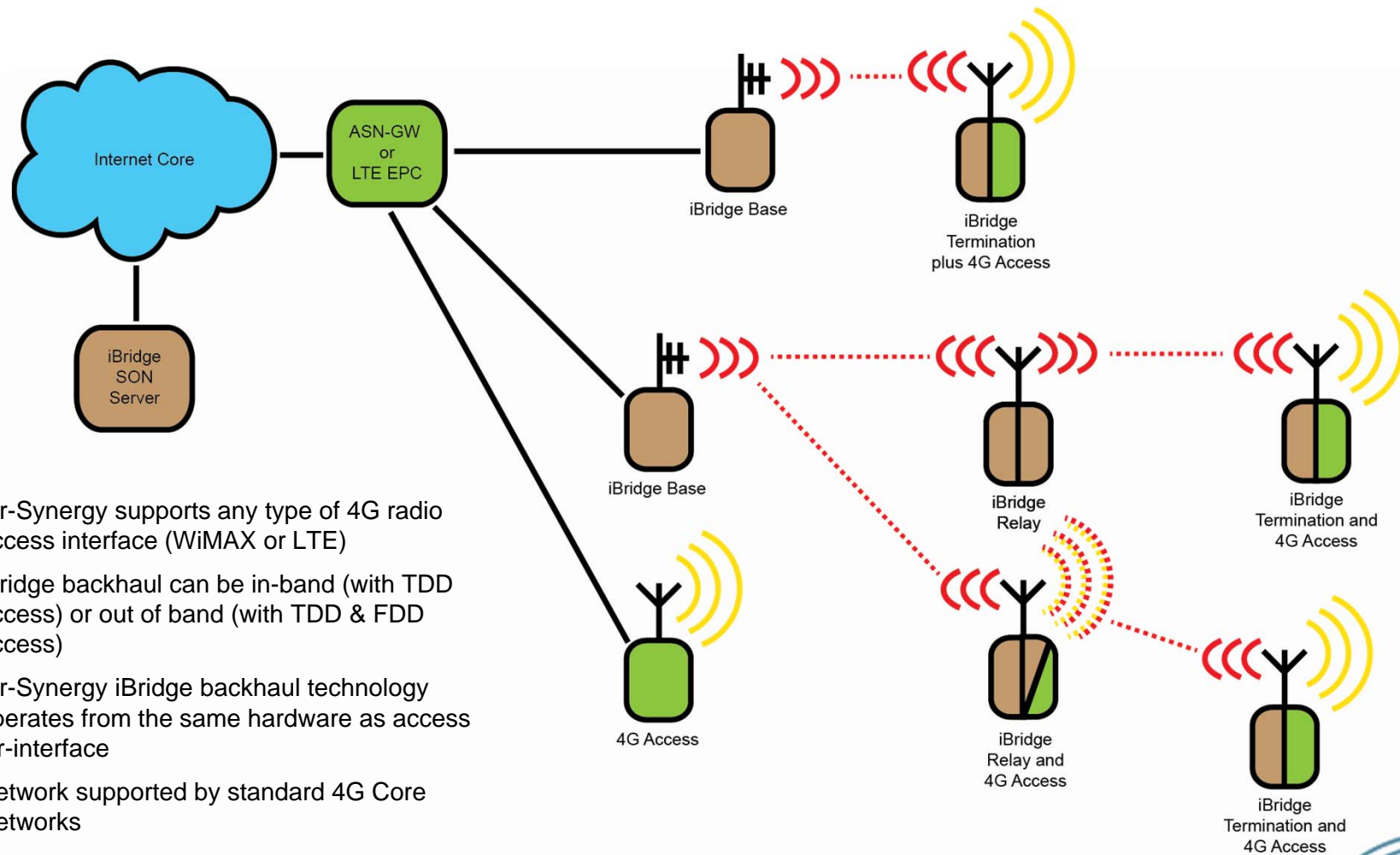


Air-Synergy for Rural Not-Spot Coverage

- Air-Synergy supports integrated wireless backhaul.
- It's dual purpose antenna provides user access omni coverage as well as supporting a switched array to self connect to the nearest backhaul node. It is then able to act as a relay for other Air-Synergy nodes further down the pole run.
- This functionality enables a wireless topology as shown below:

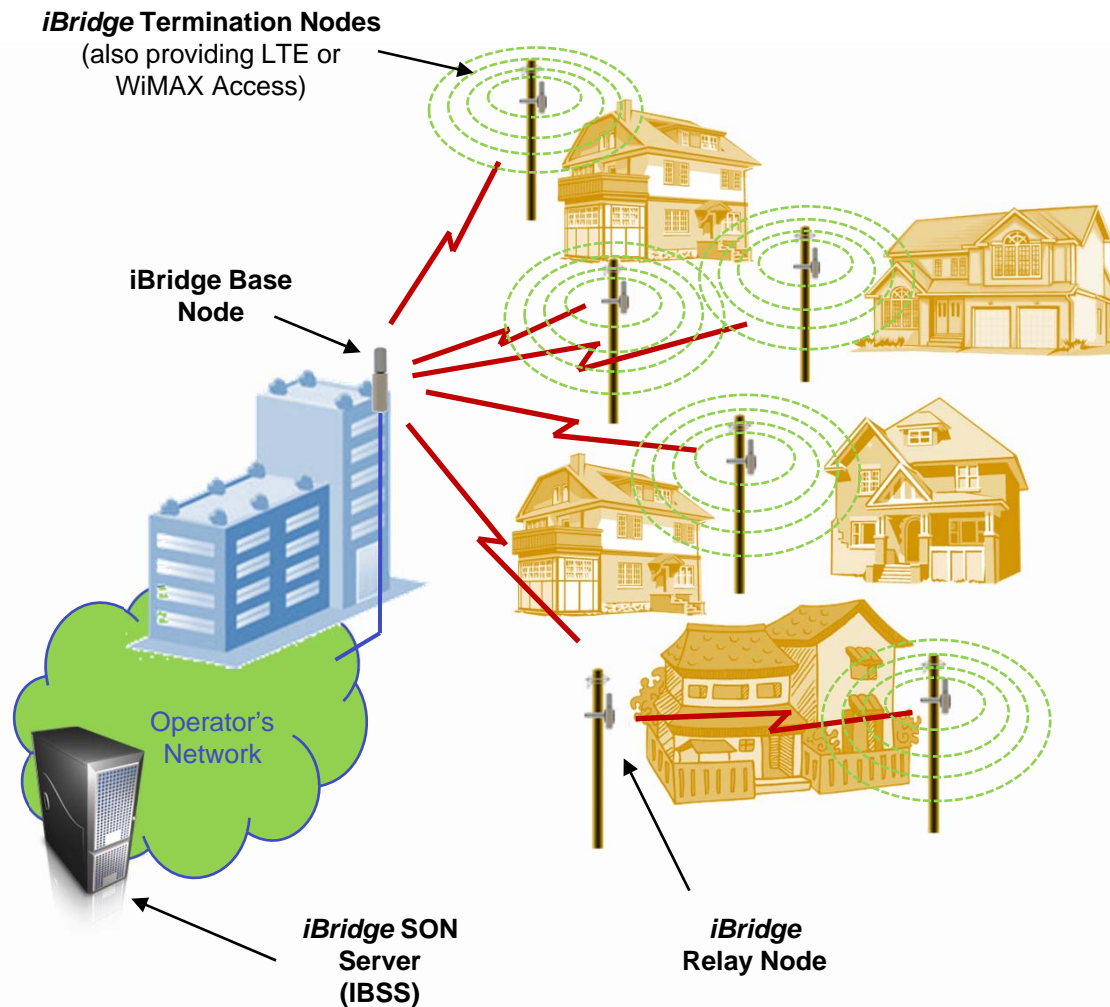


Air-Synergy Network Architecture



- Air-Synergy supports any type of 4G radio access interface (WiMAX or LTE)
- iBridge backhaul can be in-band (with TDD access) or out of band (with TDD & FDD access)
- Air-Synergy iBridge backhaul technology operates from the same hardware as access air-interface
- Network supported by standard 4G Core Networks
- iBridge “SON” provides real-time optimisation of backhaul and access radio links

Introduction: iBridge = Intelligent Backhaul



- Airspan's **iBridge** is an intelligent network that delivers backhaul functionalities utilising advanced point to multi-point access techniques in the sub 6 GHz frequency band.
 - Self-discovery and auto-registration allowing low skill rapid Node installations.
 - Fully managed end to end QoS
 - High order, high efficiency MIMO techniques
 - Smart Beam Switching antenna techniques for rapid deployment and resilience modes.
 - Low Latency & latency control
 - Centrally coordinated interference avoidance and network efficiency optimisation (**iBridge SON Server**)
 - Airspan has a large set of intellectual property and patents that cover this technology

Typical Urban Scene – spot the AirSynergy!



*refer to product mgt for details of verified devices

Improved Styling

- The AirSynergy form factor has been improved for Dual RF Synergy-3 nodes providing access and backhaul:
- Changes are in order to help the unit blend in with it's environment and to look less like a base station.
- This helps with local authorities providing permission to mount on lamp posts and other street furniture.
- There is a styled cover shrouding the overall unit.
 - The switched antenna for backhaul (iBridge) is hidden behind the cover.
 - The cover houses a wrap around antenna for WiMAX or LTE access.



*refer to product mgt for details of verified devices

Conclusion: 4G Networks for Operators

- By combining the strengths of both 4G technologies Operators get;
 - Fixed and /or Mobile Networks for their customer base
 - Wide-Area Network for connectivity for aggregation nodes (**Private WiMAX and Public 2G, 3G and LTE**)
 - Next generation solutions (**Public or Private LTE or WiMAX**)
 - For Broadband, Data and Voice
- Airspan Networks can help Operators construct their own **Private** Networks using both 4G standards.

