



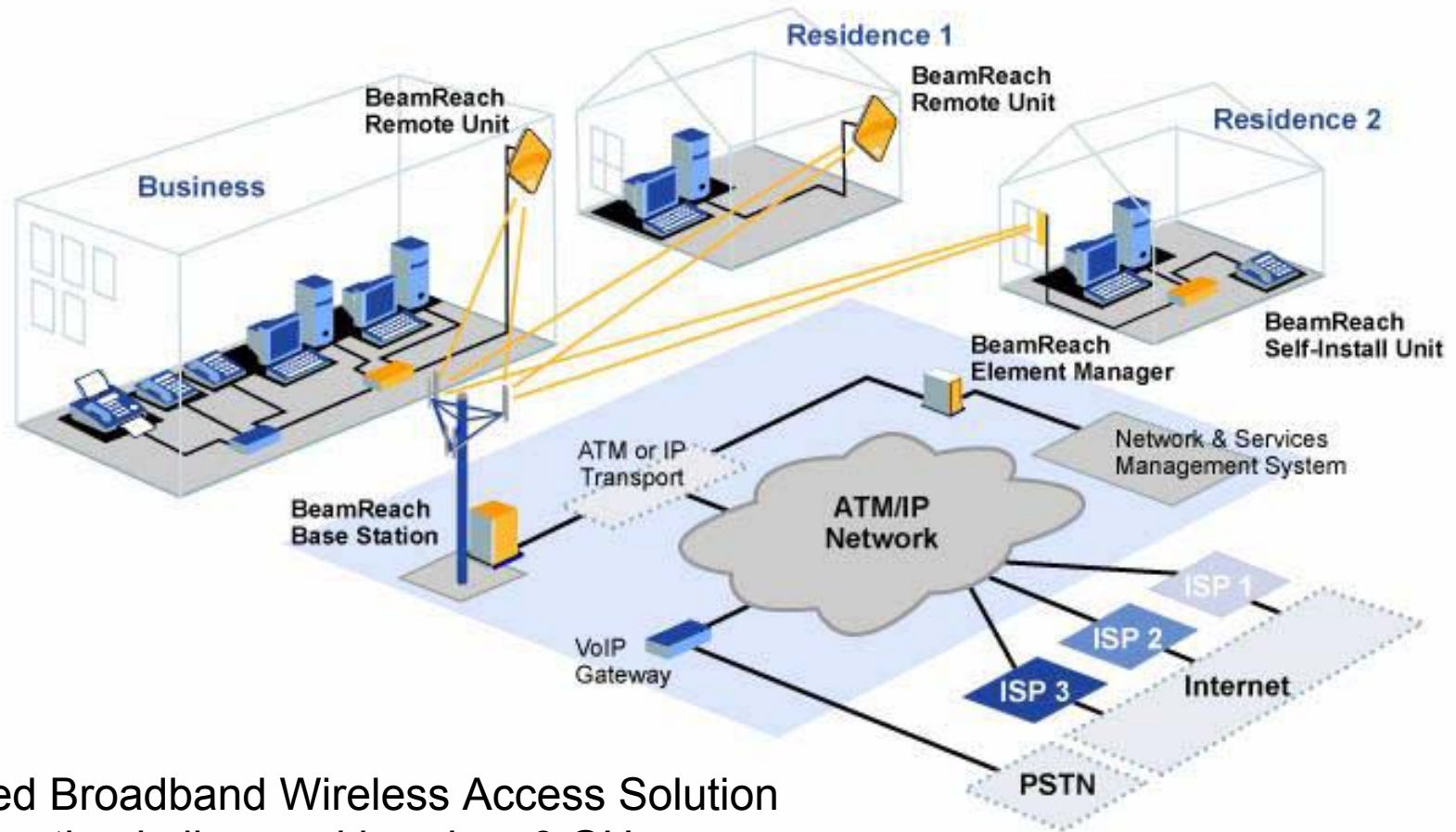
Extending the
Broadband Horizon

**Broadband Wireless Access Solution
for residential and SME applications**

**Stanford University
October 31, 2002**



The BeamPlex™ System Architecture



Fixed Broadband Wireless Access Solution
Operating in licensed bands < 6 GHz
Using cellular architecture
Delivering 1.5 Mbps to each subscriber

The BeamPlex™ Products



BRU-100
Outdoor Remote



BRN-5000
Base Station



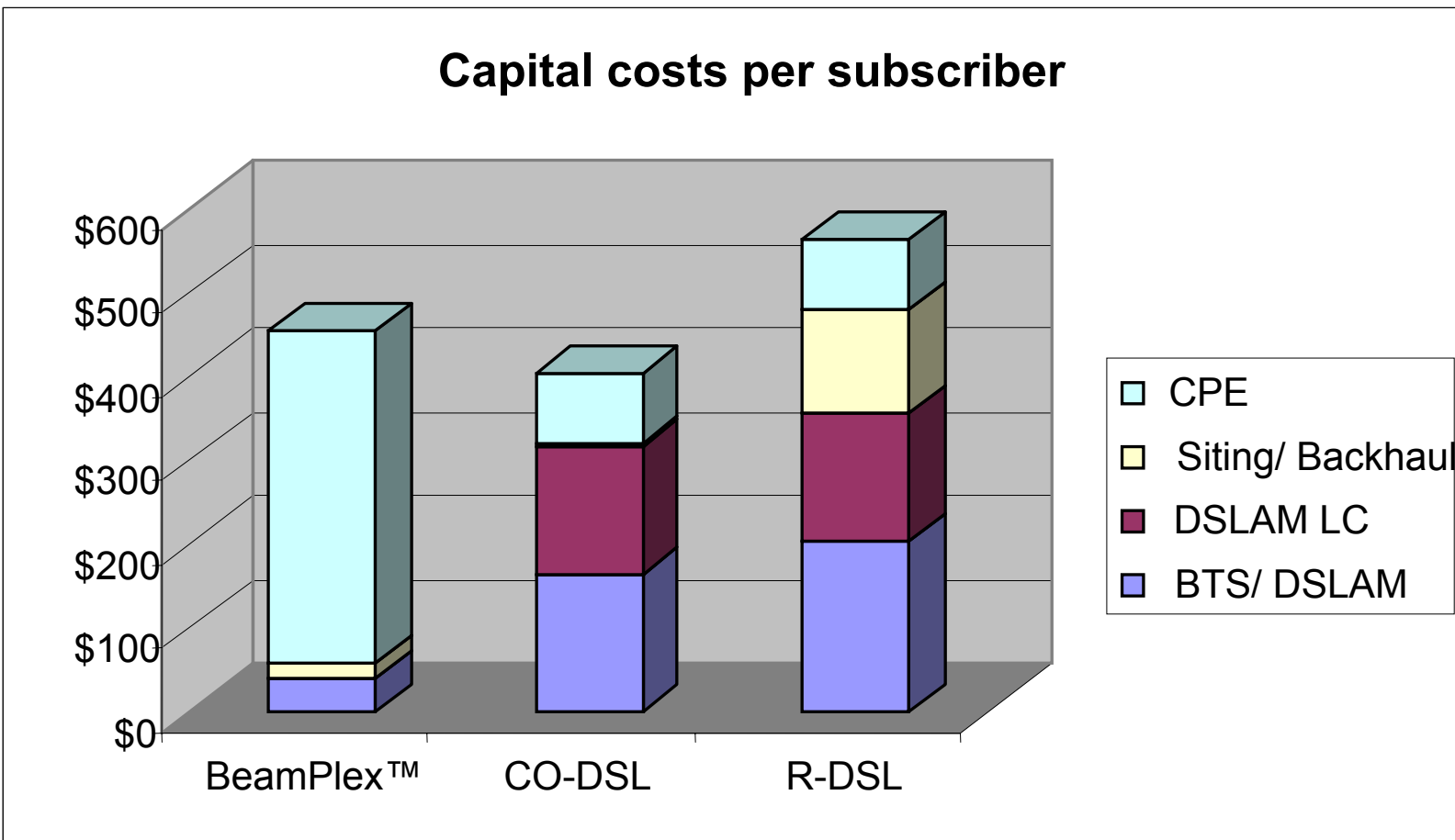
BRU-150
Indoor Remote



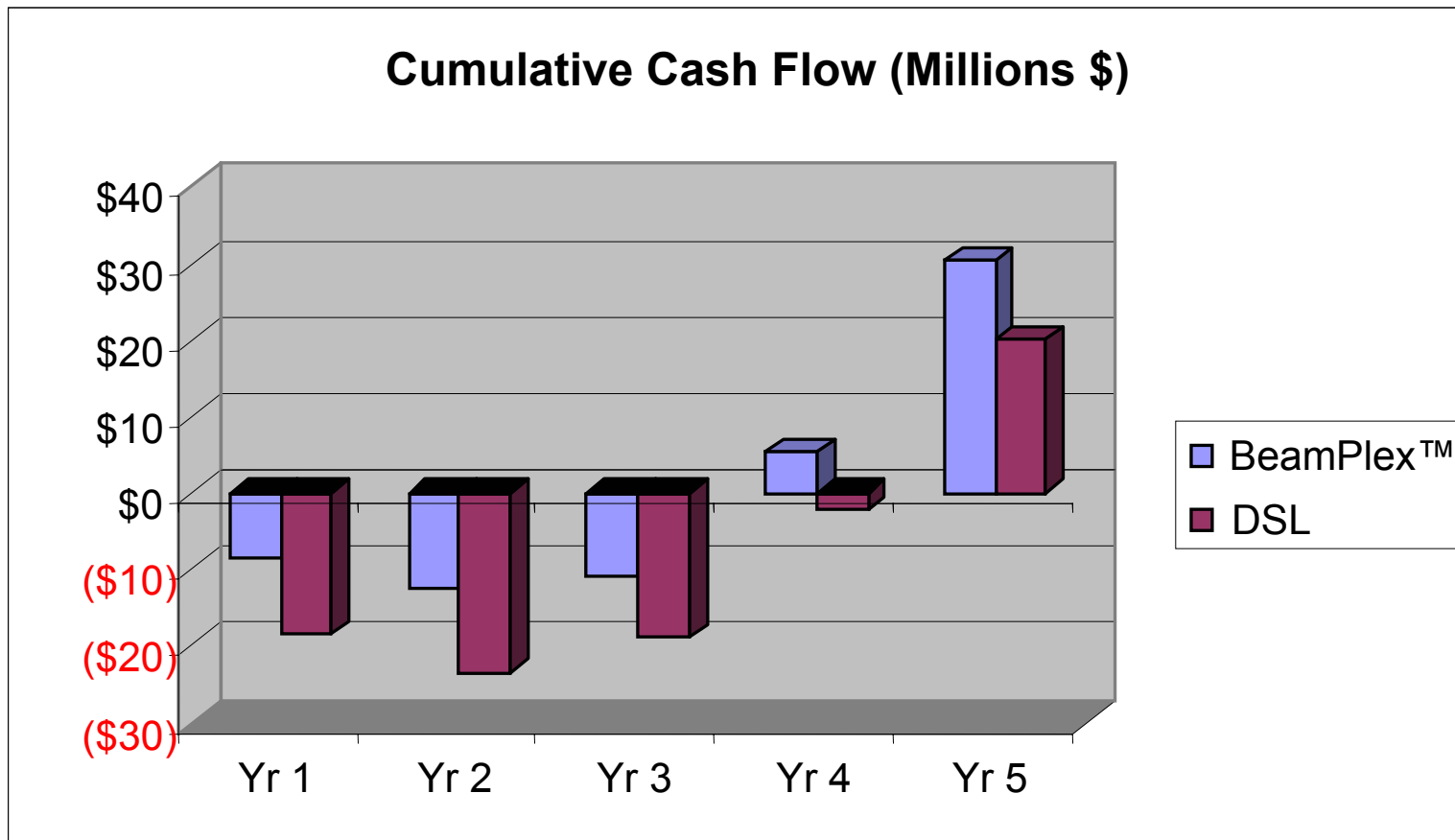
BeamPlex Element Manager

- Incumbent LEC's finding serious limitations with DSL
 - Wireless represents one of the few viable complementary technologies
 - Cable companies represent growing threat
- Competitive Carriers have limited alternatives to wireless
 - Unbundled loops too expensive
 - ILEC's can put up serious roadblocks
 - Overbuilding wired infrastructure unrealistic
- Unconventional new entrants looming
 - Content providers concerned with control of access duopoly
- Many countries have under-developed infrastructure
 - Opportunities with both ILEC's and Competitors in International Markets

Capital costs per subscriber



Comparison to DSL- Results



5 Year IRR: 47% for BeamReach solution vs 22% for DSL

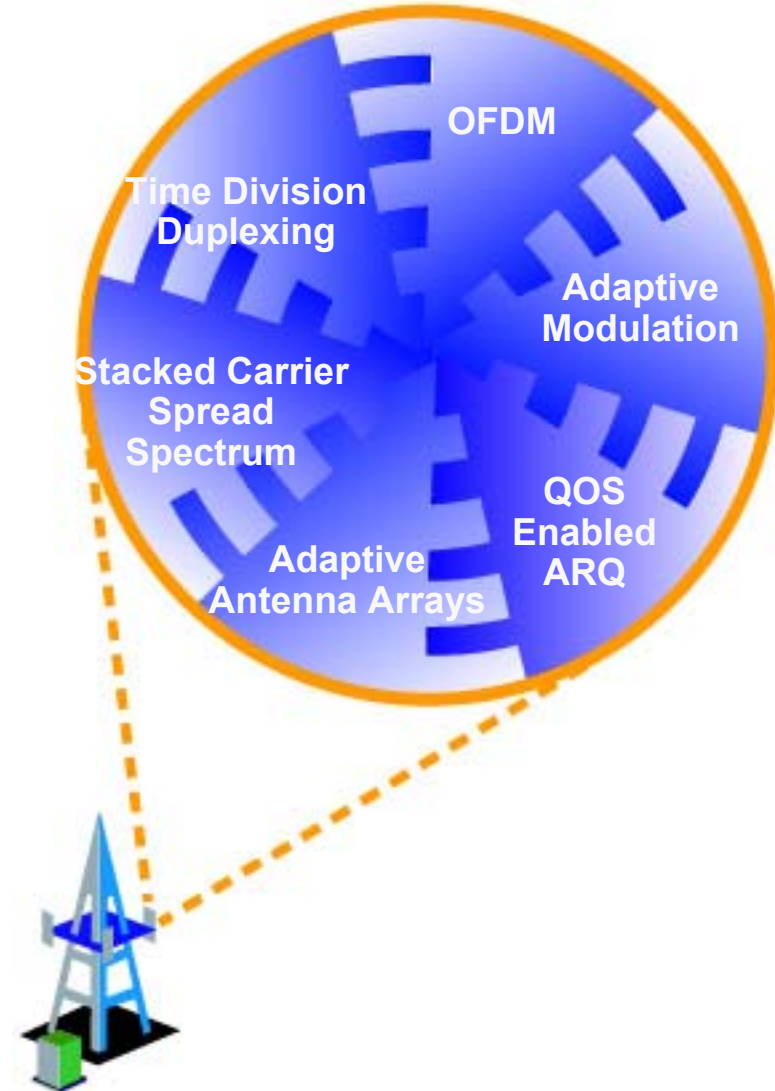
Requirements for a Successful BWA Business

- Low **cost** of **coverage**
 - Macrocell
 - Non line-of-sight performance
 - High link budget & low fade margins
- Low **cost** per sub for infrastructure
 - Large base station **capacity** = 1000's of subscribers
- Low spectrum **cost**
 - High spectral efficiency and flexibility in spectrum use
- Low **cost** CPE
 - Integrated, customer installable
 - Eliminate install costs, rapid service deployment

BeamReach Networks' Solution

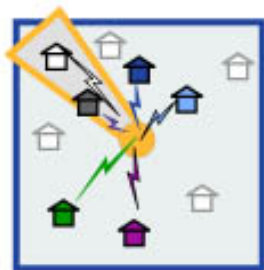
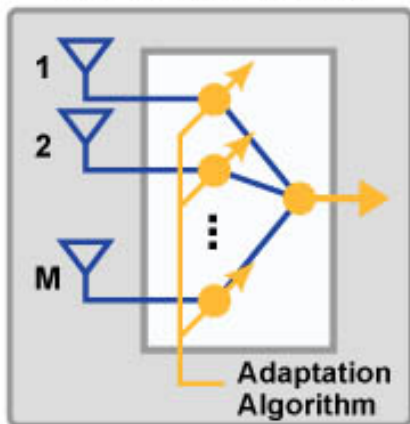
- **4th Generation System**
- **Based on Adaptive MultiBeam OFDM**
 - Adaptive beamforming and null steering
- **Concurrently delivers**
 - Large coverage: > 16 x area
 - High link rate: 1.5 Mbps
 - High capacity: up to 220 Mbps
 - High spectral efficiency: > 10 x increase
- **Low Cost**

No Compromise

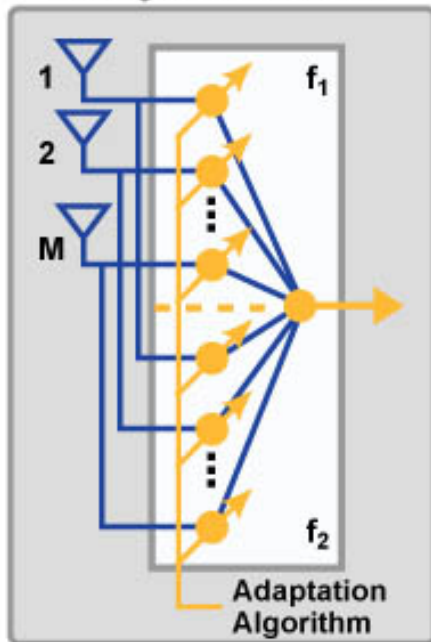


Adaptive Beamforming

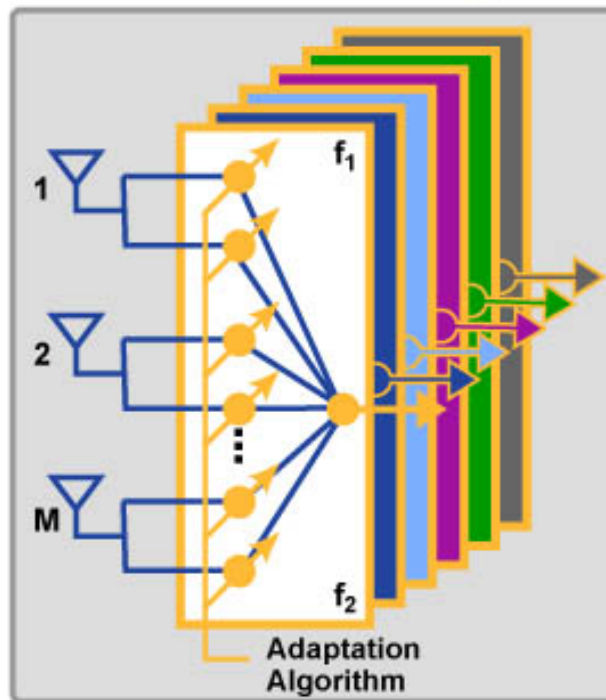
Spatial Beamforming
M antennas
M degrees of freedom



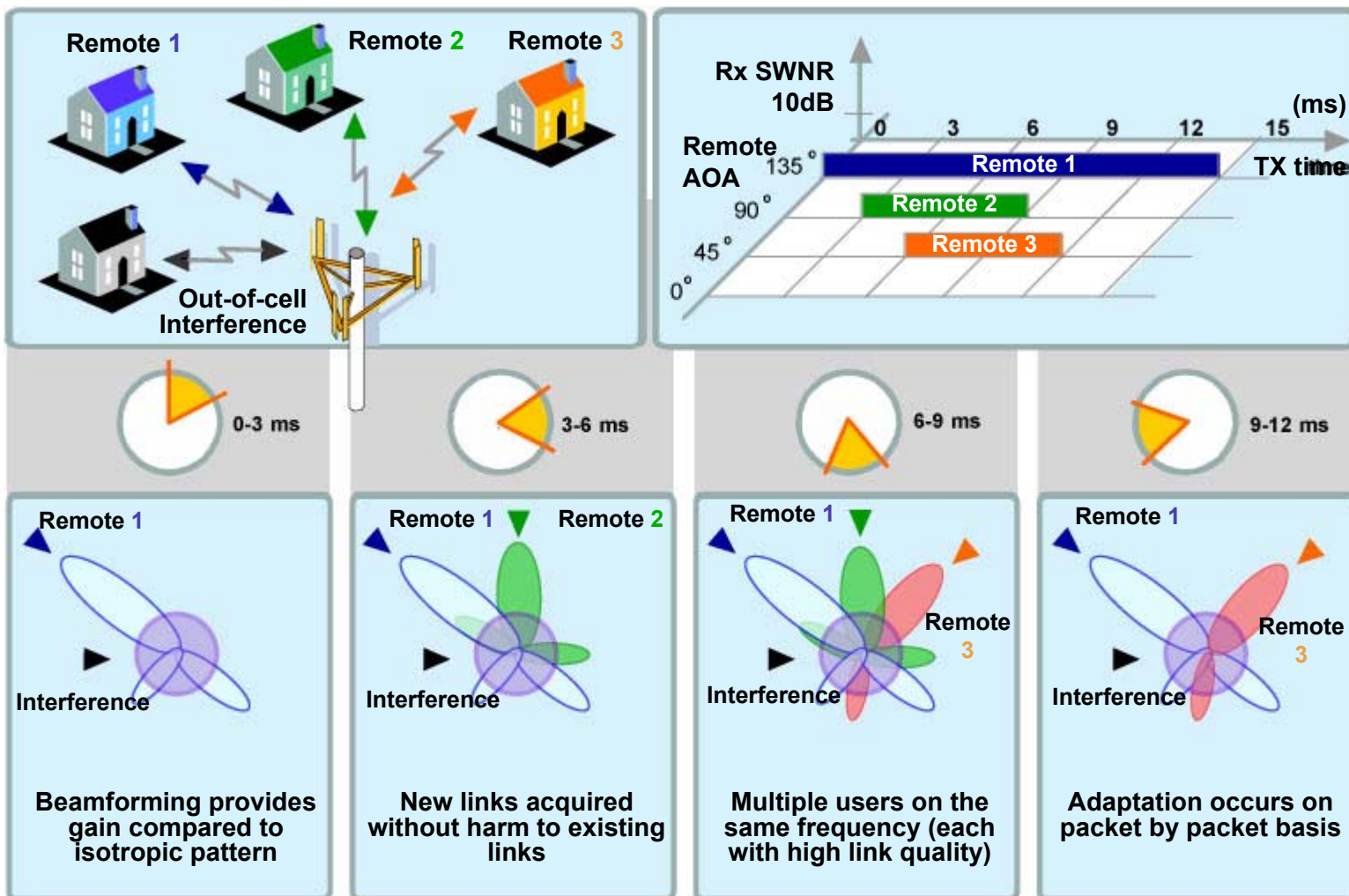
Spatial + Spectral Beamforming
M antennas, 2 frequencies
2M degrees of freedom

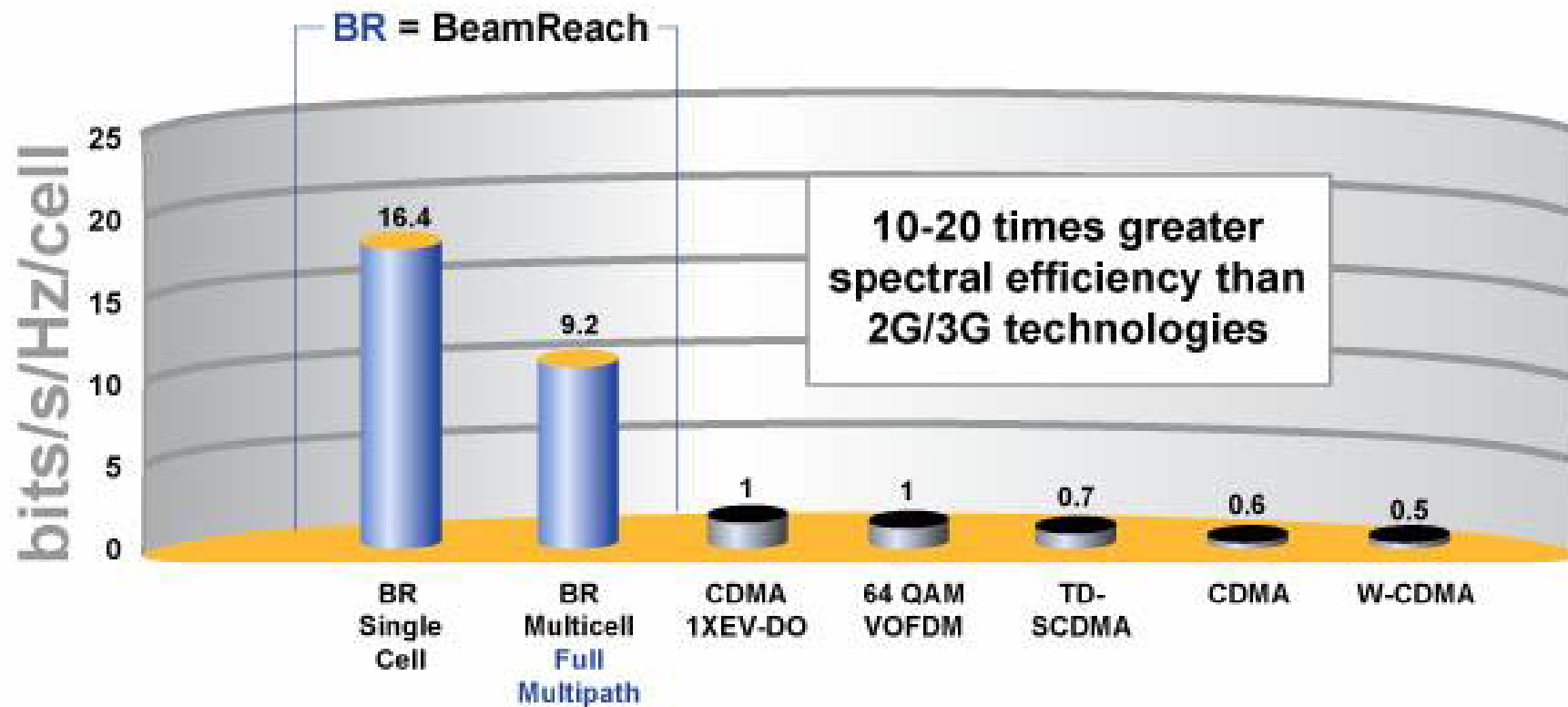


Multilink Beamforming

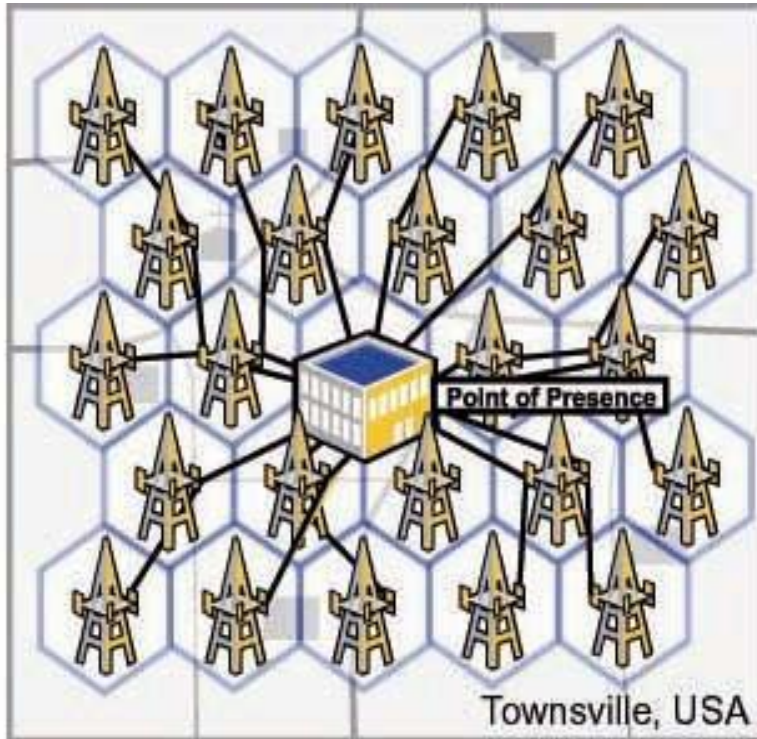


Fast Packet Adaptation & In-Cell Frequency Reuse

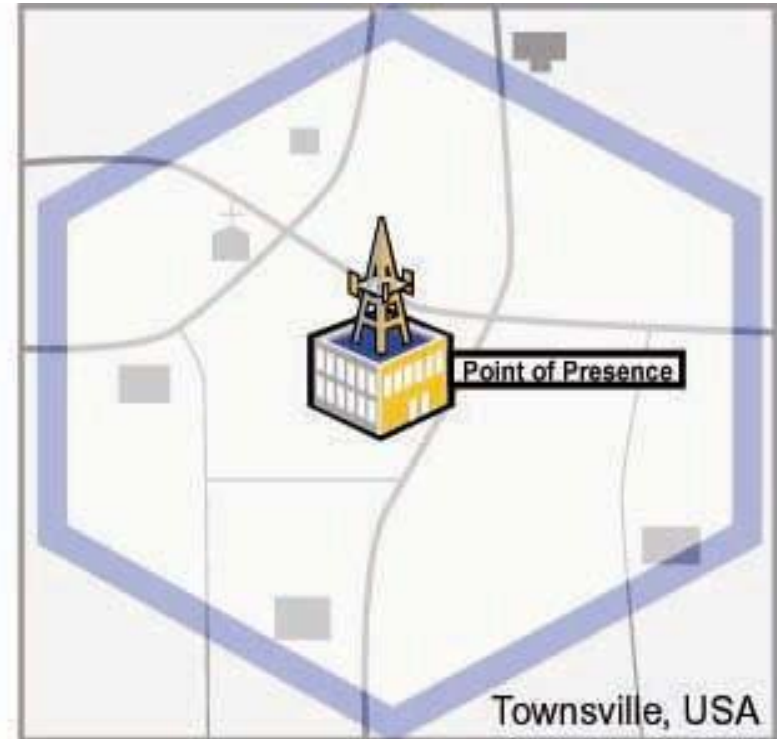




Infrastructure Coverage Comparison



Typical 2G/3G BWA Technology



**BeamReach System Maintains Wide Cells
With High Percentage of Self-Install CPE**



Market differences: Asia vs US

- Demand/ penetration of broadband services
- Requirements to provide voice and data services
- Availability of alternative broadband infrastructure
- Ability to pay
- Density of population per sq. km
- Multi-dwelling units vs single family houses
- Spectrum availability: 2.3 GHz, 3.5 GHz ?

Economics are generally far better in Asia



Asia: Multiple markets, multiple applications

- Korea/ Japan
 - Complement to DSL
 - Portability features to differentiate against DSL
 - Very low cost/ price for DSL
- China/ India
 - Business and MDU applications
 - > 1.5 Mbps for multi-dwelling units
- India
 - Broadband to villages: Large coverage