

**Investing in Infrastructure:
Increasing Internet Access in the Developing World**

CITI - May 14, 2004

Practical Aspects of Market and Project Development

Ken Zita

Network Dynamics Associates

kzita@ndadventures.com

www.ndadventures.com

“Everything Matters”



Last Mile Access in Emerging Markets

Big burden or big potential?

The essential telecom market opportunity in low- and middle-income countries is to provide:

- low-cost, high-quality telephone service and
- reliable high-speed Internet connections

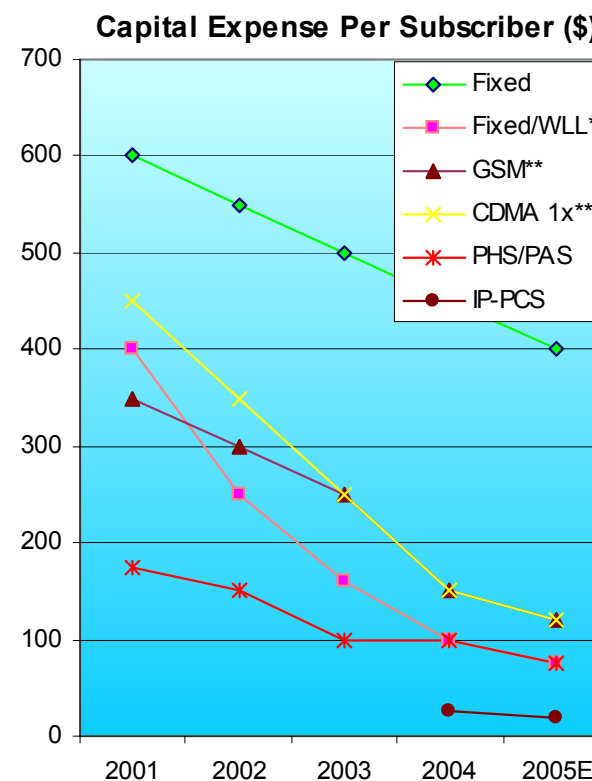


What we all want

- **Last-mile networks that are dramatically less expensive to build, easier to deploy, and more flexible to operate than existing fixed line and mobile alternatives**
- **IP deployed as widely as possible**
- **Low or no radio spectrum costs**
- **Networks designed to provide both voice and data**
- **Positive ROI in an era of declining ARPU**
- **Open the “middle” of the market pyramid**

Context

- **PSTN investment is comatose**
- **Governments still addicted to telecom taxes**
 - Spectrum remains expensive:
Pakistan \$291M = 28x ARPU (future 15x)
- **GSM**
 - More affordable but still limited to wealthiest
 - Capex as low as \$50 (av. \$120)
 - Useless for data; 3G is a fantasy
- **CDMA / CDMA WLL**
 - More elegant but remains expensive for data
 - Devices, networks, spectrum, \$/mbyte
- **The future is “all-IP”, but when?**
 - WiFi/SIP still exotic



Source: Network Dynamics Associates

Internet access options

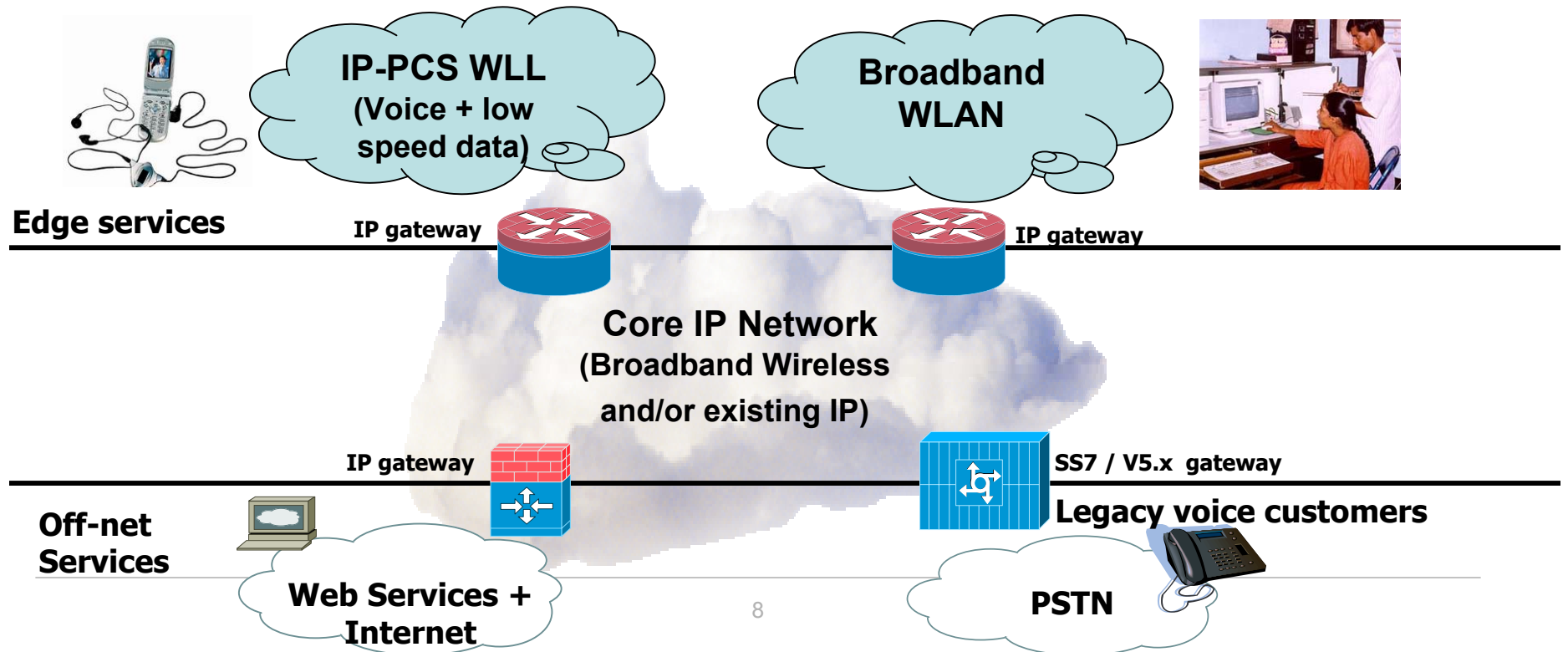
- **(Traditional PSTN and satellite)**
- **Broadband wireless islands**
 - A lot of new, powerful and cheap solutions
 - WISP/VoIP for business
 - Primarily urban core, but links to remote areas via satellite
 - Terminal costs falling dramatically
- **WiFi**
 - Chips are evolving fast, especially for voice
 - Business model does not scale due to range
- **WiMax**
 - Standards-compliant, volume production in 2006/7
 - Initial systems will be consumed by “triple play” in mature markets – will delay introduction in small/poor markets
- **IP networks are not easy to manage**
 - Domain management, complexity and scalability
 - Managing bit storms over open protocols

So, what do we build?

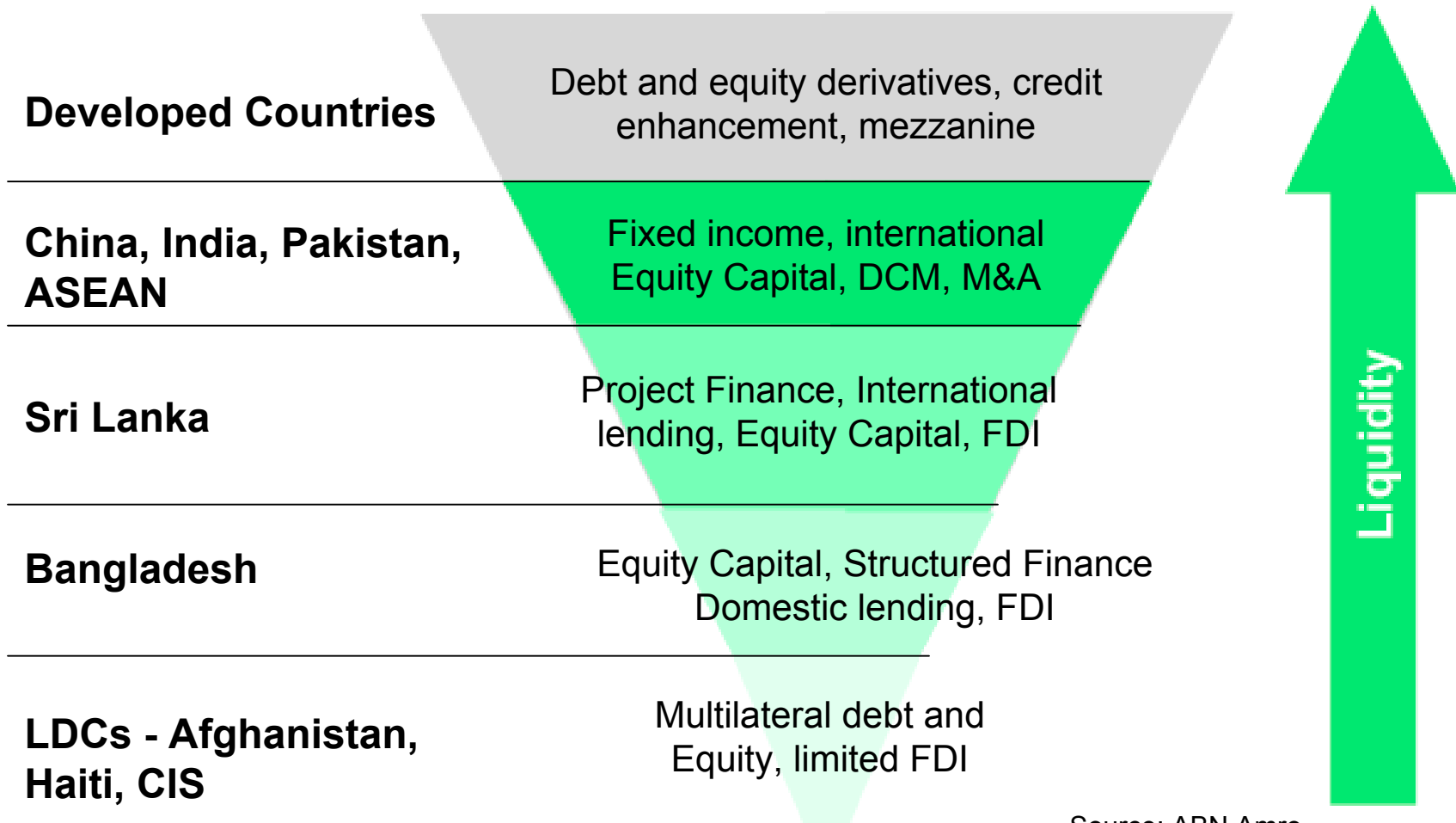
Delian Architecture Summary

Vision: Hybrid network in near term

- Propagate IP to the network “edge”
- Proven, improved WLL – making Chinese “Little Smart” even smarter
- **IP core network with Broadband Wireless**
- **Proven “edge” technology for voice (IP-PCS/PHS)**
- **WLAN to “distribute IP” to IP-PCS nodes + business broadband**
- **Off-net voice and enhanced services through gateways**



Financing Options Vary Widely by Market



Source: ABN Amro

Financing Challenges

- **Traditional international equity investors are cautious**
 - Lack of understanding / Bigger fish to fry
 - Increasing awareness of emerging markets opportunity
 - Prefer (but will not get) control
- **Informal market entry barriers are steep**
 - Established families dominate market opportunity
 - “Market liberalization” does not mean “free market”
 - Transparent on paper vs. transparent in fact
 - Policy irregularities elevate investment risk
- **Debt**
 - Pegged to political volatility
 - Weak or immature debt markets
 - Changeable covenants
 - Only the largest get affordable bank rates

The Good News

- **Capitalization entry barriers have fallen**
 - IP and related technologies dramatically lower Capex
 - 10's vs. 100's million \$
 - Broadens pool of potential investors
- **Local markets can capitalize good projects**
 - Emerging market telecom equity performance is strong
 - Local market liquidity
- **Regulatory swing toward opening local loop**
 - PSTN lags mobile investment
 - Natural monopoly argument catching up with market reality
 - Limited understanding of what is really possible with next-generation IP systems

Take aways

- **Local loop is ripe for dramatic transformation**
- **Technology solutions do not exist in the abstract**
- **Politics matters most**
 - 95/5 rule