



Broadband Networking by Satellite

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Broadband Networking by Satellite

- ▼ **Broadband access for scarcely population areas or lows penetration rate**

- ▼ **Satellite Broadband Solutions: extending reach**

- ▼ *End-to-End Architecture (Example)*

**Broadband access for
scarcely population areas
or lows penetration rate**

Study of broadband access

▼ Objective of the study :

- Assess different solutions available for deployment in 2005 that could allow for broadband access in :
 - Scarcely populated areas
 - Low broadband access penetration rate
- Provide :
 - Indicative Capex and Opex prices for end to end solutions
 - Positioning of the different solutions with potential restrictions

▼ Service requirements :

- Residential, SoHos, Government (Town hall, schools,...), Public access points, ...
- First focus is Always-on Internet access in addition to legacy voice service
 - Web browsing,
 - Email,
 - Peer to peer applications
 - Gaming, ...
- Then for further study : VoIP service, Video streaming, ...

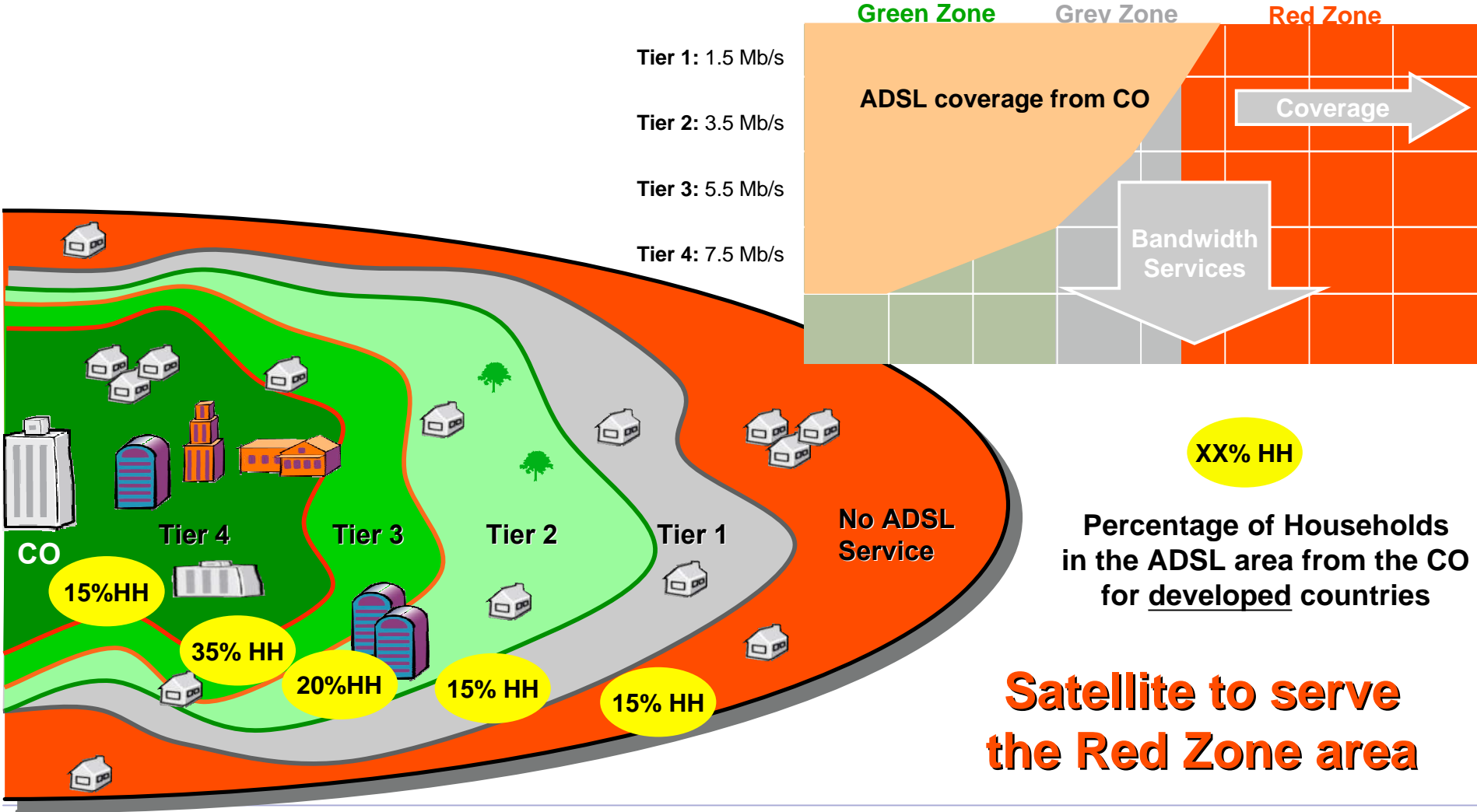
Price computation hypothesis

- ▼ Prices are given for a western Europe country deployment
 - Application to France when needed (e.g. Local Loop Unbundling costs, ...)
 - Lower installation costs in emerging countries can be expected
 - Satellite costs are based on European costs
- ▼ Capex :
 - Prices are indicative 2005 operators prices based on significant quantities (At least 10 K end-users). Price erosion can be expected in the coming years.
 - For sake of comparison between solutions, a worst case Capex amortization is taken over 36 months (Regular CPE amortization period).
 - Radio solutions assume that there is no need for a dedicated Antenna tower to be installed (high point or tower space available).
 - Default installation cost is set to 15% of associated Capex.
- ▼ Opex :
 - Network operations and maintenance costs not yet taken into account
- ▼ Focus is on the specific access network needed to connect remote areas so common costs such as ISP or national backhauling are not considered.

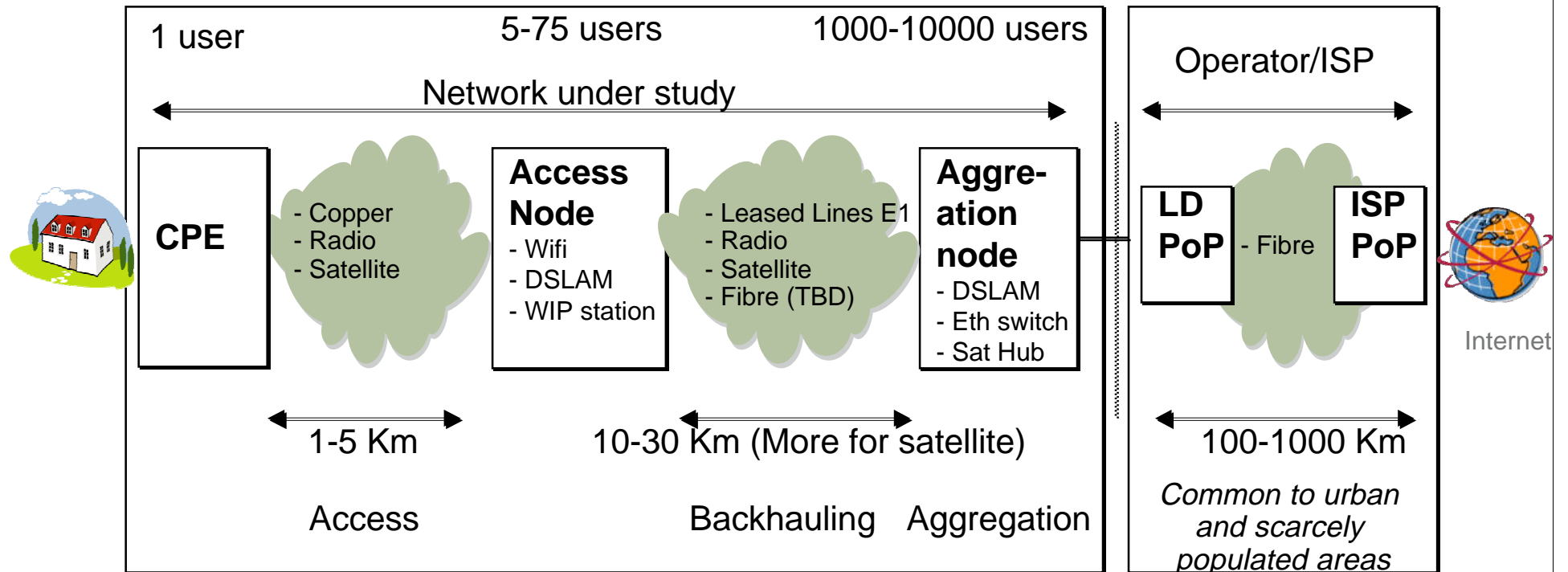
Hypothesis on subscriber geographic distribution

- ▼ West european average rural village size estimation
 - 600 inhabitants over a 15 km² zone (5 km diameter).
 - Average distance to a bigger town is 12 kms.
- ▼ Focus on this mean village : 150 households
 - Several broadband access penetration rates :
 - 5% (2003), 15%, 30% (2006)
 - Numbers of subscribers in the 5 to 75 range
- ▼ Smaller size village : 15 households (less than 5 users to connect)
 - 2way Satellite access is supposed to be the most appropriate solution.
- ▼ Larger size village : 1500 households (more than 100 users to connect)
 - DSL access is supposed to be the most appropriate solution.

ADSL service versus distance



Network model

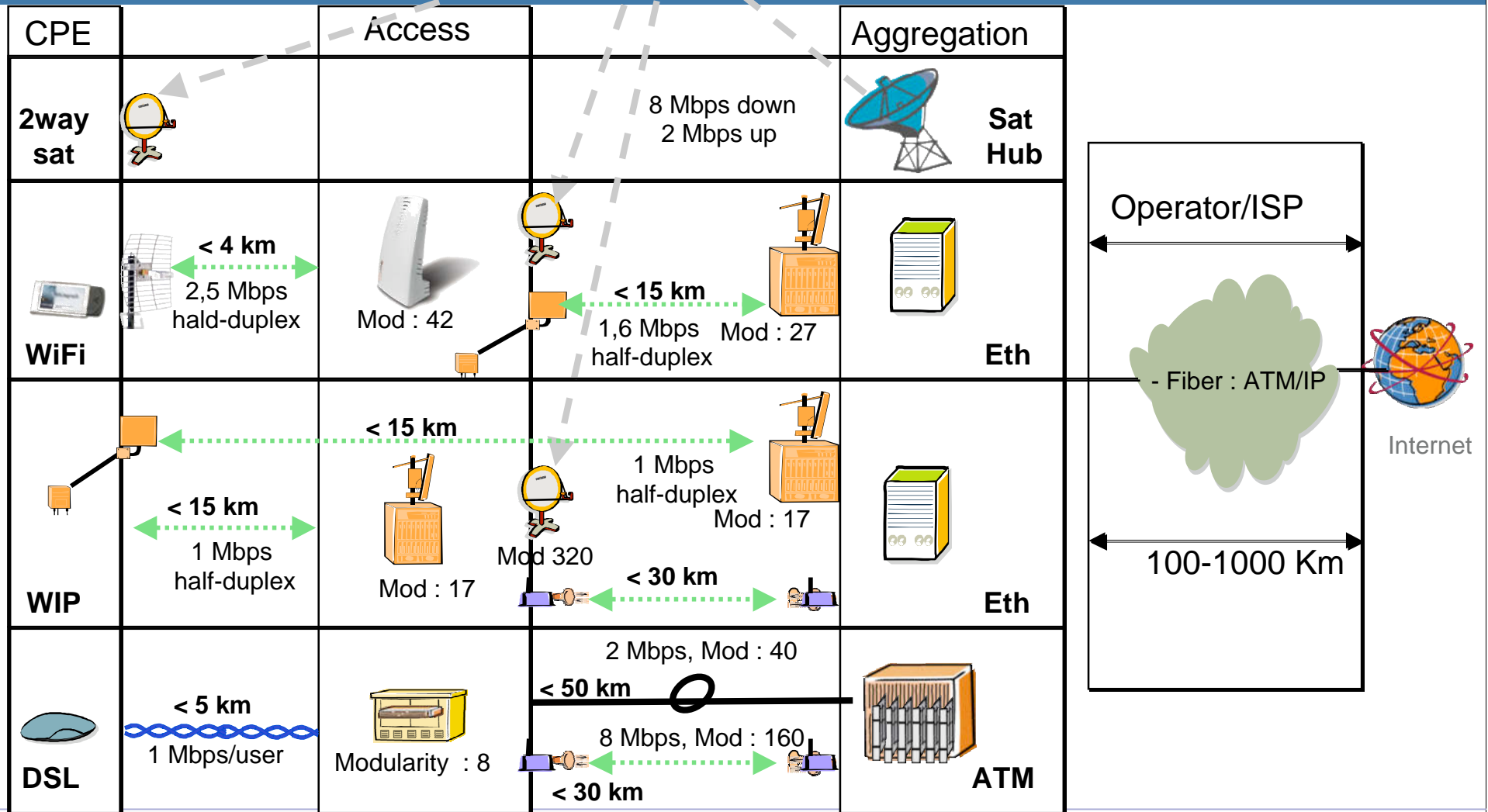


- ▼ Focus on scarcely populated areas problematic
 - => Access to Long Distance (LD) Point of Presence (PoP)
- ▼ Network under study connects subscribers and aggregate traffic up to LD PoP to which traffic is passed to an ISP for Internet access.

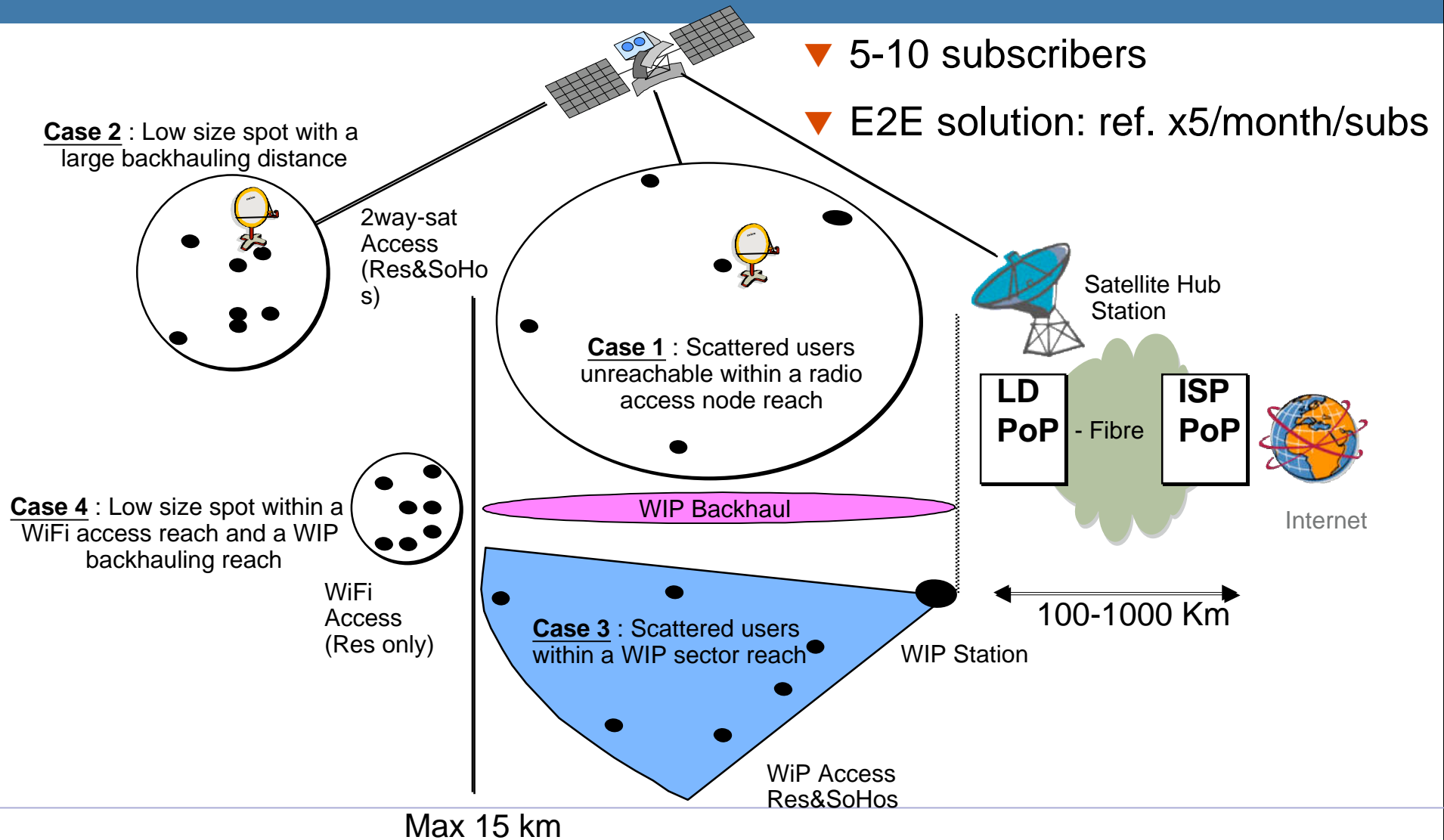
Some selected key end to end combinations :

- ▼ E2E is considered to be the previously described regional network (no national backhauling nor ISP fees)
- ▼ DSL access
 - With E1 Leased lines or Microwave backhauling
 - 2way Satellite and WIP are not selected as backhauling options because they are suitable to carry ATM based traffic.
- ▼ WiFi access
 - With WIP or 2way-sat backhauling
 - Microwave or E1 leased lines may also be considered as backhauling options but additional equipment needed to interface between Ethernet and E1.
- ▼ WIP access :
 - E2E WIP and WIP access with 2 way sat or Microwave backhauling
 - WIP again or Leased Lines may also be considered as backhauling options
- ▼ 2way sat :
 - E2E 2way-sat

E2E solutions

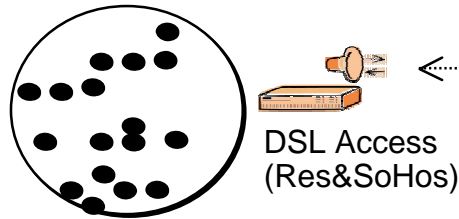


Summary : Low size village

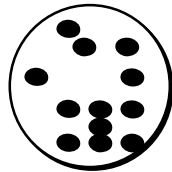


Summary : Medium size village

Case 2 : Medium size spot within a DSL access reach but with a large backhauling distance



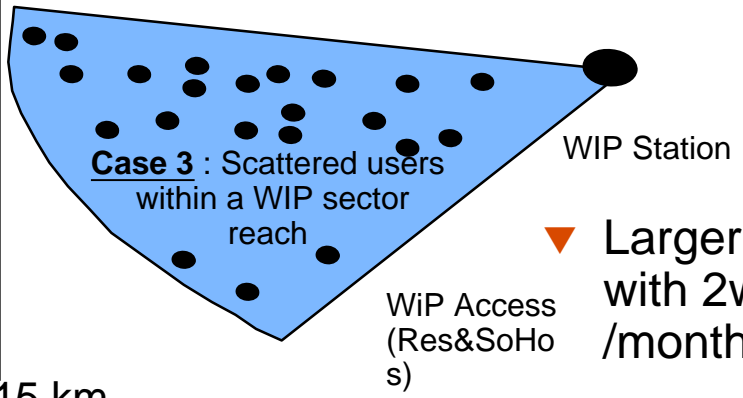
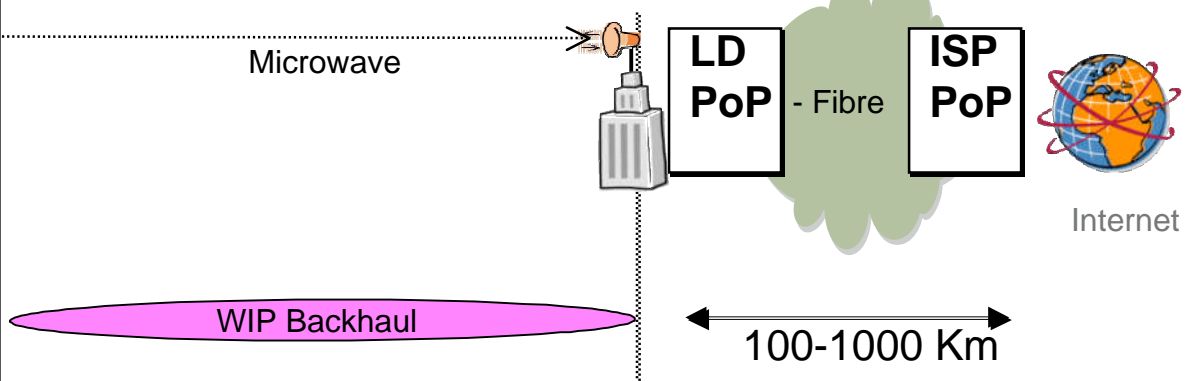
WiFi Access (Res only)



Case 1 : Medium size spot within a WiFi access reach and a WiP backhauling reach

▼ 10-30 subscribers

▼ E2E solution: ref. x2.5/month/subscriber



▼ Larger backhauling distance with 2waysat at 70-80! /month/subscriber

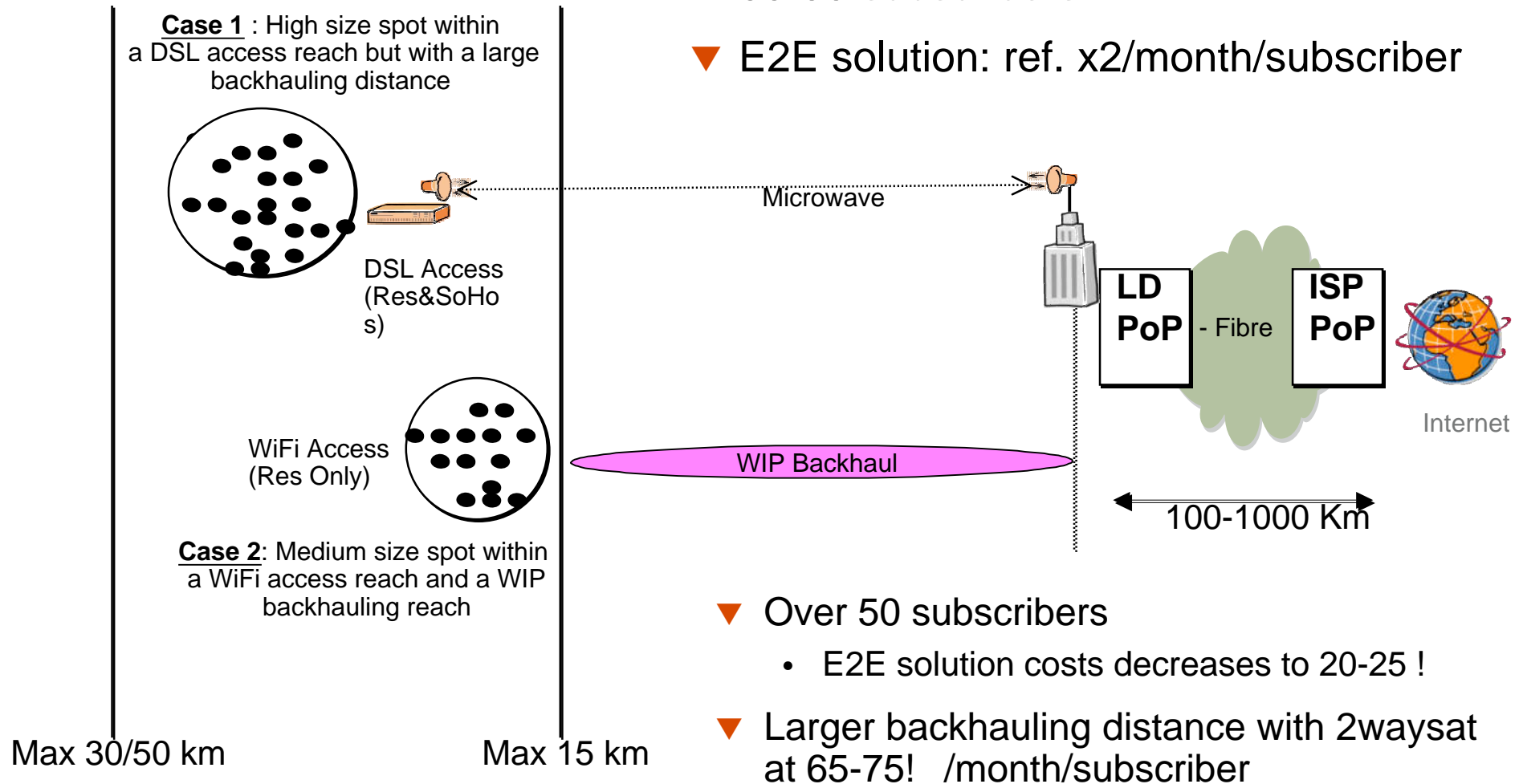
Max 30(/50 km)

Max 15 km

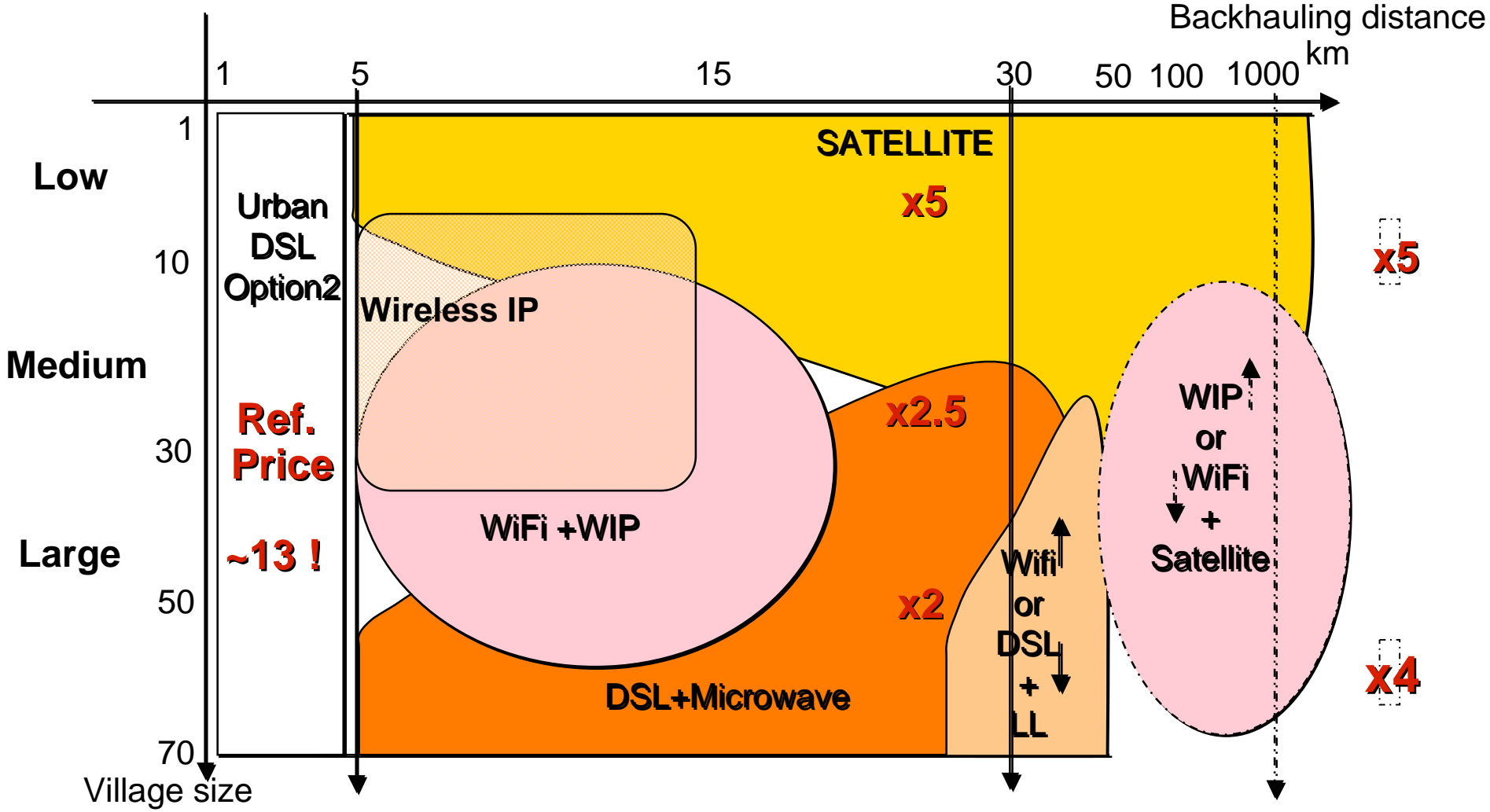
Summary : Large size village

▼ 30-50 subscribers

▼ E2E solution: ref. x2/month/subscriber

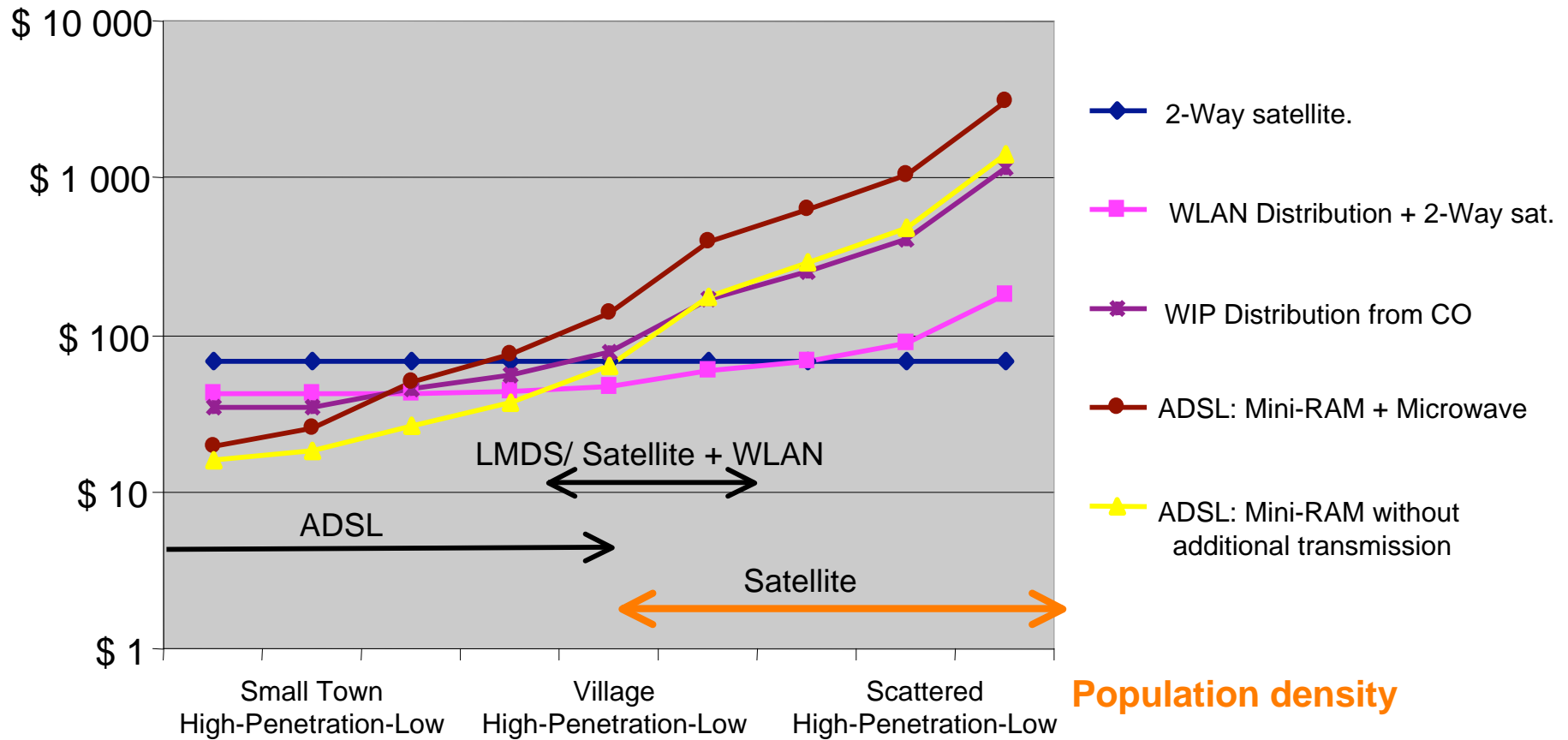


Overall synthesis : Cost per user per month with 3 year amortization period



Cost Comparison example (Residential)

Typical monthly cost per user
(Opex + Capex /36 months)

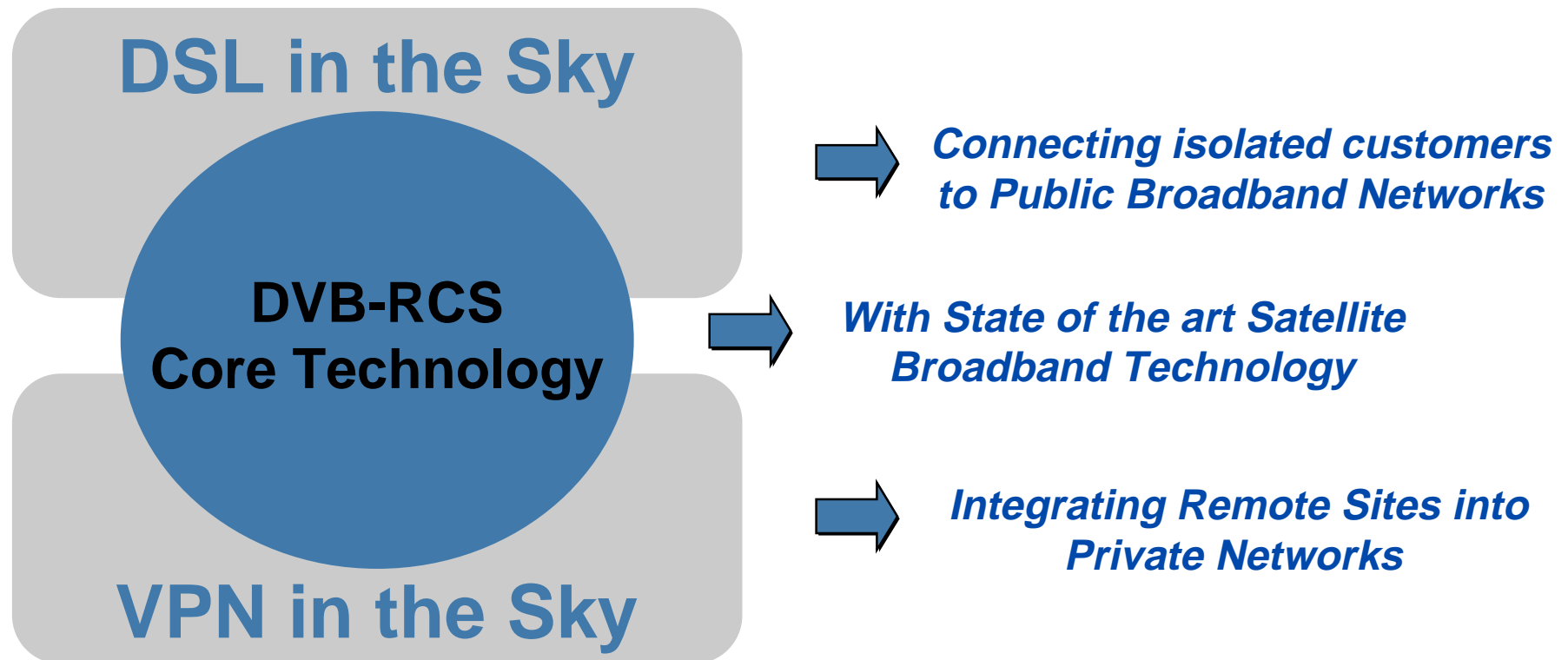


Conclusion of the study :

- ▼ There is not a single solution, a set of solutions is needed to cover all needs.
- ▼ End to end solution selection must be done based on country :
 - Geography
 - Telecommunications authorities (Radio fee, LLU, ...)
 - Existing infrastructure (Copper, Fiber, Microwave, Satellite, ...)
- ▼ Cost of the solution is still bigger than for urban areas (13! /user/month)
 - Capex investment is between 2 and 4 times more than urban DSL
 - Long term amortization period is needed to achieve monthly cost closer to urban
 - Monthly Cost reduction per user is in the 30-50% range from 3 to 7 years
- ▼ Some key elements of the cost chain can be optimized :
 - Backhauling : 25-50% of E2E cost
 - Reuse of existing infrastructures (Antenna tower, Fiber when available, ...)
 - Site engineering and operations : 20-30% of the E2E cost
 - Equipment installation in public premises (free renting space, ...)
 - Telecommunications fees : radio license (WIP@3,5Ghz, Microwave), LLU, ...

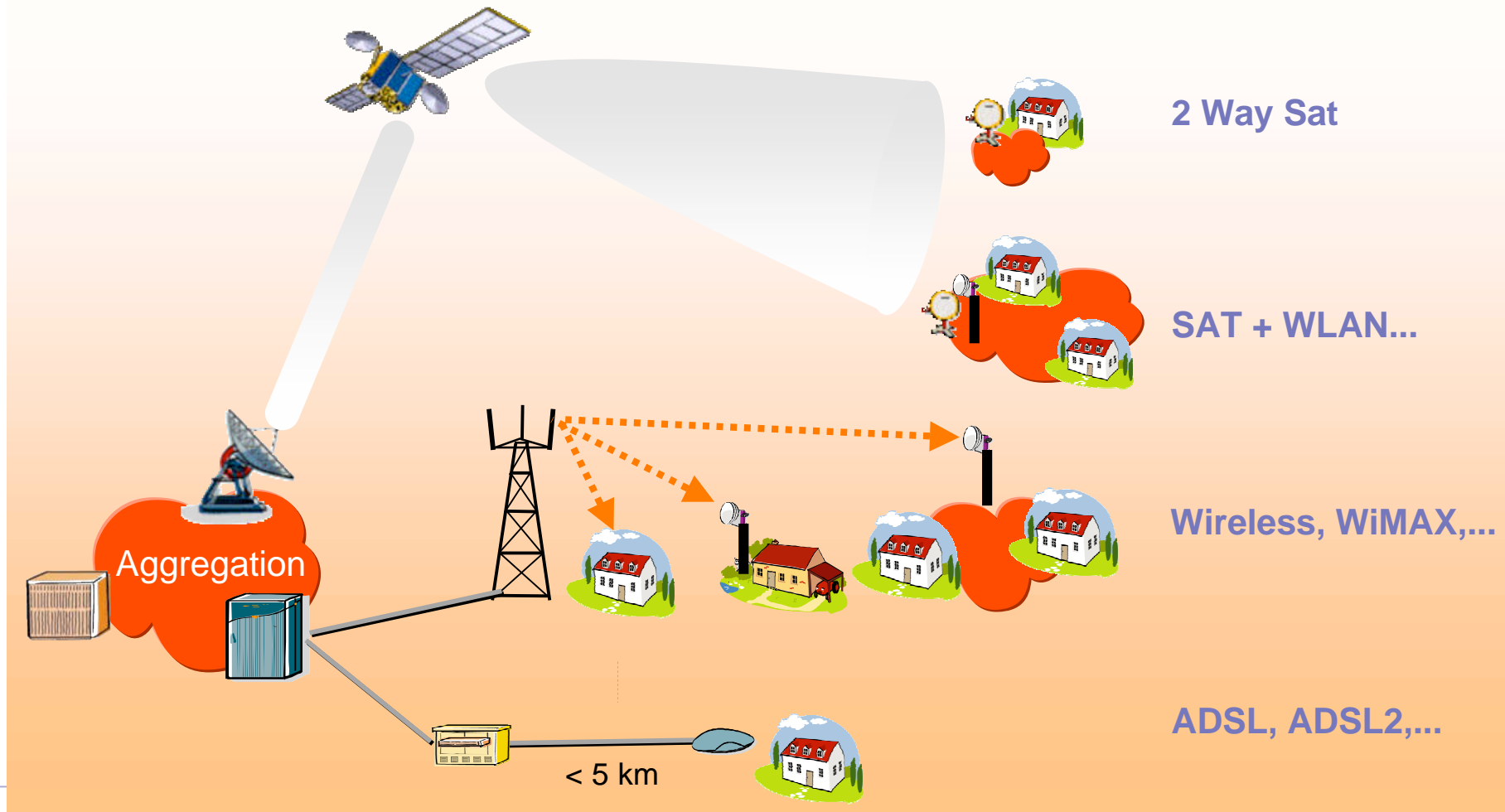
Satellite Broadband Solutions: extending reach

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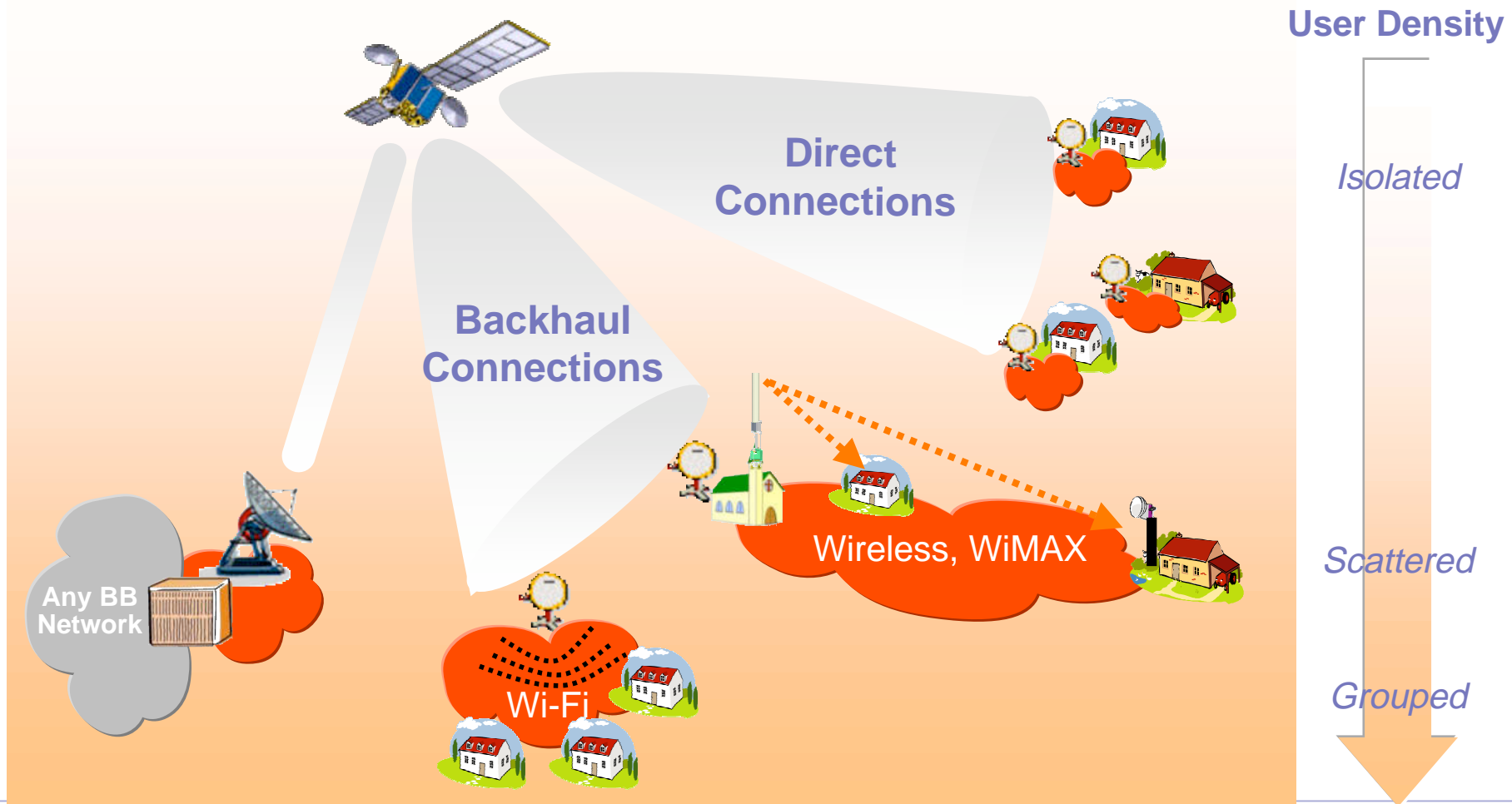
“DSL in the Sky” Objective

Connecting Isolated Customers to Public Broadband Networks



“DSL in the Sky” Objective

Connecting Isolated Customers to Public Broadband Networks



“DSL in the Sky” Benefits ...

... for Consumer, SOHO & SME

End-User **Satisfaction**

- Always on High Speed connections
 - ⇒ Up to 8 Mbps downstream, up to 2 Mbps upstream
- Full range of IP applications
- Unique Fair Sharing mechanisms
- Priority to Real Time traffic, VoIP

DSL like Experience

... for Service Provider

Service **Definition & Differentiation**

- Full control of traffic parameters
- Easy SLA definition & enforcement
- Volume Base accounting capabilities
- Broadband bundling of Data, Video & Voice

**Right Service, Right
Price at the Right Time**

“DSL in the Sky” Benefits ...

... for Service Provider

Carrier Class Solution

- Scalable & Upgradable
- High reliability and full redundancy
- Automated service provisioning
- Comprehensive management platform
- Worldwide Operation Support

Optimized Operations

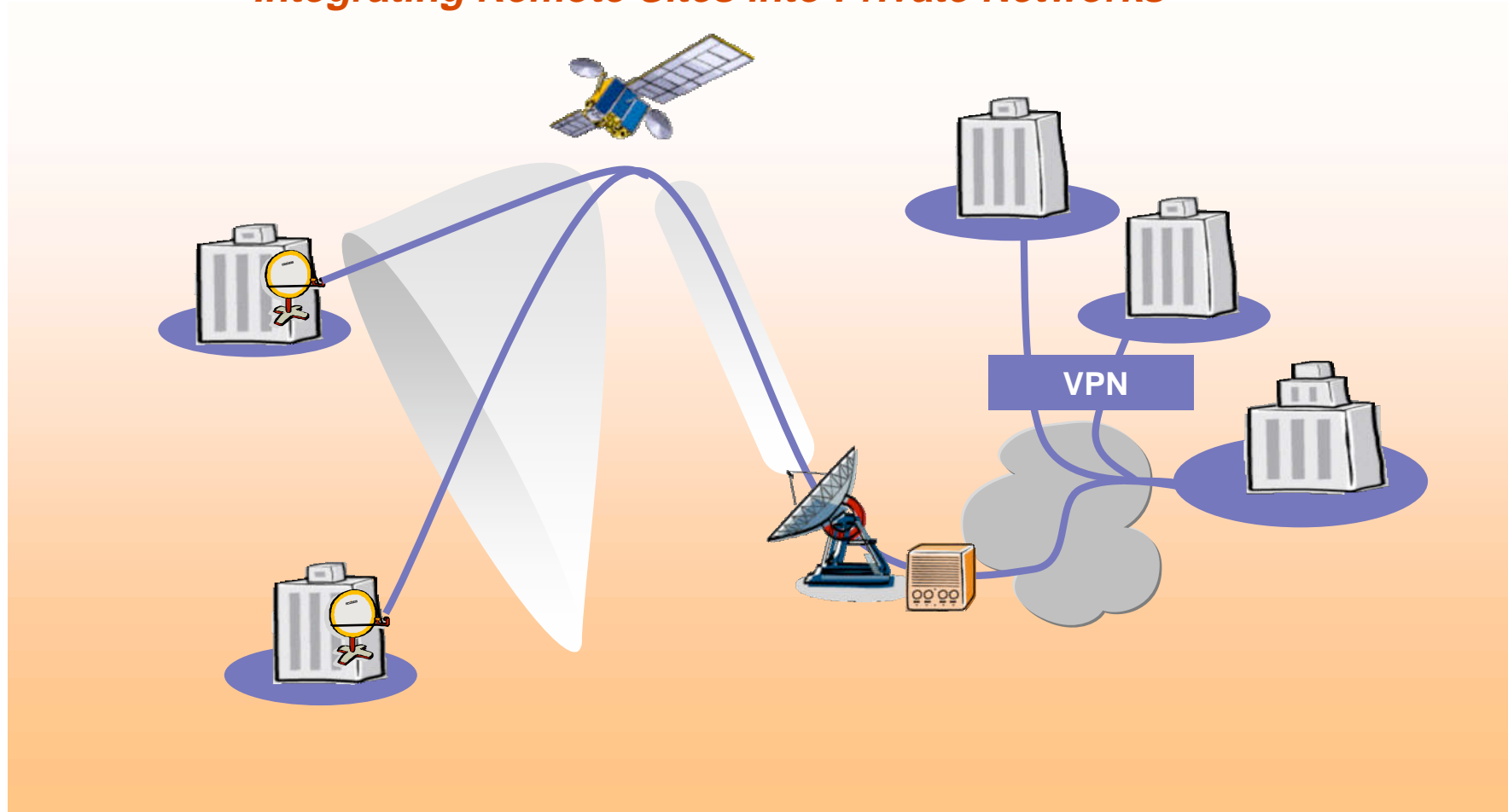
Integration in Existing Broadband Access Networks

- Multi-Service Provider configurations
- Network & OSS levels (including billing)
- DSL protocol support (PPP)
- Equipment & Process Reuse
 - Last mile extension
 - or Local Loop/Hot Spot Backhauling

Both Wholesale & Retail

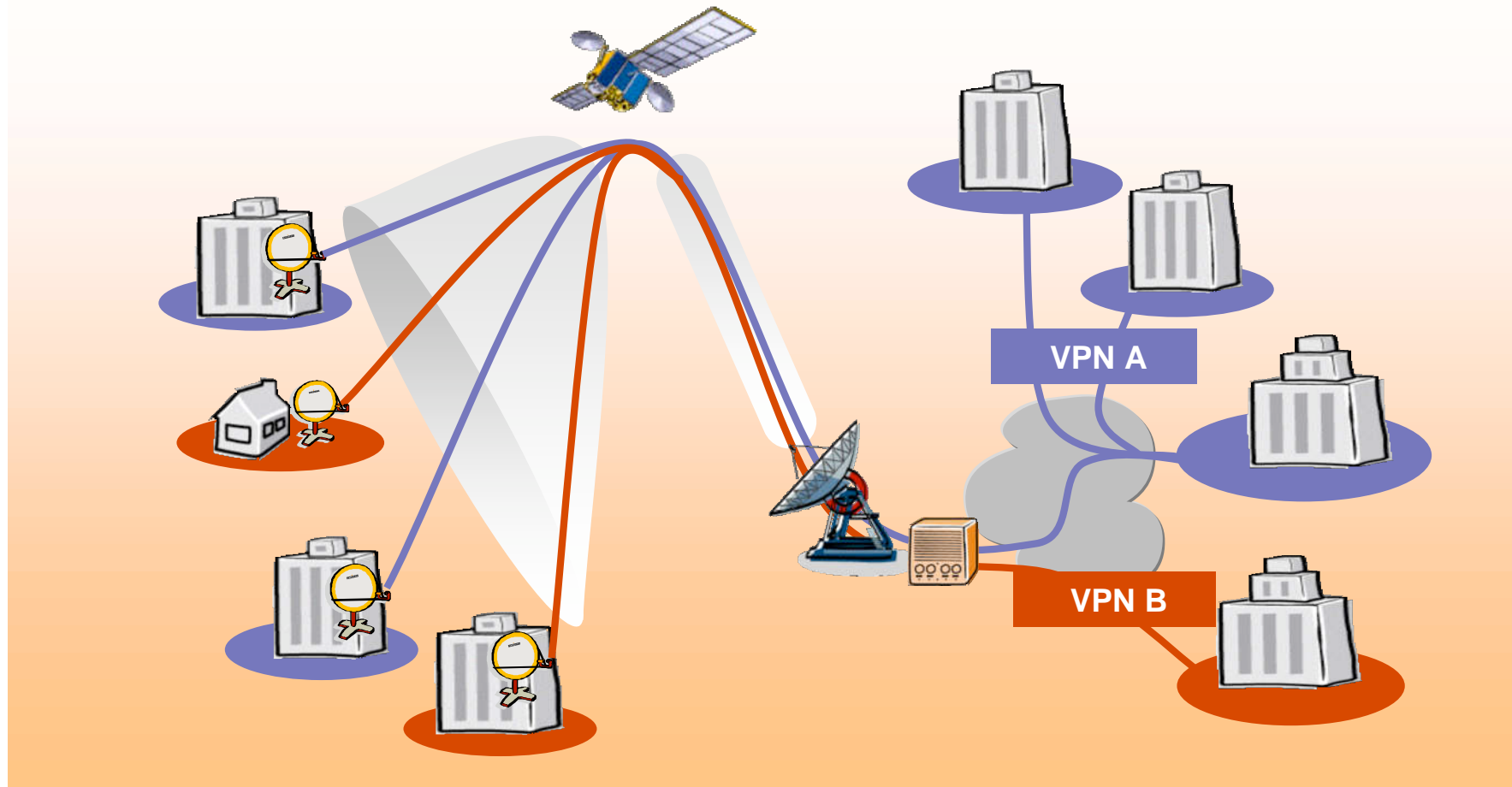
“VPN in the Sky” Objective #1

Integrating Remote Sites into Private Networks



“VPN in the Sky” Objective #2

Allowing Several Private Networks to Co-Exist Independently



“VPN in the Sky” Benefits ...

... for Multi-Site Entities

Flexible VPN Implementation

- Layer 2 or Layer 3 (IPSec)
- Smooth Integration into Existing VPN
- Combined VPN and IP Acceleration (PEP)

**An Optimized Solution
whatever the Configuration**

Advanced Services & Applications

- Private VoIP
- Portfolio of Satellite Optimized Applications
 - ⇒ Generic packages (Content Distribution, eLearning, ...)
 - ⇒ Solution Lines (eRisk, eMedecine, ...)
- Compatible with Alcatel OmniPCX Enterprise (IPBX)
- Solution for legacy protocol transport (SCADA, X25, ...)

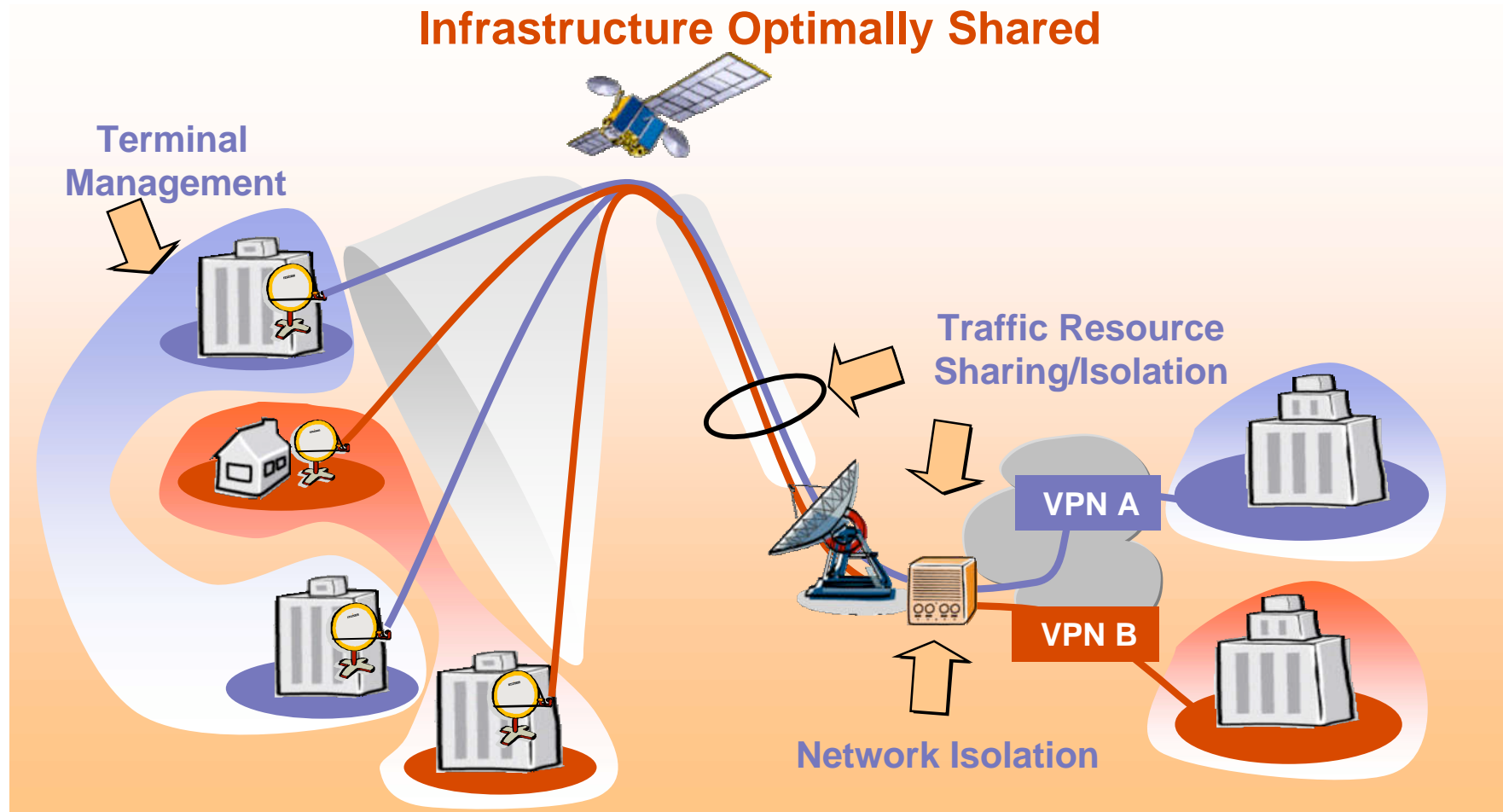
**More Services ...
... More Revenues**

Low Cost Dedicated Private Networks

“VPN in the Sky” Benefits ...

... for Service Provider

Infrastructure Optimally Shared



DVB-RCS Core Technology

DVB-RCS

- The today reference standard for operators and suppliers
 - ⇒ ETSI approved 2000
- Now a fully implemented and tested technology
- Truly multi-vendor context with interoperability

Future proof Technology

Bandwidth Requirements **Minimization**

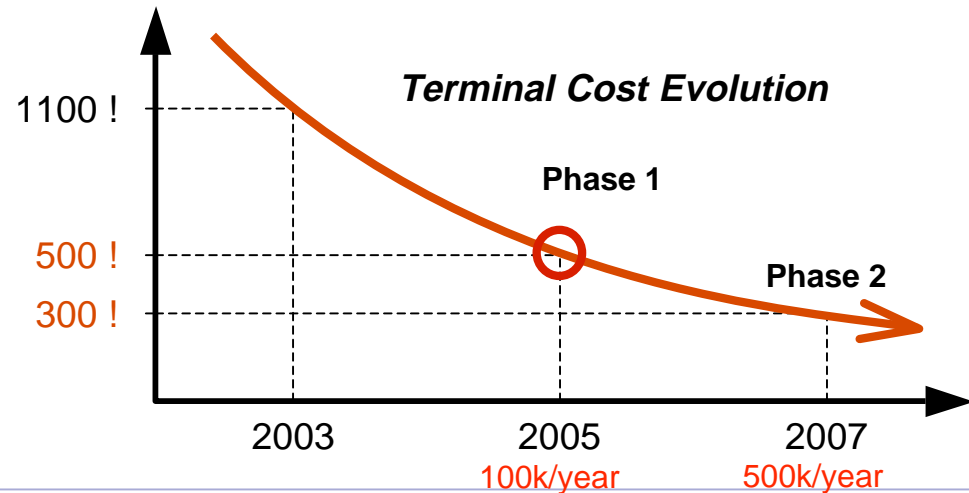
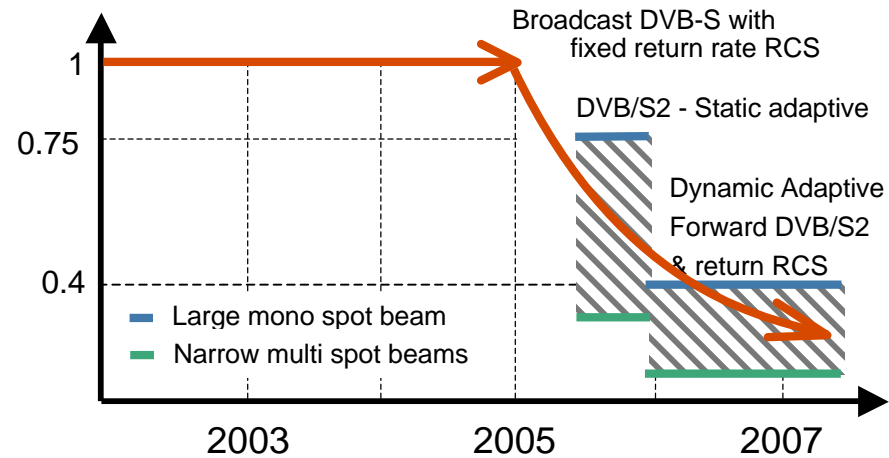
- Efficient and flexible waveform
- Powerful DAMA mechanism for resource allocation
 - ⇒ Contention free, Frequency hopping & fast allocation cycles, Flexibility
- Optimized log-in process

More Customers for Less Bandwidth

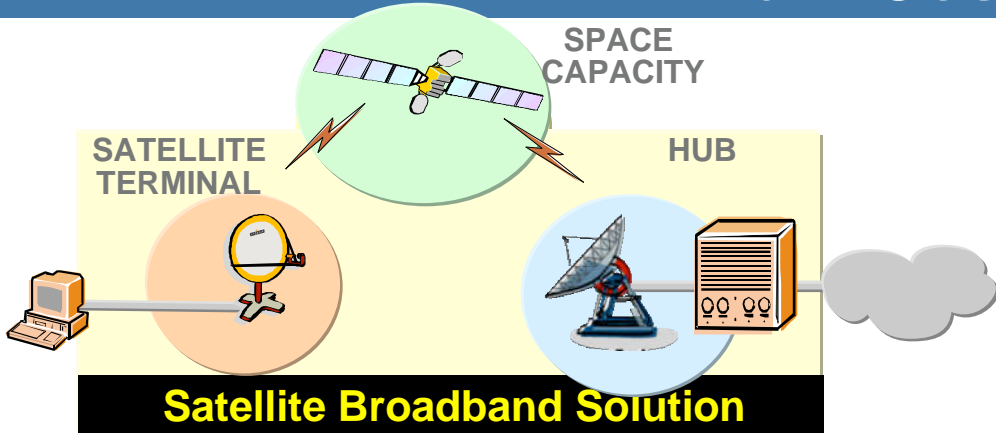
DVB-RCS Optimisation

- **Support of open standards**
 - ⇒ **DVB-S2** & DVB-RCS
- **Reduced Transmission Cost with Improved Efficiency and System Optimization**
 - ⇒ adaptive waveforms
 - ⇒ focused coverage (multi-spots)
- **Reduced Terminal Cost**
 - ⇒ based on volume
 - ⇒ involve consumer electronic partners
 - ⇒ benefit from standardized chipsets

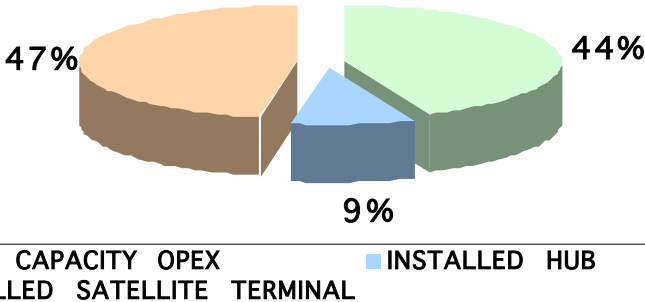
Relative Transmission Cost



Broadband Access by Satellite Main Cost Drivers



PER SUBSCRIBER MONTHLY COST (Typical 2005)

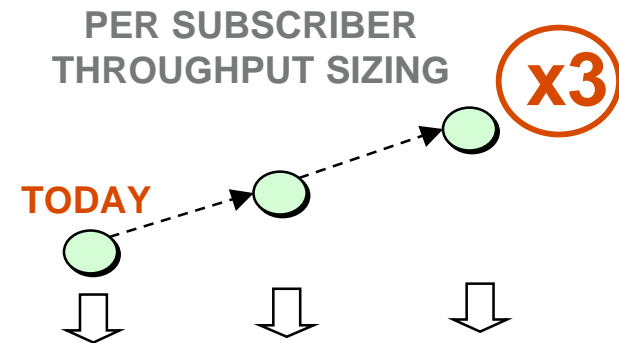
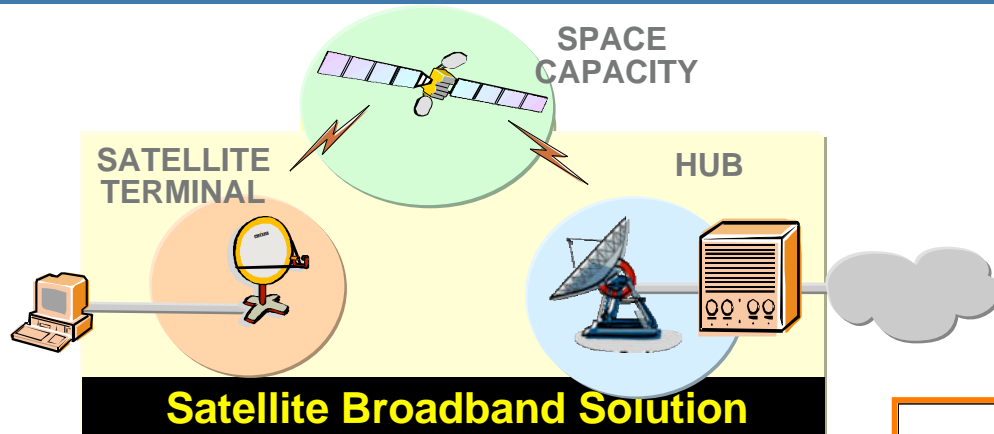


The 3 Main Cost Drivers

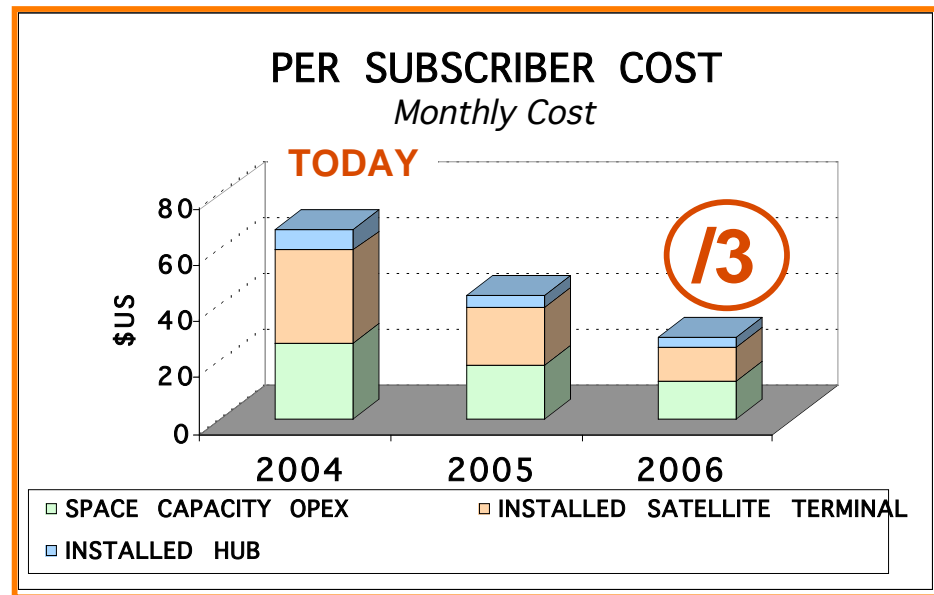
- > Space Capacity
- > Installed Satellite Terminal
- > Installed Hub

HUB, SATELLITE TERMINAL CAPEX amortized over 36 months

DVB-RCS: Trend



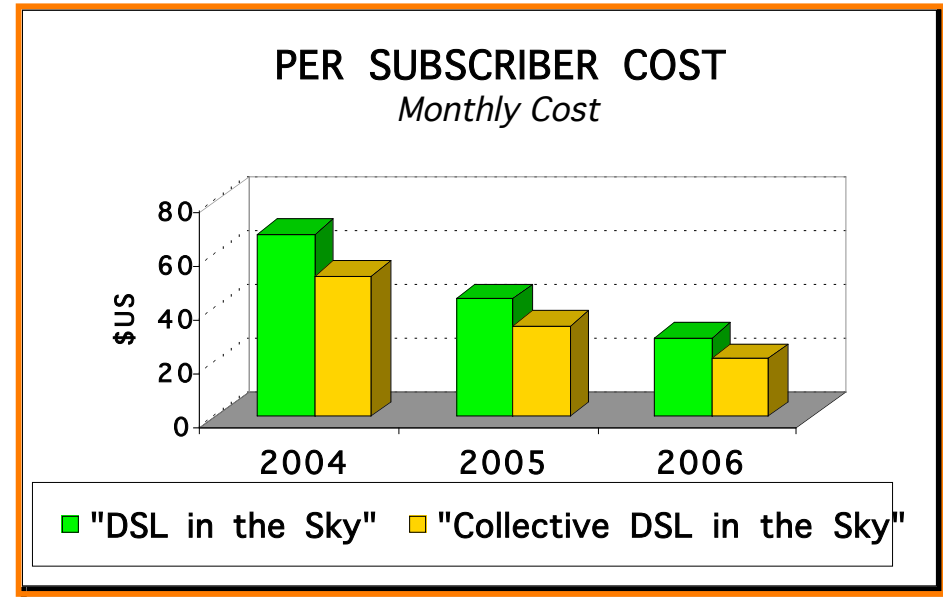
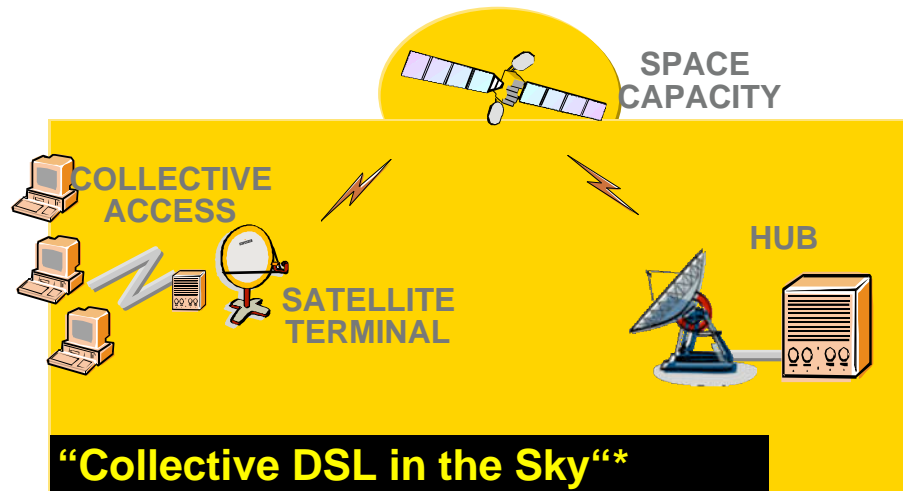
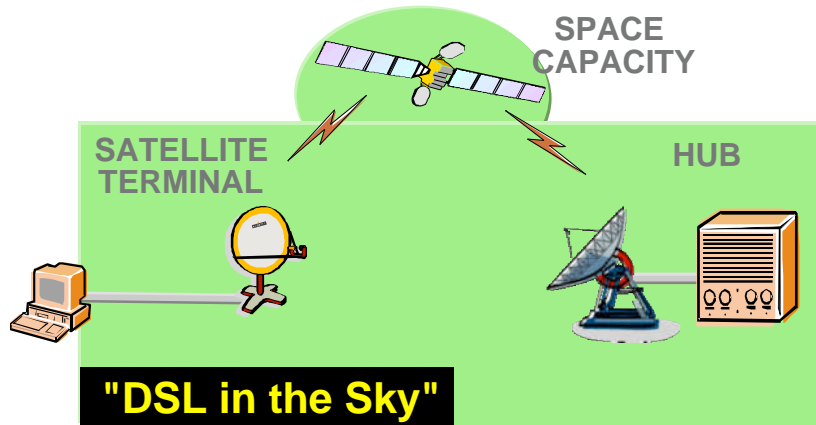
Service Cost Decline **/3**
despite
Traffic Growth **x3**



HUB, SATELLITE TERMINAL CAPEX amortized over 36 months

* Solution Dependant Cost Drivers

DVB-RCS: Collective

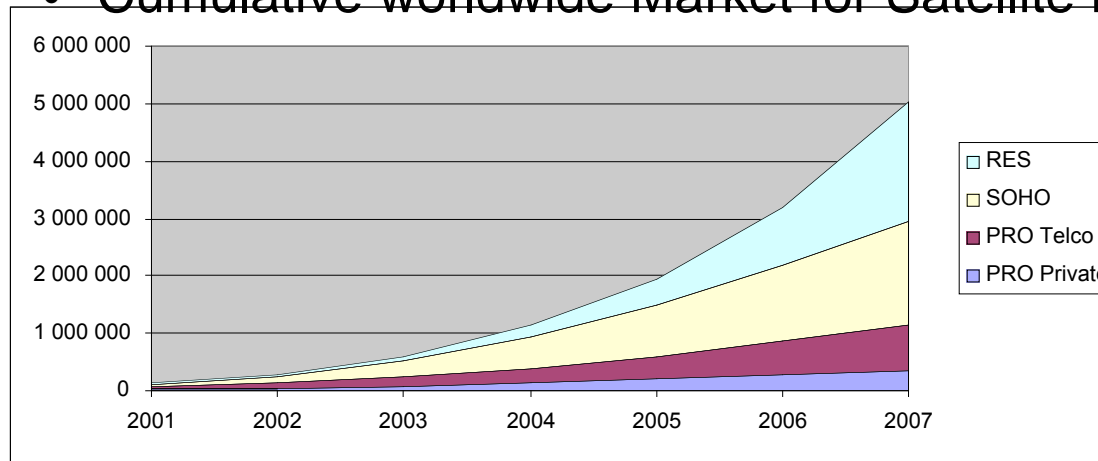


Satellite Backhaul Opportunity

*Number of subscribers/users per terminal: 2004: 20(WIFI) – 2005: 30 (WIFI) -2006:80 (WIMAX)

Satellite broadband market: per segment

- Cumulative worldwide Market for Satellite Broadband



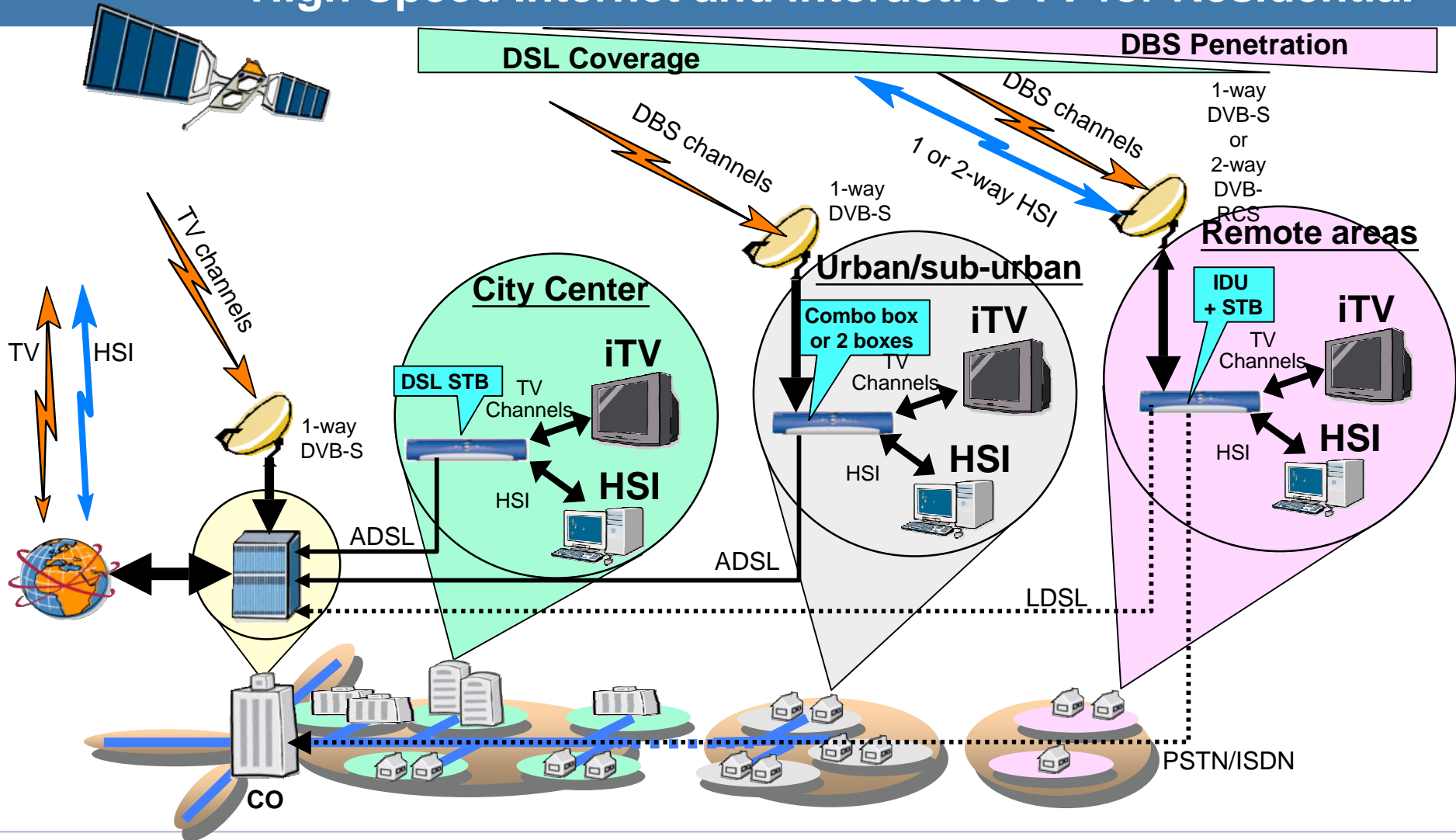
Source: Alcatel Space reference / Gilat
 Scenario based on published market studies (Merril Lynch, Frost & Sullivan, Northern Sky Research, Comsys, etc.) + information from Satellite operators / Service providers

slide updated 11/12/2003

- Pro ~1 million units installed end 2007 (Private Networks & SME through Telcos)
- Residential / SoHo ~4 million units installed over 7 years

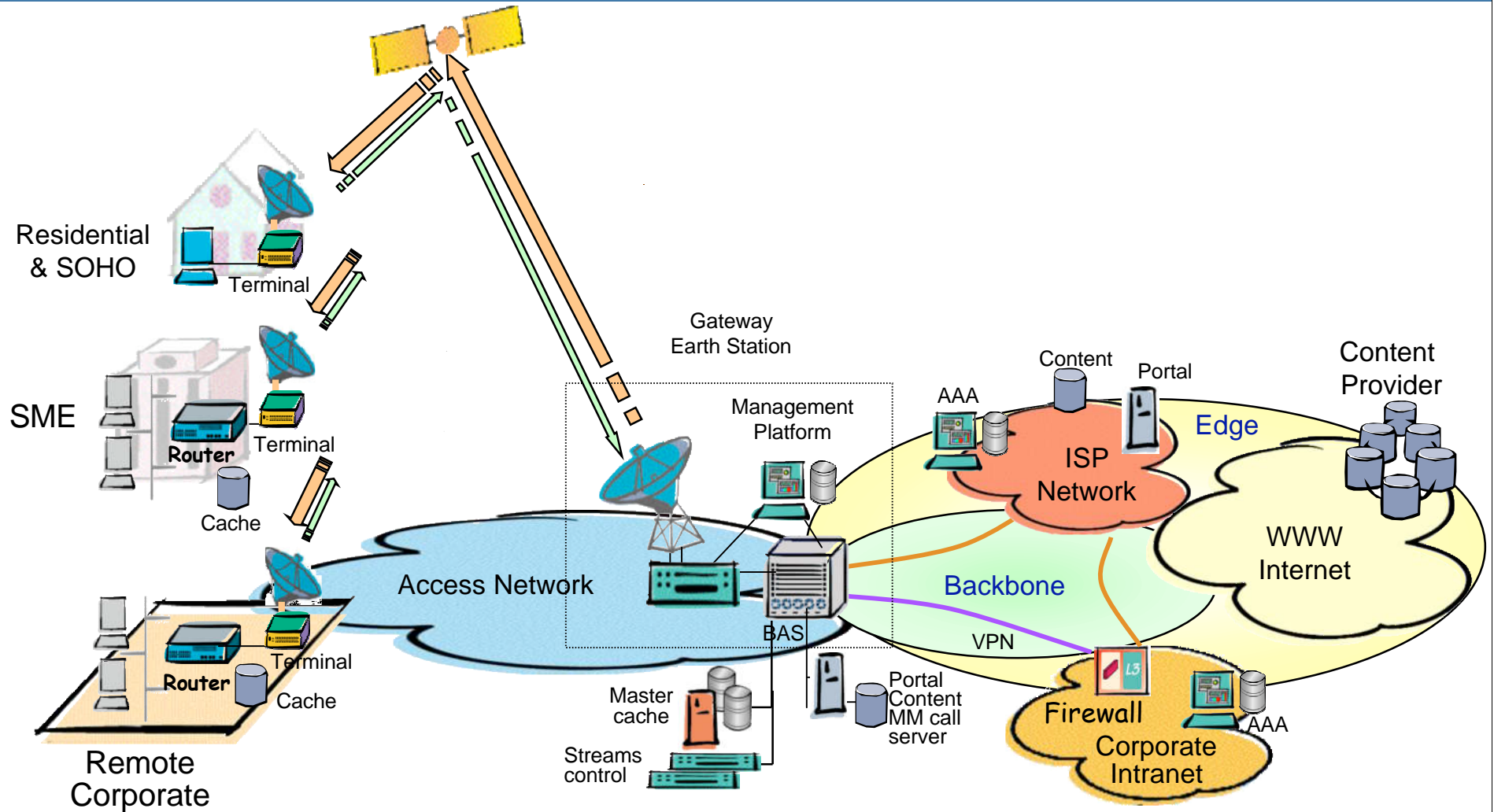
<u>Cumulative market</u>							
	2001	2002	2003	2004	2005	2006	2007
PRO Private	24 K	48 K	86 K	135 K	196 K	265 K	339 K
PRO Telco	35 K	77 K	152 K	257 K	402 K	588 K	810 K
SOHO	61 K	128 K	287 K	560 K	910 K	1332 K	1803 K
RES	11 K	28 K	59 K	182 K	437 K	993 K	2093 K
Total	130 K	281 K	584 K	1134 K	1945 K	3178 K	5045 K

Satellite and DSL Complementarity: High Speed Internet and interactive TV for Residential



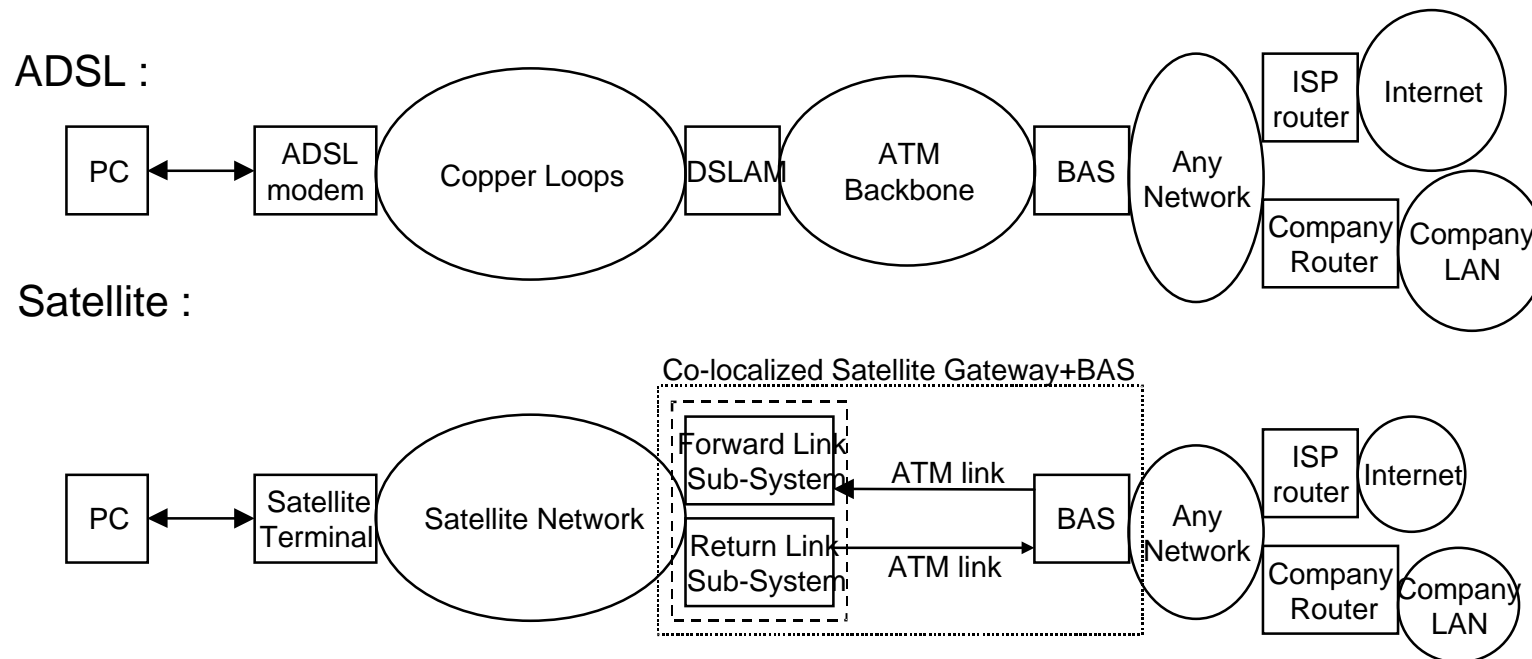
End-to-End Architecture (Example)

End-to-End Architecture (Access)

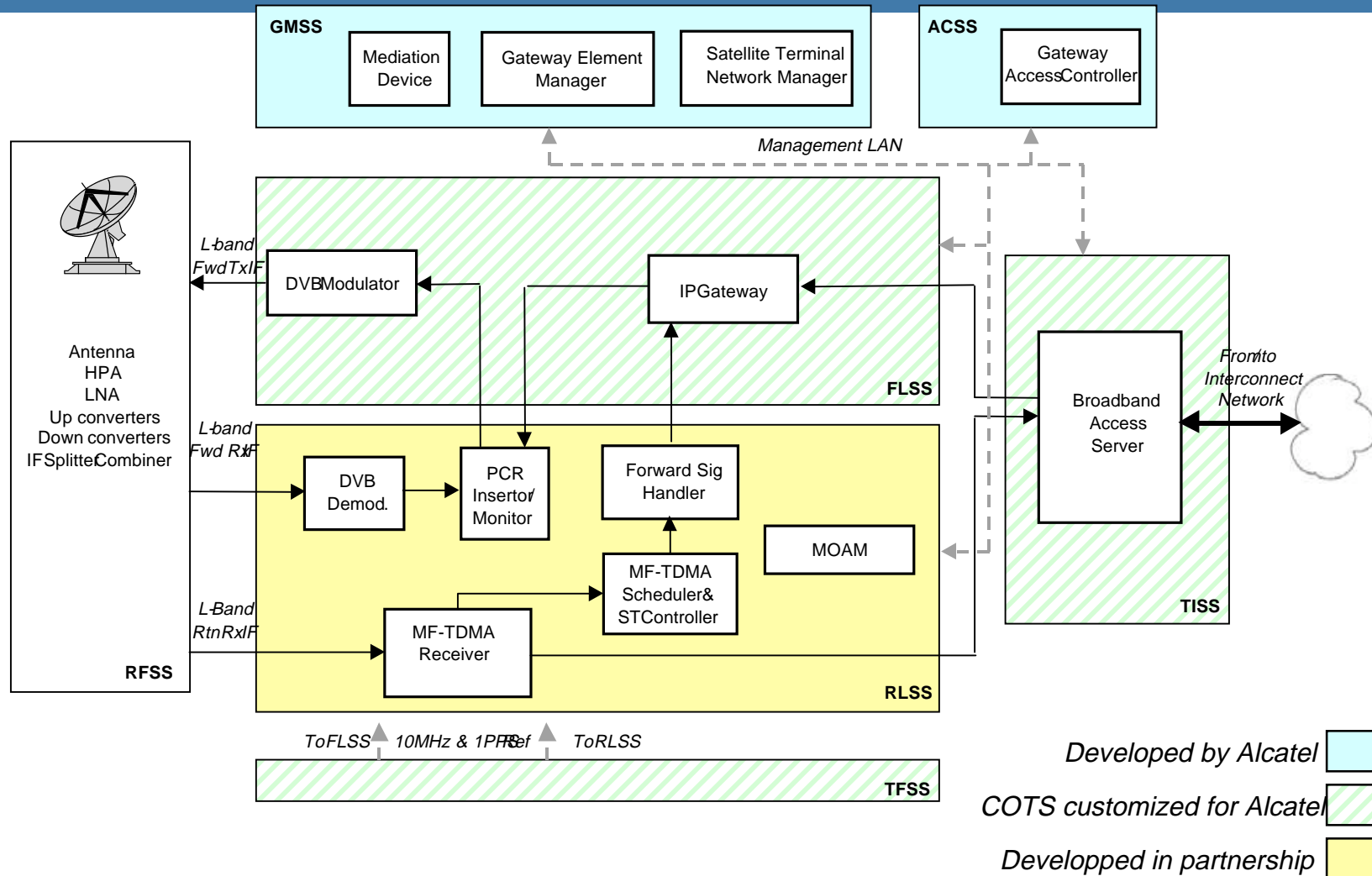


“DSL in the Sky” versus ADSL

- ▼ Physical Interface between the BAS and the Satellite Gateway is the same as that between the BAS and the ADSL DSLAM
- ▼ Satellite Network Management Interface open to OSS and ISPs



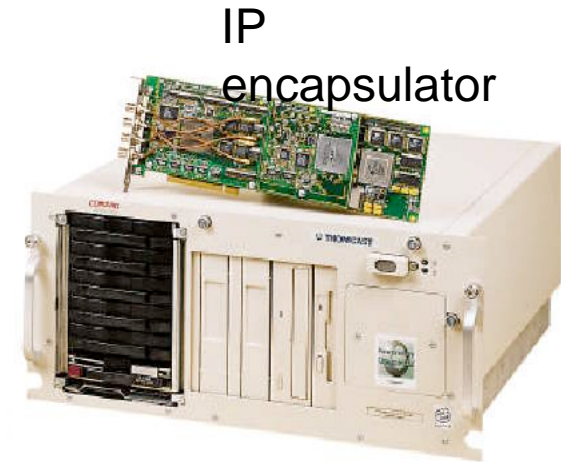
Alcatel 9780 DVB-RCS Gateway Architecture



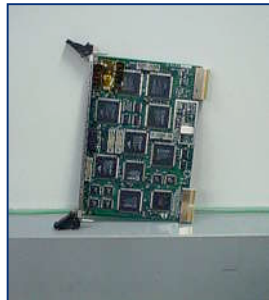
Product Overview: Gateway sub-systems



TISS:
WAN/RLSS/FLSS interface
RTN and FWD link QoS



IP
encapsulator



MCD card



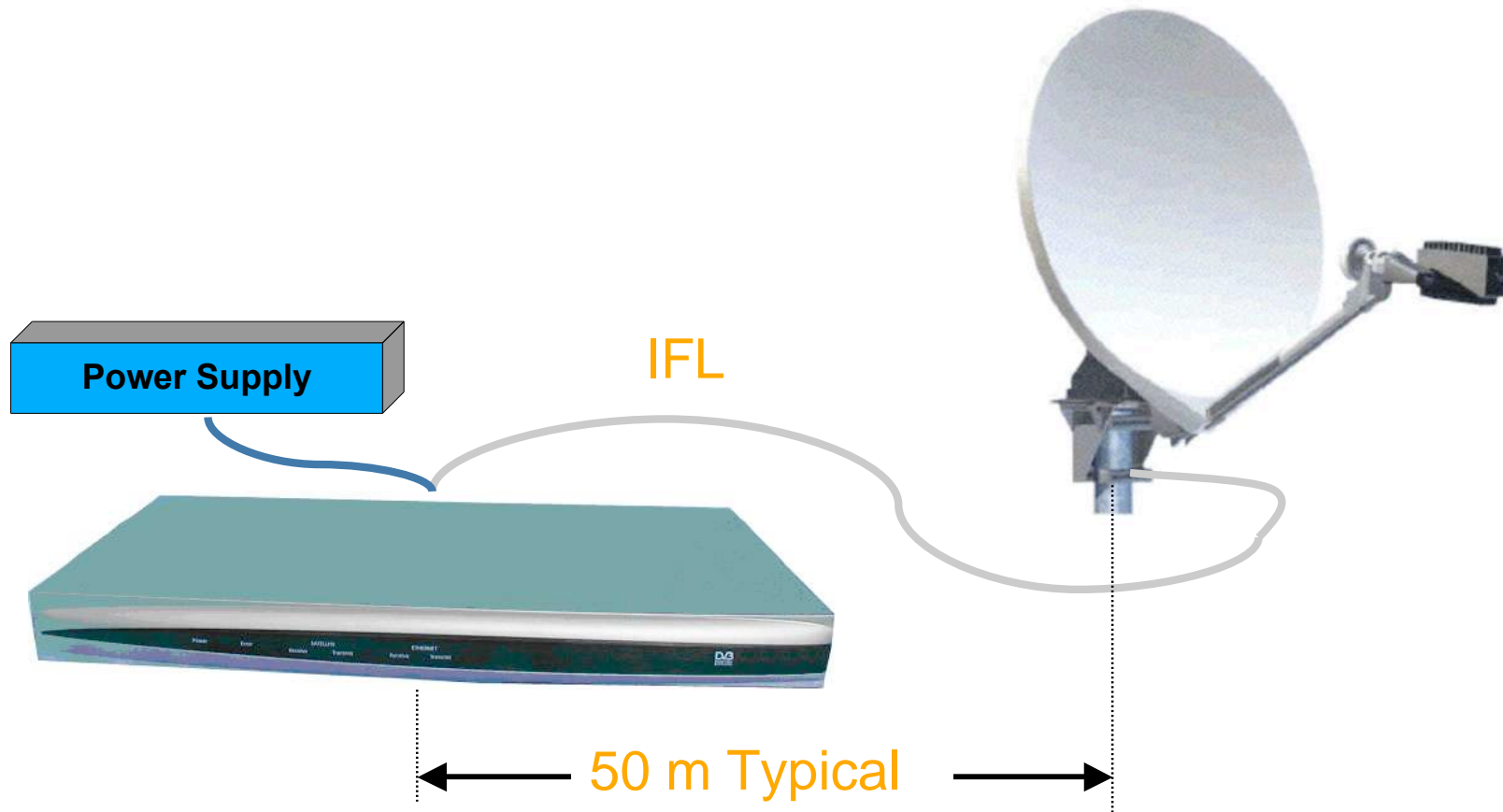
RLSS:
Multi carrier decoding
and demodulation
DAMA, synchronisation,
power control

FLSS:
IP/DVB encapsulation
DVB-S modulation



DVB-S modem

DVB-RCS Residential Terminal



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