Ethernet over ADSL and SHDSL

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About access network

- **Broadband end-users**
  - Residential users have different needs than business users mostly asymmetric
  - Business users have different needs for different symmetry application
- **Recent FCC data (file hspd0702.zip from the link) shows deployment characteristics in USA**
  - http://ftp.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD) indicates that asymmetric services and spectrum are dominant
- **Bundle composition can influence the performance. We may be able make the following assumption for WW deployment.**
  - Bundles that have T1s (<2%)
  - Bundles with ADSL (> 78%)
  - Bundles with SHDSL (<20%)
  - Most bundles will carry POTS

FCC data: (in FCC-02-033A1 and hspd0702.xls)

- **For all wireline services: At least 200 Kbps in one direction**
  Table 1 shows that ADSL exceeds non-ADSL by a
  factor of about 3.9. (3.95 Million ADSL versus 1.08 Million non-ADSL =
  Other Wireline). Out of these, as seen in Table 2, Advanced Services which
  over 200 kbps upstream, are less skewed but still dominated by ADSL (1.37
  Million ADSL versus 1.08 Million non-ADSL).

- **Advanced Services: at least 200 Kbps in each direction**
  used primarily by businesses of all size, are clearly dominated by ADSL.
  Moreover, during the last six months of 2001, most of new lines have been
  ADSL in both Advanced Services and in total wireline High-Speed Lines.

Asymmetric Access Market

						Percent Change	
						Dec 2000 -	June 2001
Types of Technology 2/	December 1999	June 2000	December 2000	June 2001	December 2001	June 2001	- Dec 2001
ADSL	369,792	951,583	1,977,101	2,693,834	3,947,808	36 %	47 %
Other Wireline	609,909	758,594	1,021,291	1,088,066	1,078,597	7	-1
Coaxial Cable	1,411,977	2,284,491	3,582,874	5,184,141	7,059,598	45	36
Fiber	312,204	307,151	376,203	455,593	494,199	21	8
Satellite or Fixed Wireless	50,404	65,615	112,405	194,707	212,610	73	9
Total Lines	2,754,286	4,367,434	7,069,874	9,616,341	12,792,812	36 %	33 %

Table 1
High-Speed Lines 1/
(Over 200 kbps in at Least One Direction)

Symmetric Access Market

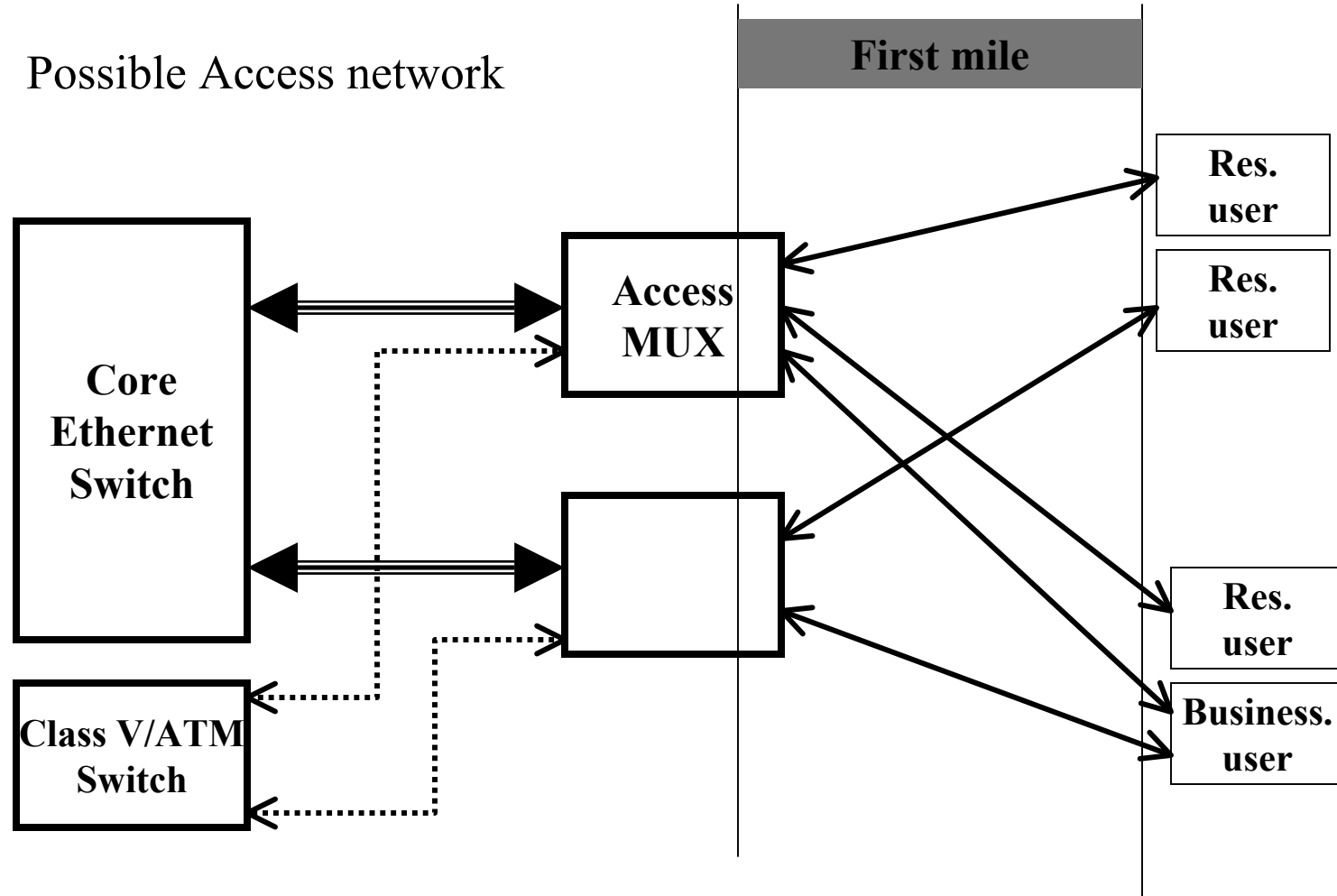|	Table 2 Advanced Services Lines 1/ (Over 200 kbps in Both Directions)						
						Percent Change	
Types of Technology 2/	**December 1999**	**June 2000**	**December 2000**	**June 2001**	**December 2001**	**Dec 2000 - June 2001**	**June 2001 - Dec 2001**
ADSL	185,950	326,816	675,366	998,883	1,369,143	48 %	37 %
Other Wireline	609,909	758,594	1,021,291	1,088,066	1,078,597	7	-1
Coaxial Cable	877,465	1,469,130	2,193,609	3,329,976	4,394,778	52	32
Fiber	307,315	301,143	376,197	455,549	486,483	21	7
Satellite or Fixed Wireless	7,816	3,649	26,906	73,476	75,341	173	3
Total Lines	1,988,455	2,859,332	4,293,369	5,945,950	7,404,343	38 %	25 %

Conclusion

- **World wide Bundle composition is in favor of ADSL for both symmetric and asymmetric services**
  - **There are some minority of SHDSL installation**
- **Copper Access Networks require both PHY technologies from the access node**
- **If either of the PHYs (ADSL or SHDSL) is kept out then the overall solution becomes more complex and more expensive.**

- **SUMMARY:**
  - **ADSL+SHDSL → Desirable: covers 95+% of deployments**
  - **ADSL ONLY → Acceptable: cover 75+% of deployments**
  - **SHDSL ONLY → NOT Desirable: covers less than 25% of deployments**

Appendix
Ethernet in the access network

- Possible Access network

First mile

Core Ethernet Switch

Access MUX

Class V/ATM Switch

Res. user

Res. user

Res. user

Business. user

Appendix
Scenarios for Ethernet in Access

- **Ethernet switches in the core are much cheaper and easier to operate than ATM. That is why Ethernet is attractive to operators**
- **Back haul fibers are either based on ATM or Ethernet not both**
- **Choices: If certain users are forced to use ATM because of PHY incapability to offer a particular service rate then we have the following scenarios:**
  - **ATM OC-12 will be most likely the back haul protocol in DSLAM if SHDSL is chosen only for EoxDSL, and ADSL-PHY for ATM**
    - **There will be IWF between Ethernet to ATM inside DSLAM**
  - **Gigabit Ethernet will be the most likely candidate for the back haul protocol if ADSL is chosen for EoxDSL**
    - **There will be IWF between ATM to Ethernet for SHDSL**
- _**Gigabit Ethernet will be most like candidate for the back haul protocol if ADSL and SHDSL is chosen for EoXDSL**_
    - _**No IWF is needed**_