

Beyond V.34

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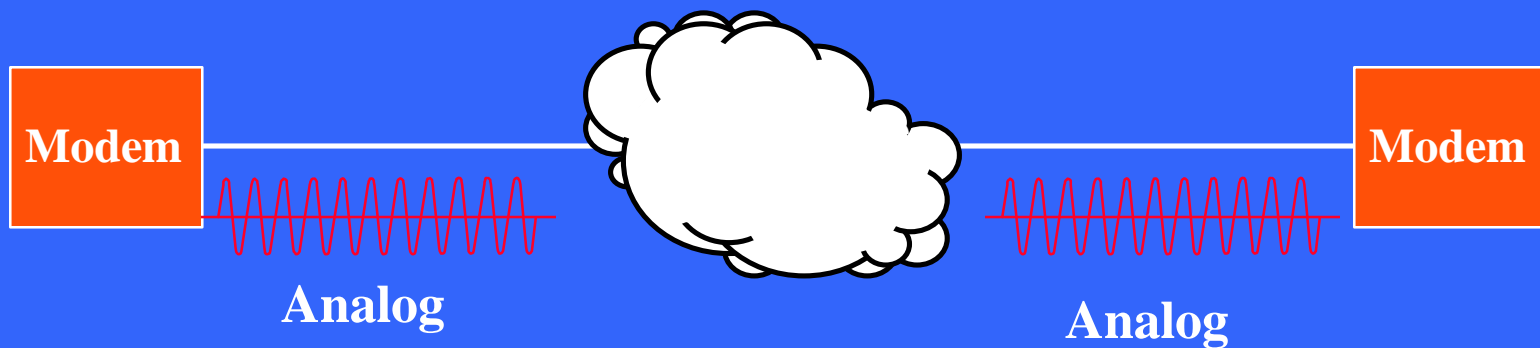


Beyond V.34

- V.34 .. stretching the limits of the telephone network
- 56k .. changing the paradigm
- ISDN .. an outdated utopian dream?
- Cable Modems vs ADSL Modems
- Scenario '97
- Scenario 2000



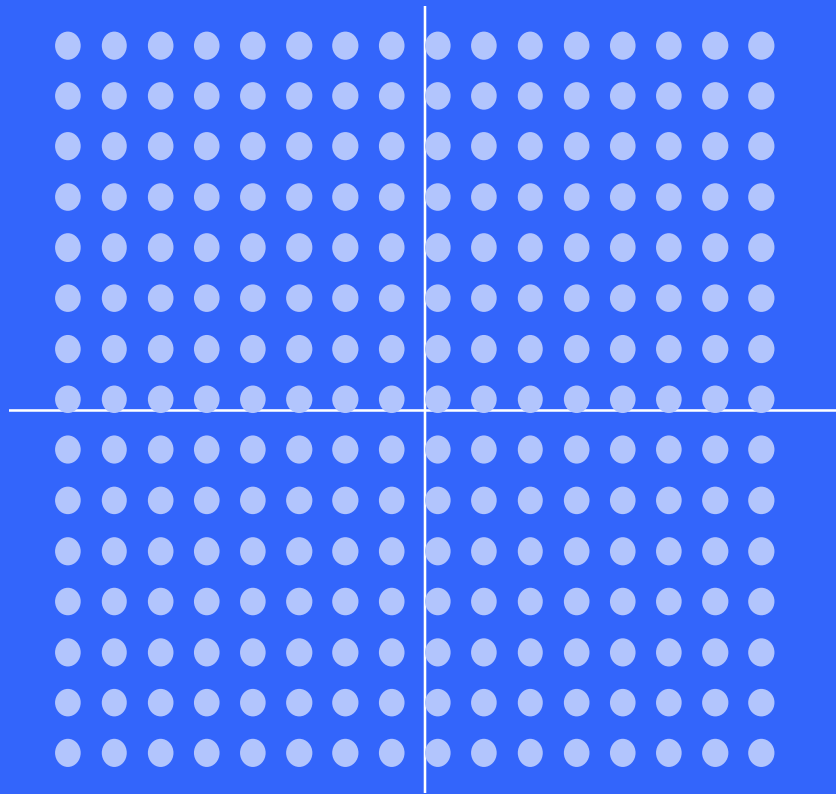
Conventional modem “paradigm”



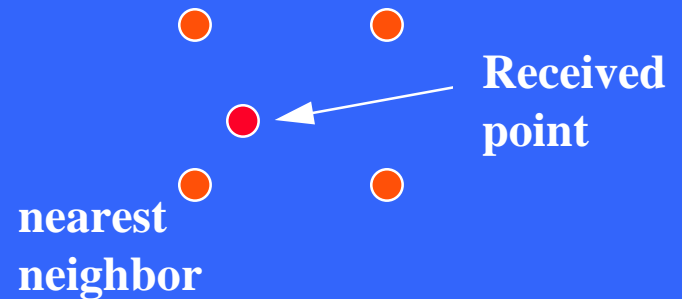
The phone network was designed to carry voice .. modems make a digital data stream look like an analog voice signal



Modems 101



256 signal points - 8 bits /point

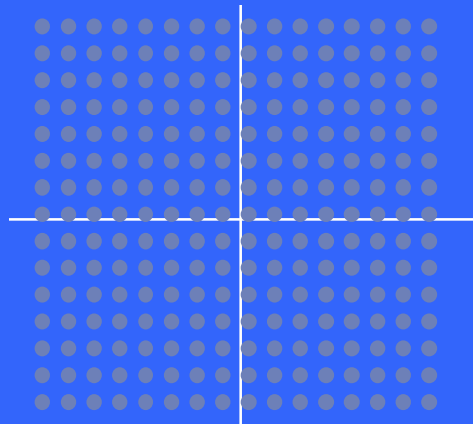


*E.g. 3000 points (symbols)
per second = 3000 x 8
= 24000 bits per second*

Quadrature Amplitude Modulation



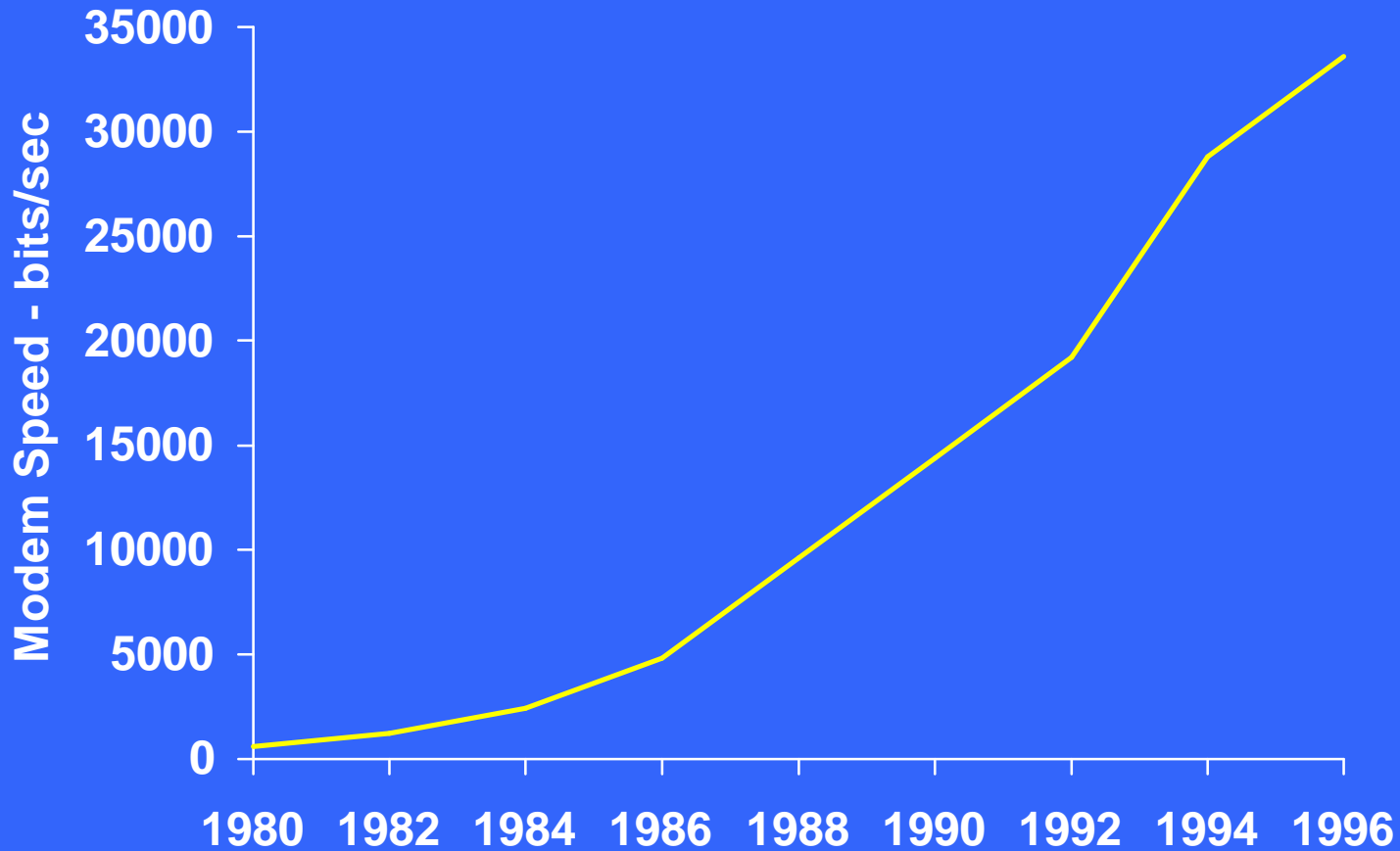
V.34 Modems



- Advanced signal processing techniques to get speeds up to 33,600 bits per second
 - Line probing used to determine how fast modem can go
 - Shell mapping - points nearer the edge of the constellation are further apart
- Speed depends on quality of the local loop .. typically 21,600 - 28,800 bits/second



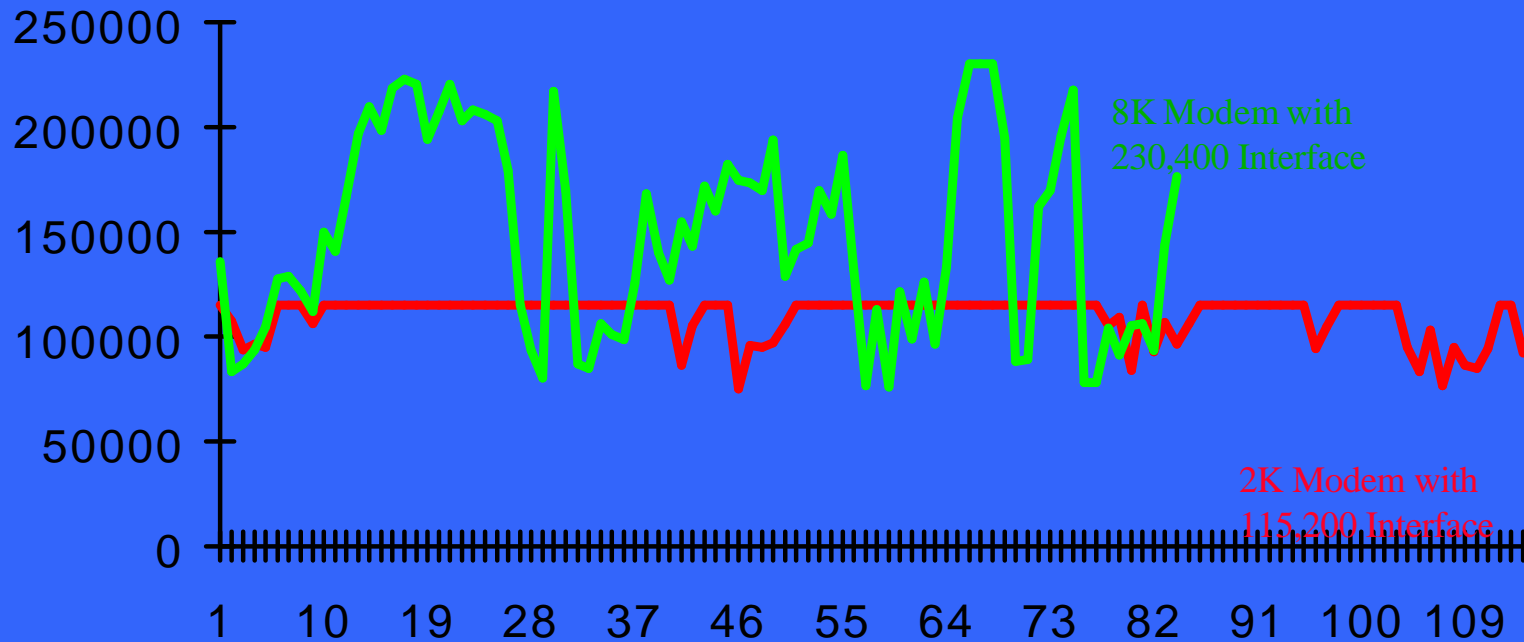
How fast can modems go?



The Impact of Data Compression

Modem Throughput
bits per second

Oracle Database File

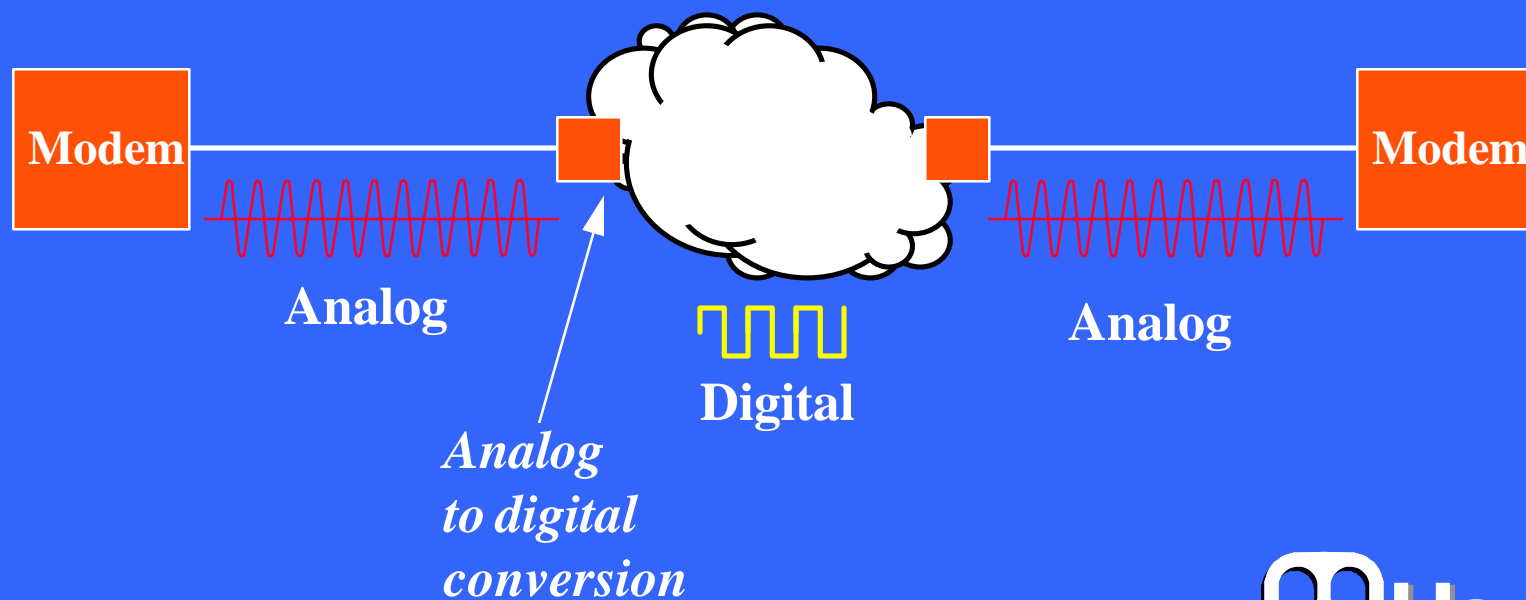


Time (Seconds)

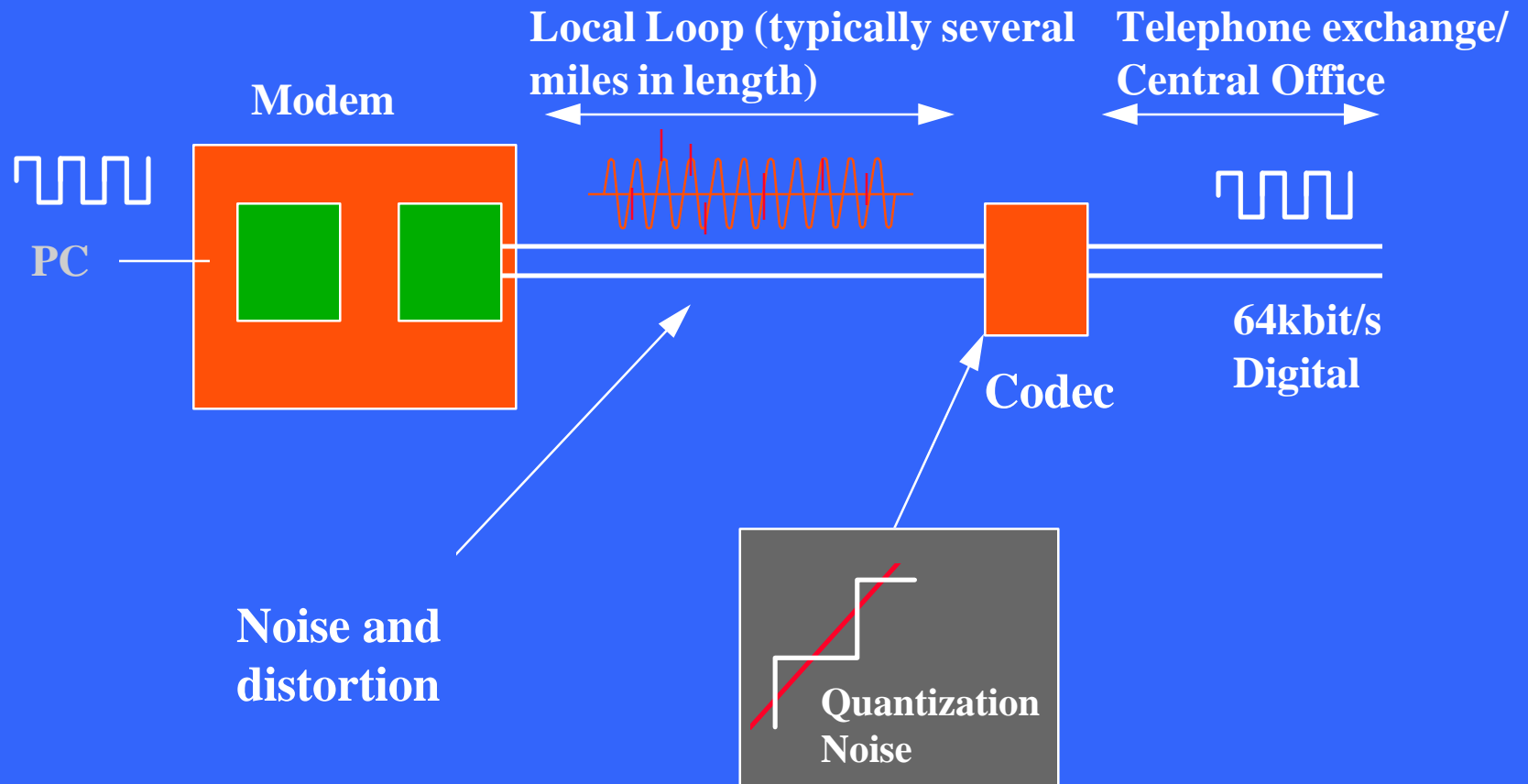


Conventional modem “paradigm”

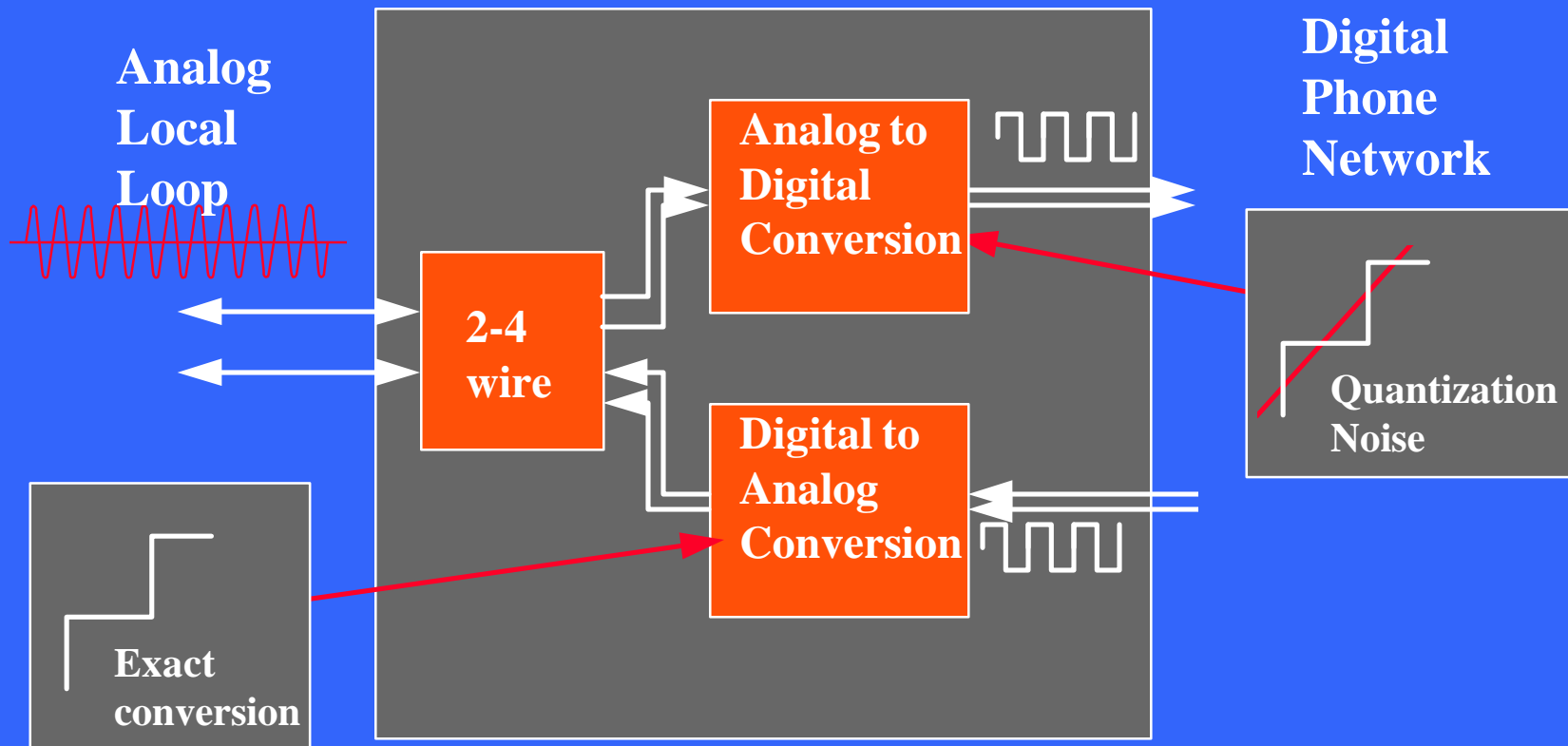
Internally phone network carries data
digitally in Pulse Code Modulation
(PCM) format



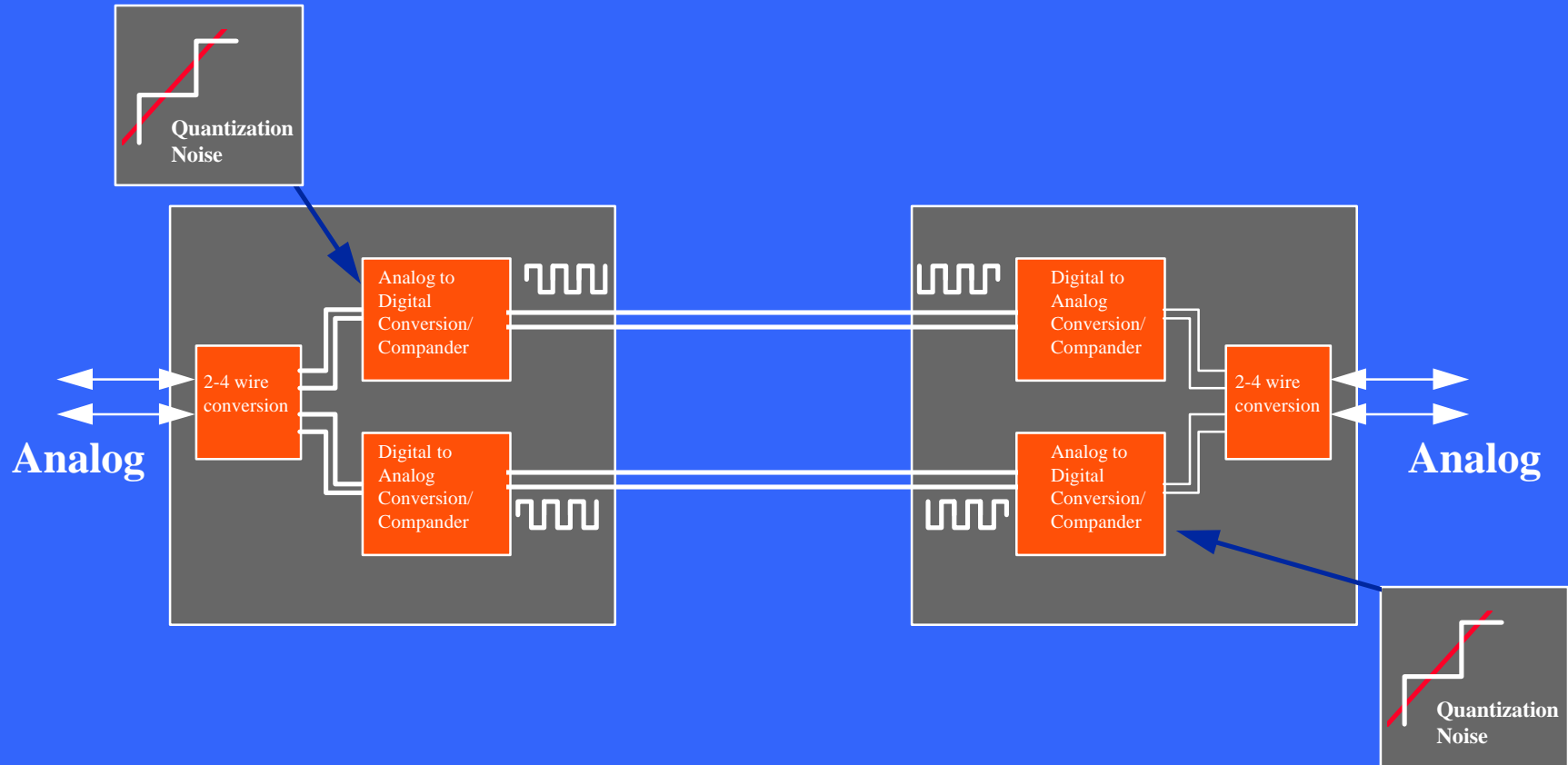
Limits on modem speed



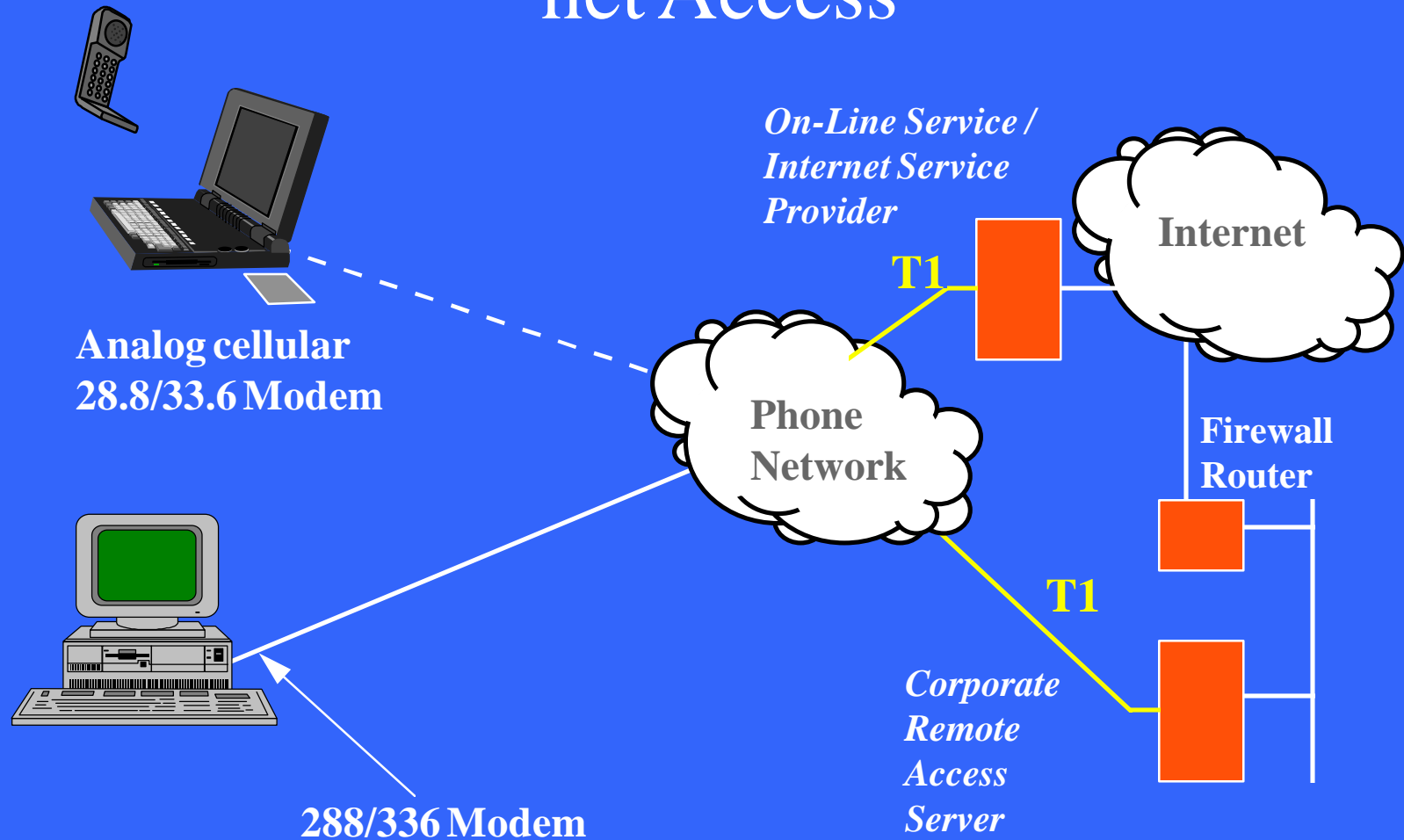
PCM Codec



Conventional 'phone connection

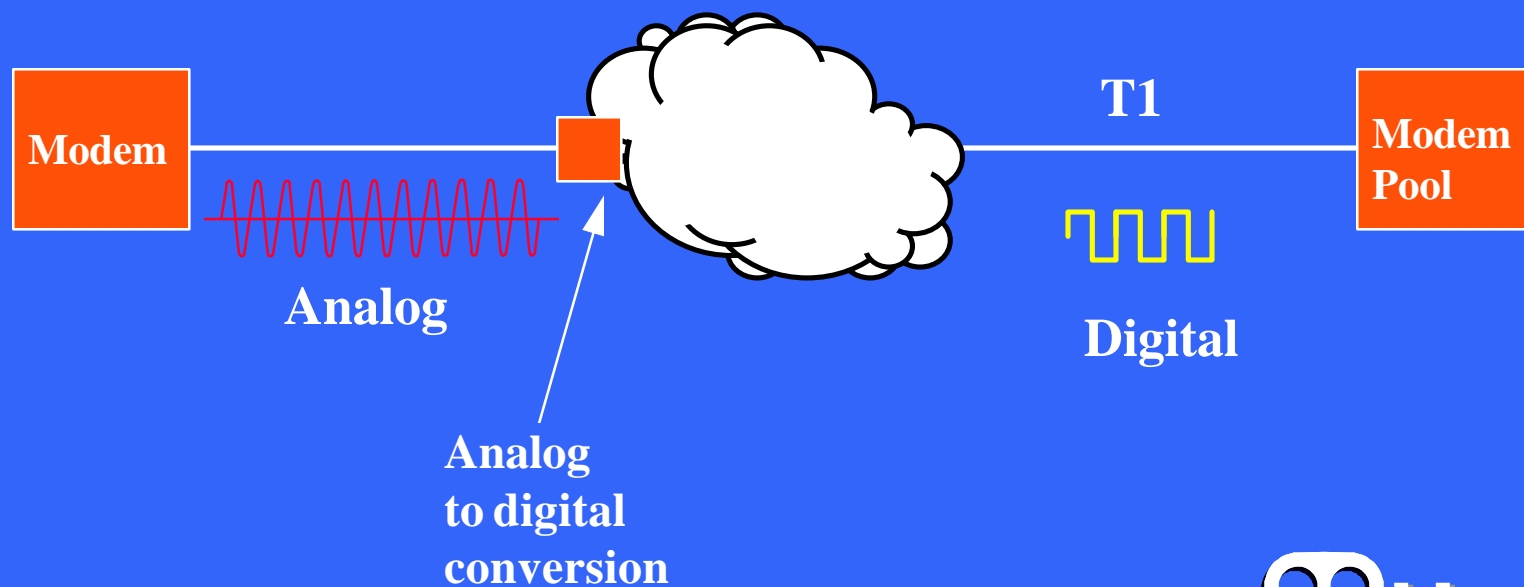


'net Access

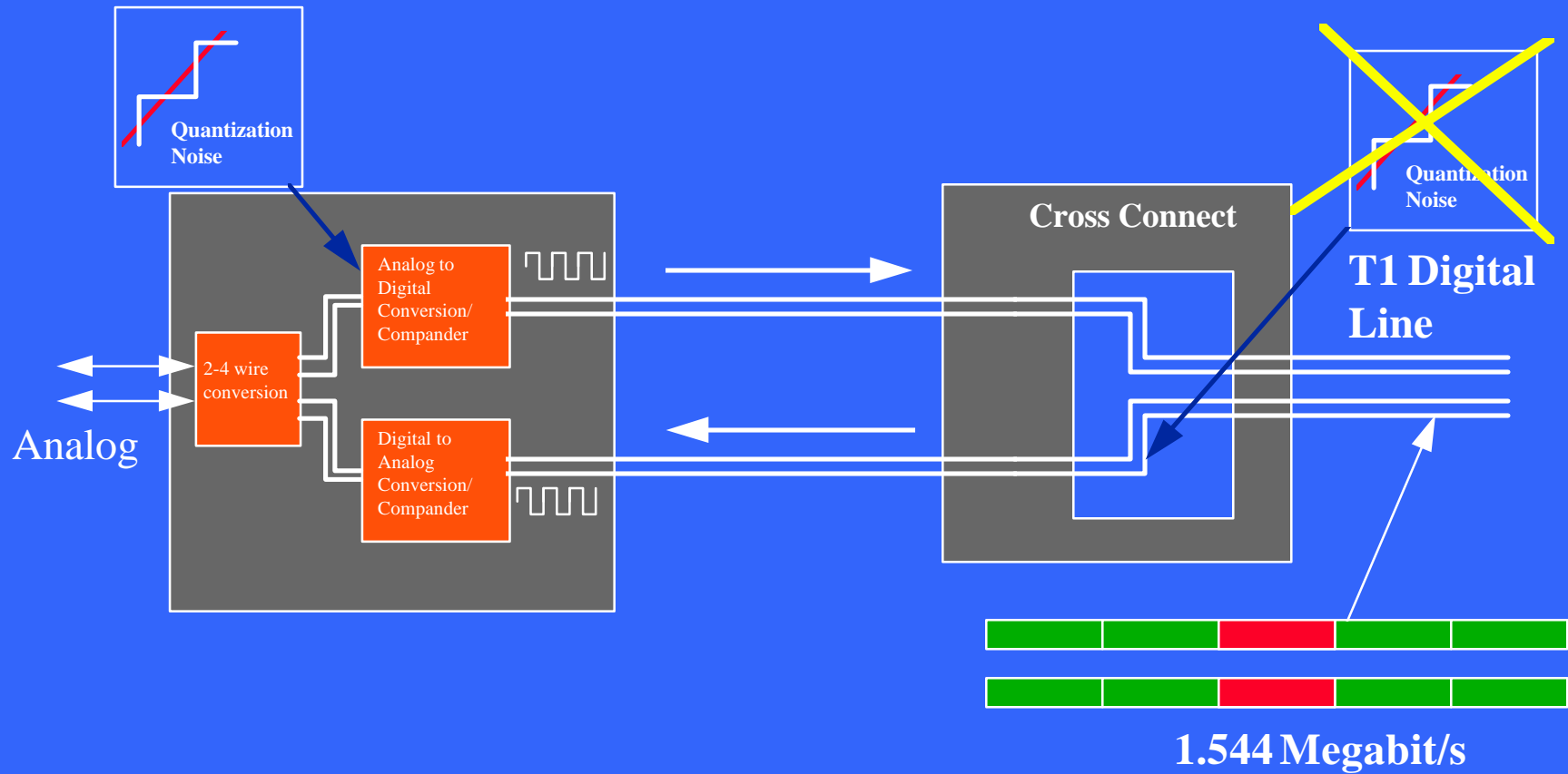


New Modem Paradigm

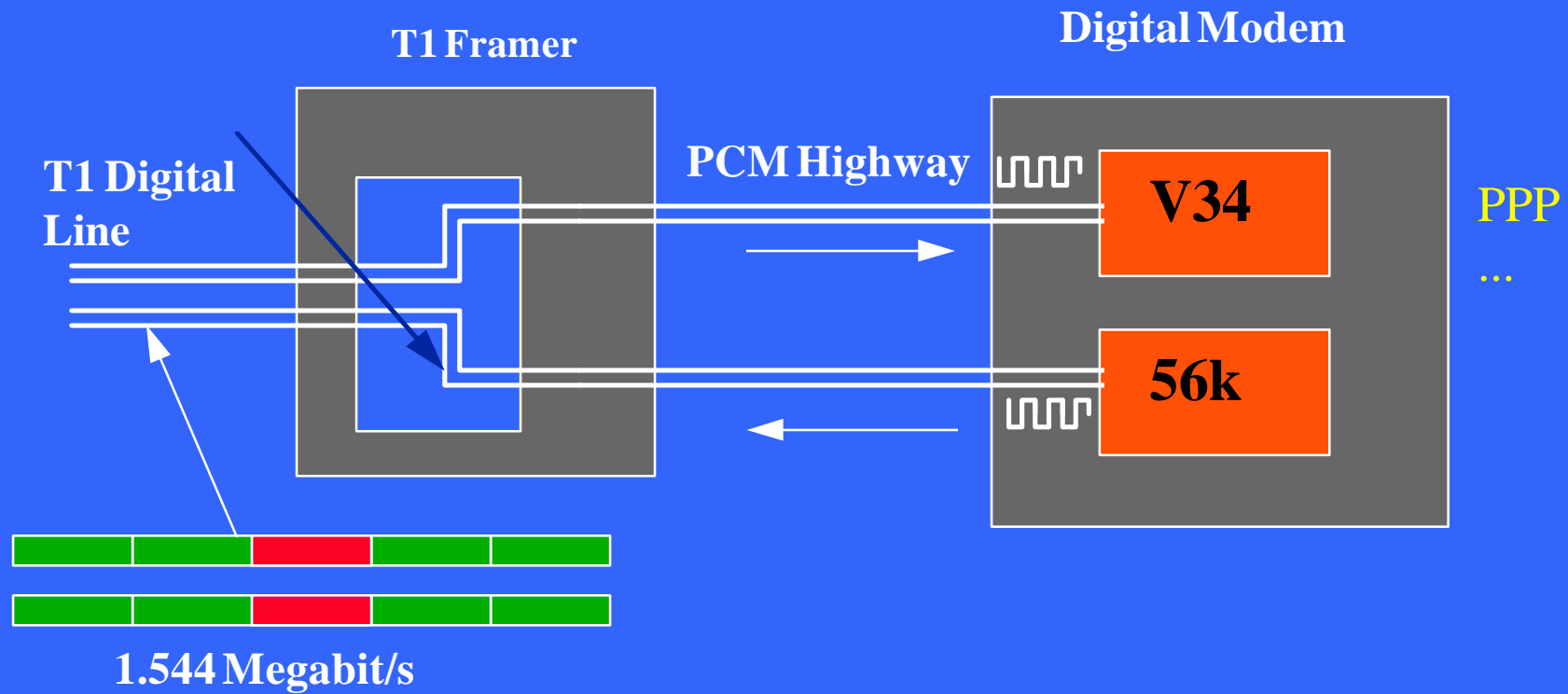
When one end of the connection uses a digital connection (T1 or ISDN) then there is no analog to digital conversion process in one direction of transmission



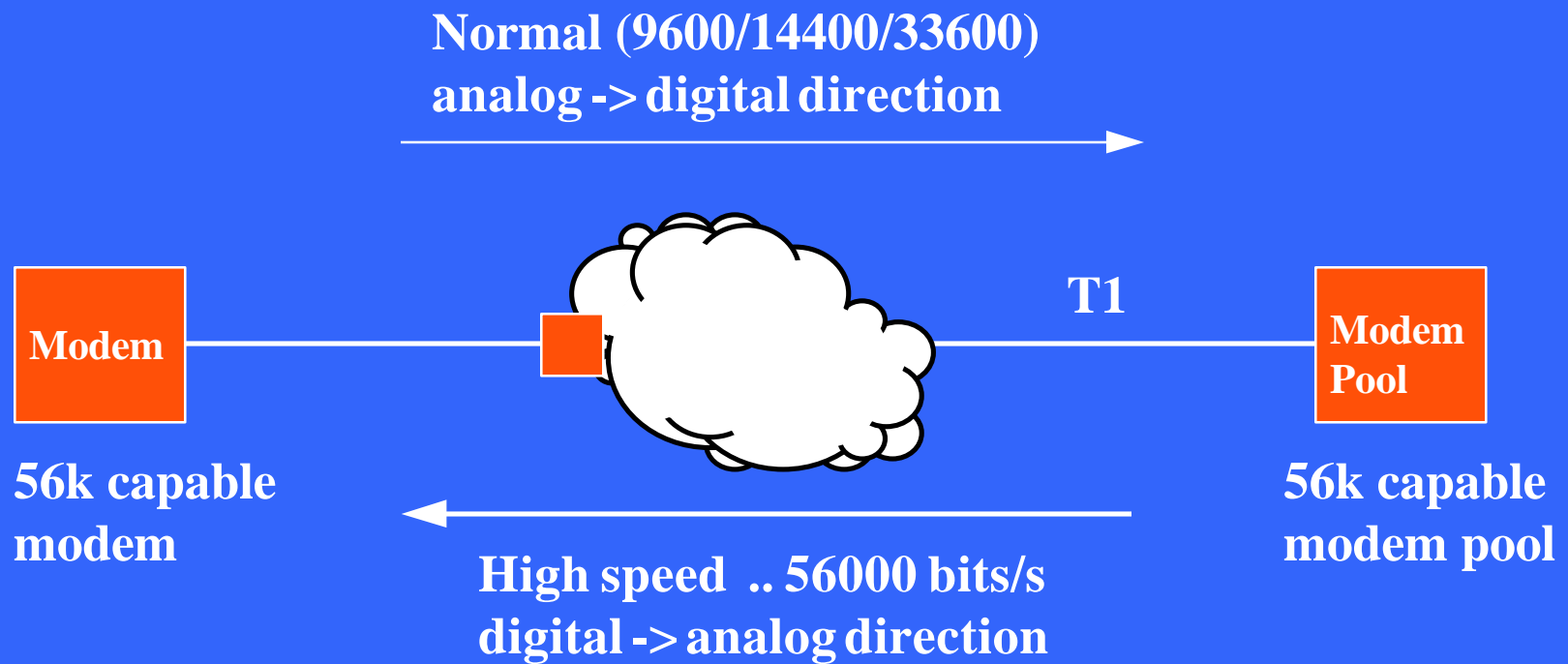
T1 Connection to on-line service



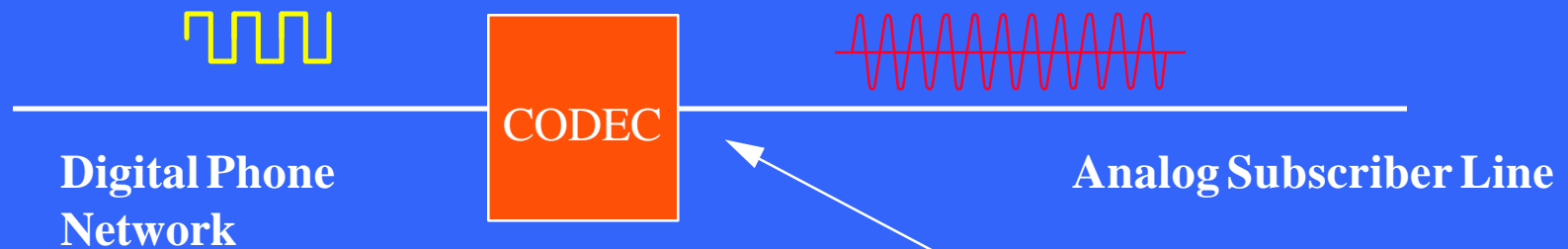
Digital Modem Pool with 56k



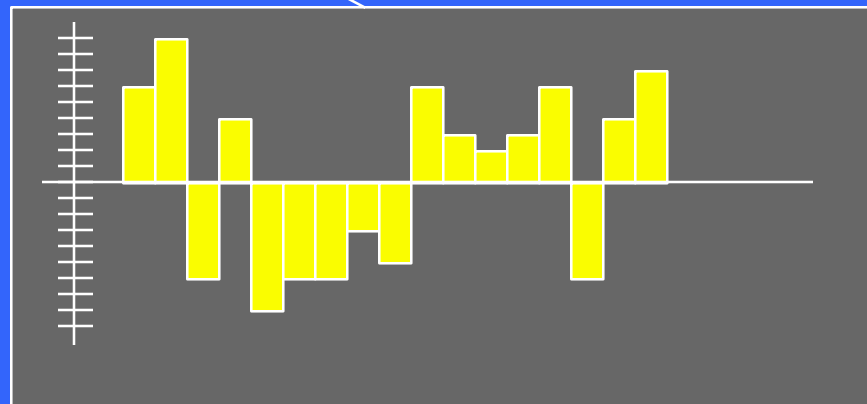
New Modem Paradigm



56k Modem Technology



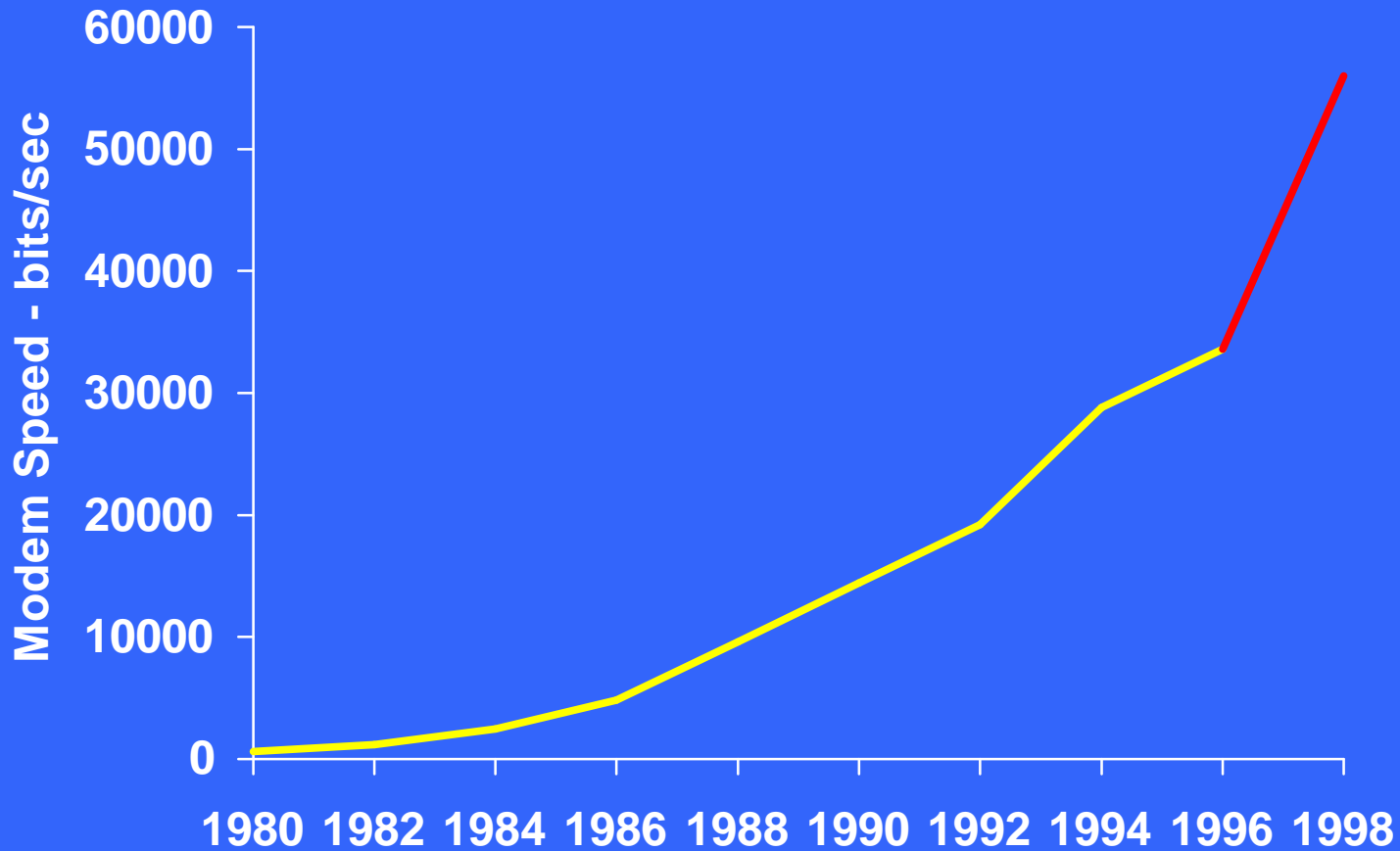
56k will use “old” concepts such as Pulse Amplitude Modulation, Partial Response Signaling...



Pulse Amplitude Modulation



How fast can modems go?



56k - Current Status

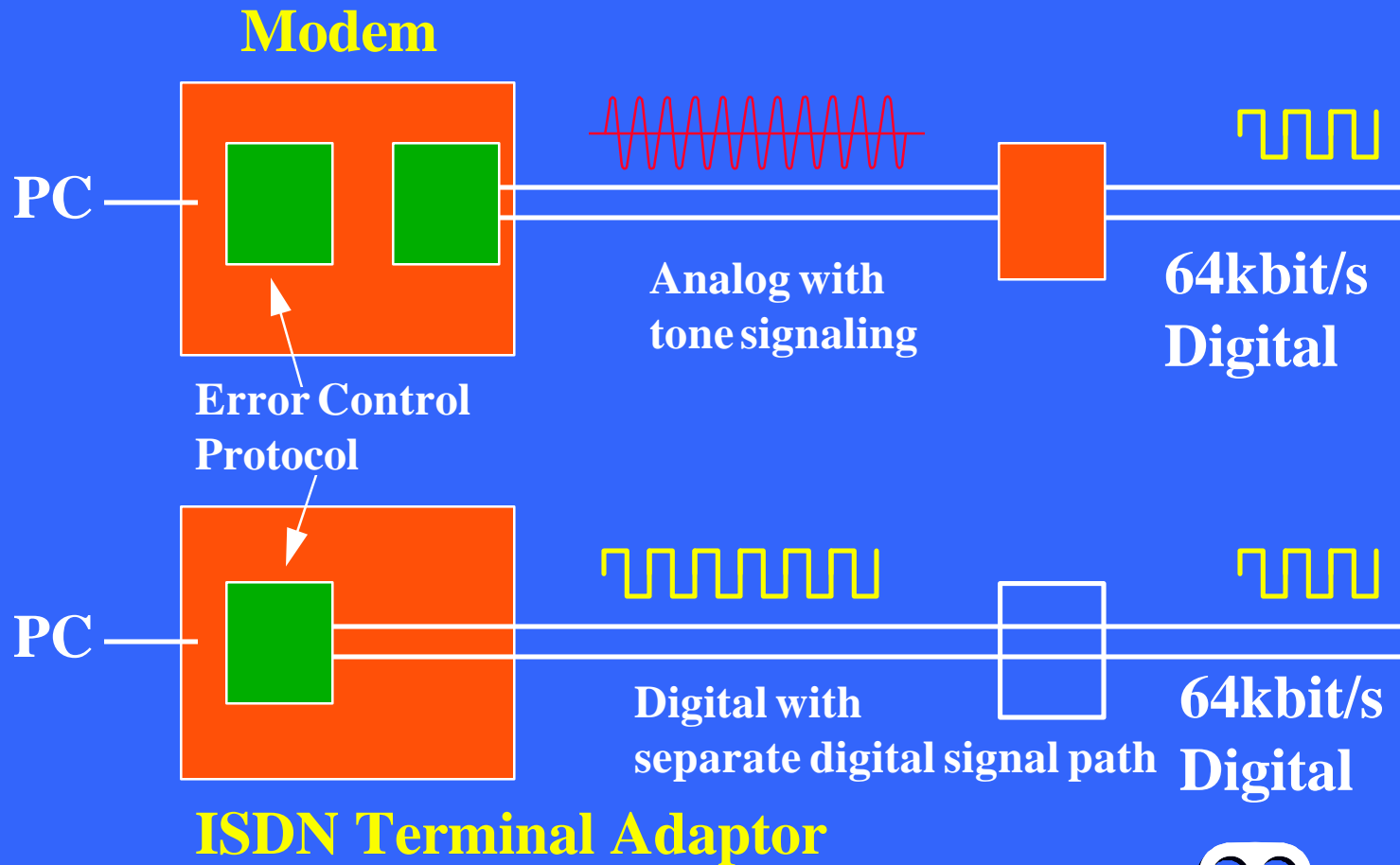
- Multiple companies announced intent to introduce product **BUT**
- .. no widely supported effort to harmonize technology therefore
- .. current implementations are proprietary and will not interoperate
- Proposal made to ITU & various companies interested in consensus building
- Choice - user confusion or delayed deployment?



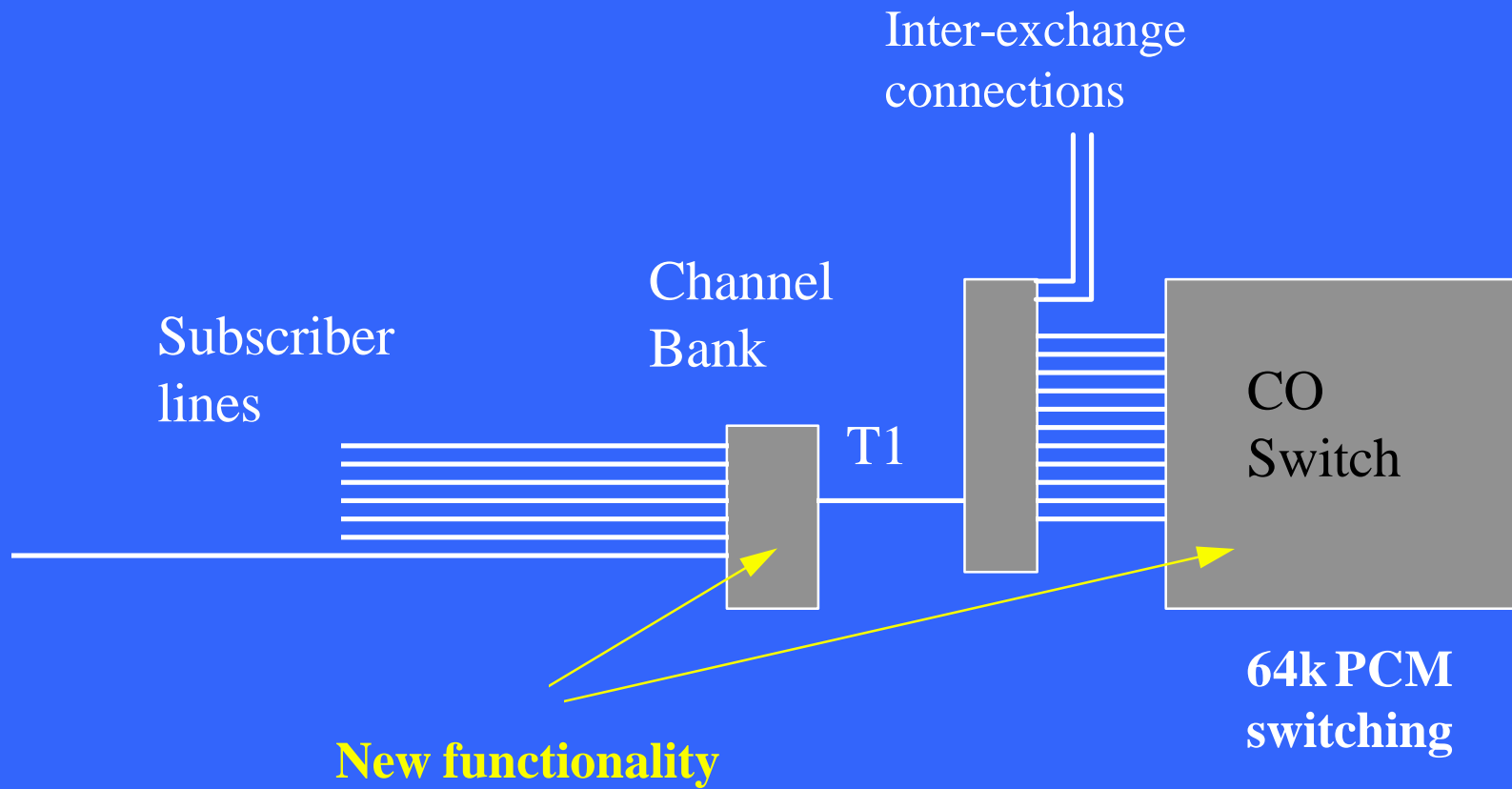
ISDN

- Integrated **S**ervices **D**igital **N**etwork
- In the '70's was seen as THE network of the future
- Over-complicated before it was even deployed
- From the mid '80's new concepts such as **SONET**, **ATM**, **Fibre to the Home** took hold - Broadband ISDN
- In the '90's many doubt the long term viability of ISDN

ISDN



Telco Infrastructure



Deploying ISDN?

- ISDN deployment requires the Telco to install new line cards in the Central Office
- Even if ISDN service is available it still needs to be “installed”
- Line needs to be “provisioned” to suit ISDN Terminal Adaptor
- Installation \$\$\$, higher monthly access \$\$\$ and in some cases a per-minute usage charge

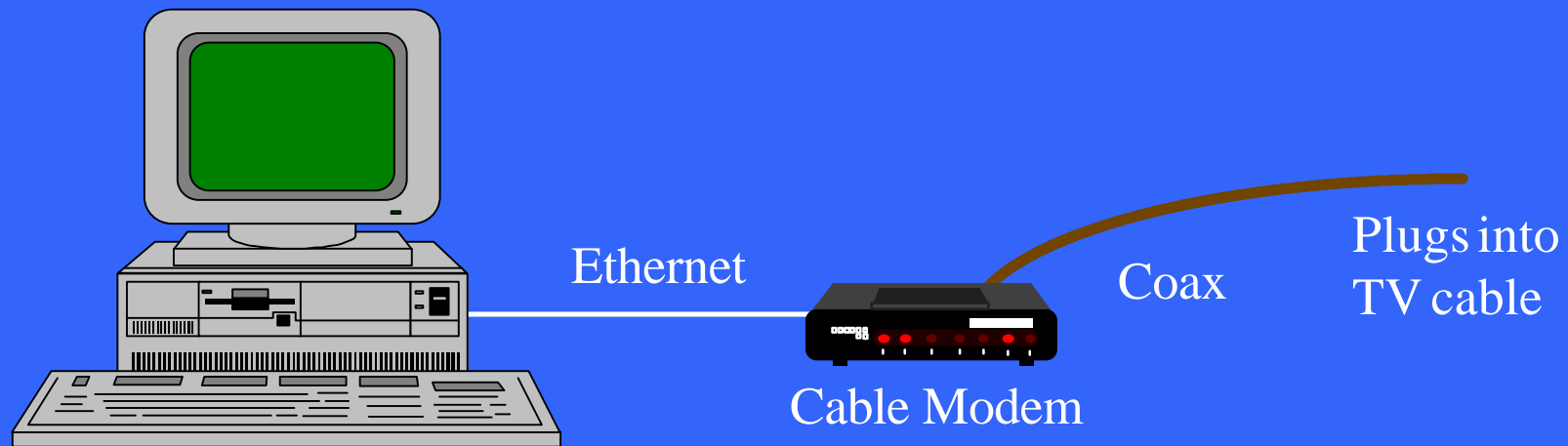


Cable Modems & ADSL

- Cable Modems
 - Cable TV operator's means of providing high speed Internet access
 - 10-30 Mbits/s shared amongst 1-400 homes
- ADSL
 - RBOC/Telco's means of providing high speed Internet access, potentially video dialtone
 - 1.5-6 Mbit/s to each home



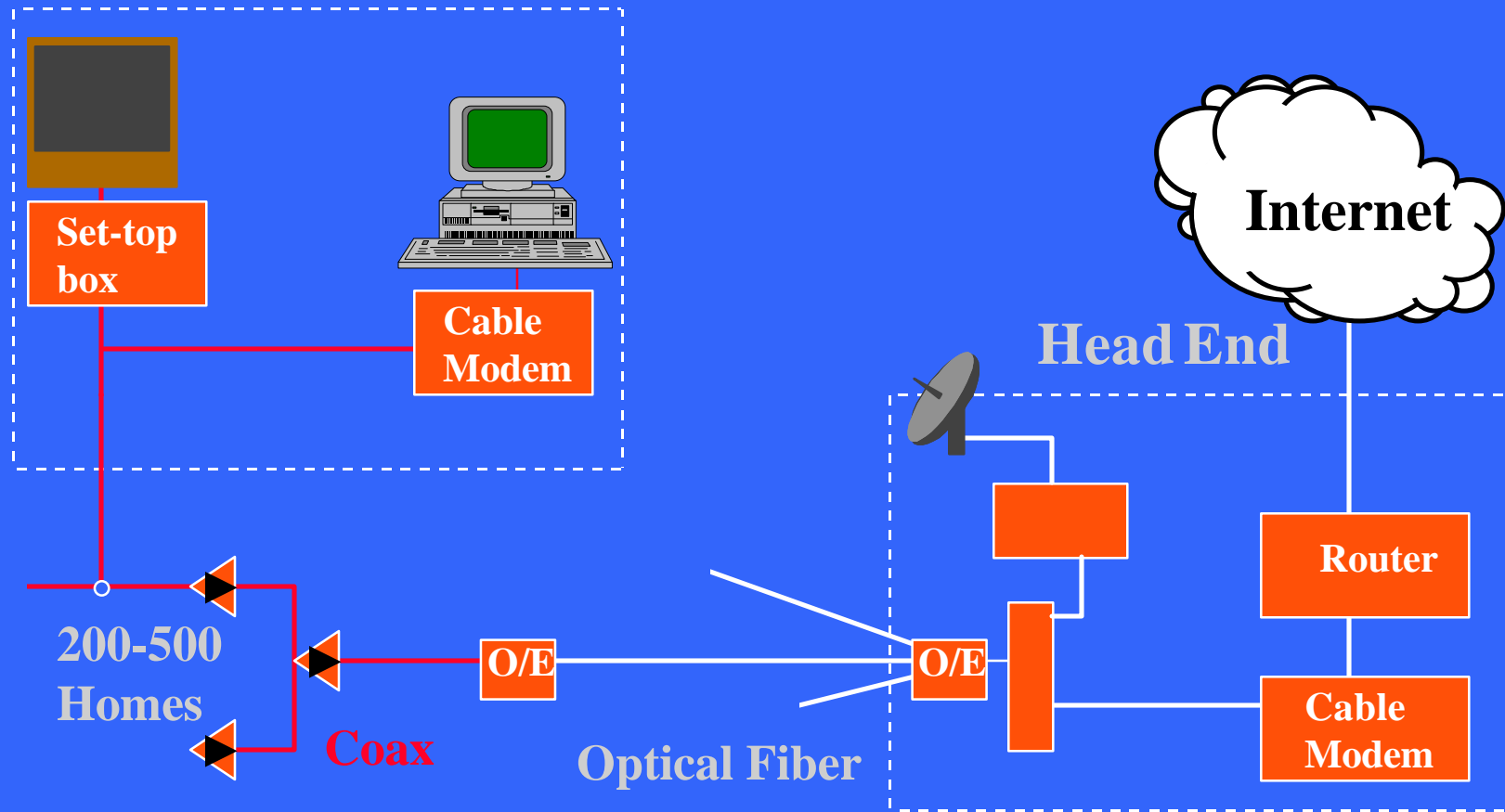
Cable Modem - User perspective



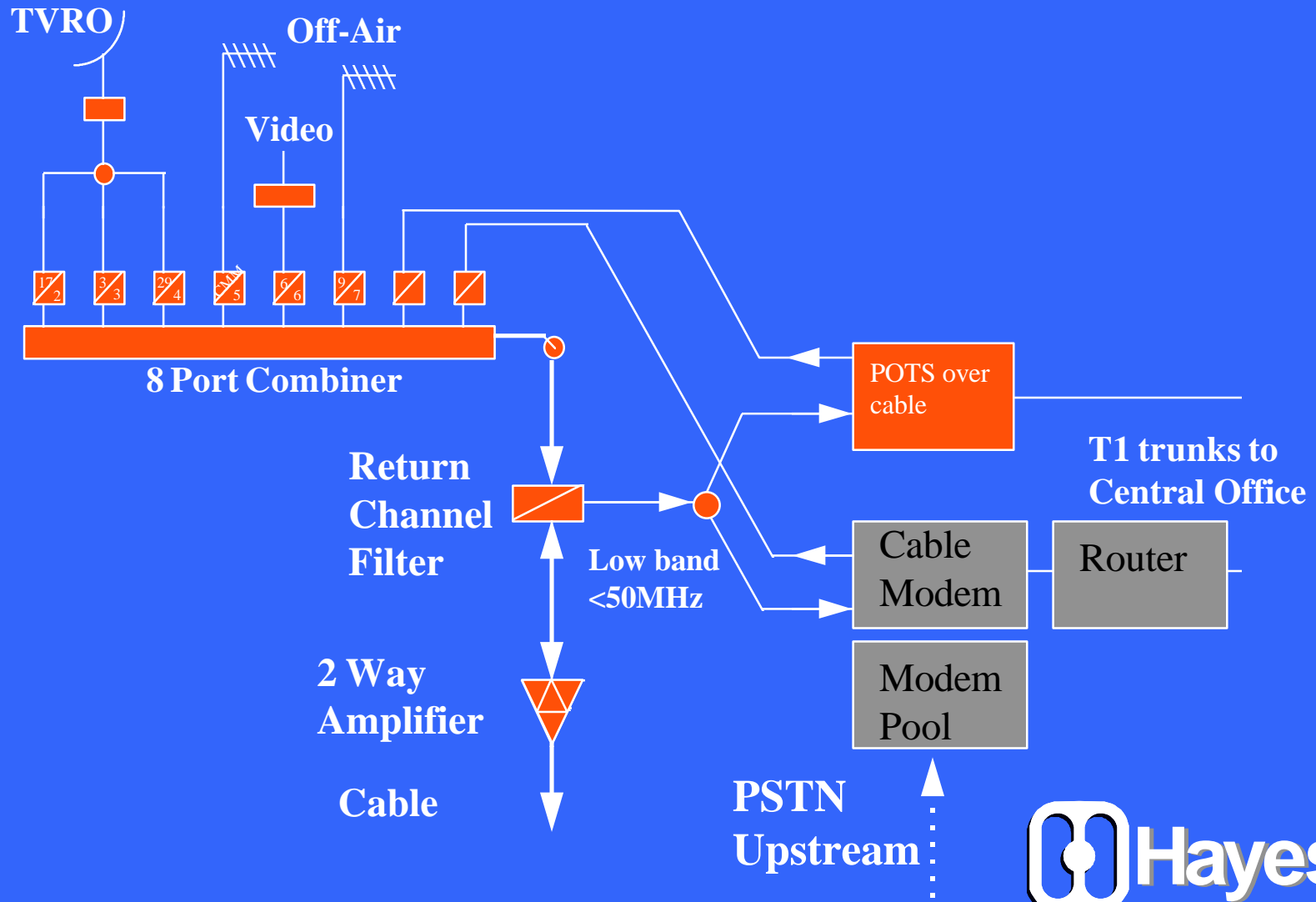
- High speed - say around 1Mbit/s
- \$35-50(?) per month service from cable service provider
- ..includes modem rental and unlimited(?) service access
- Modem vendor provides tech support for modem
- Modems available thru' retail .. say 1998



Cable Modem - Infrastructure



Head-End with Cable Modems

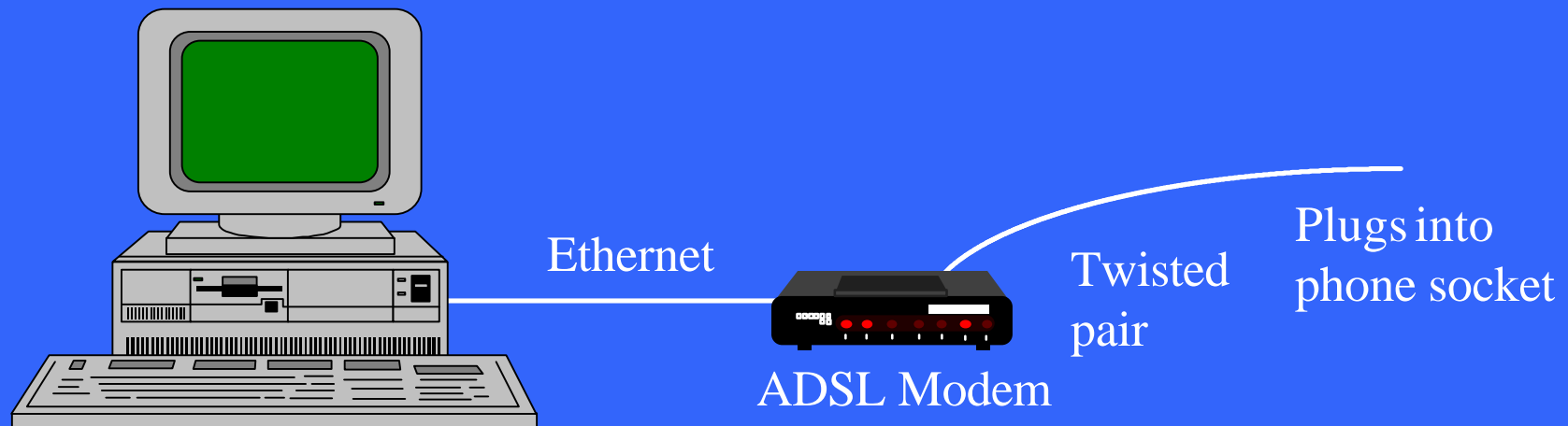


Cable Modems - Industry Activities

- IEEE 802.14 Committee - Cable Modem Standard
- Cablelabs RFP/ product review
- MCNS - Big 5 cable companies / Arthur D Little developing an interoperability standard
- Society of Cable TV Engineers
- Industry converging on some elements - 64QAM for downstream, QPSK for upstream - short term use of PSTN for upstream



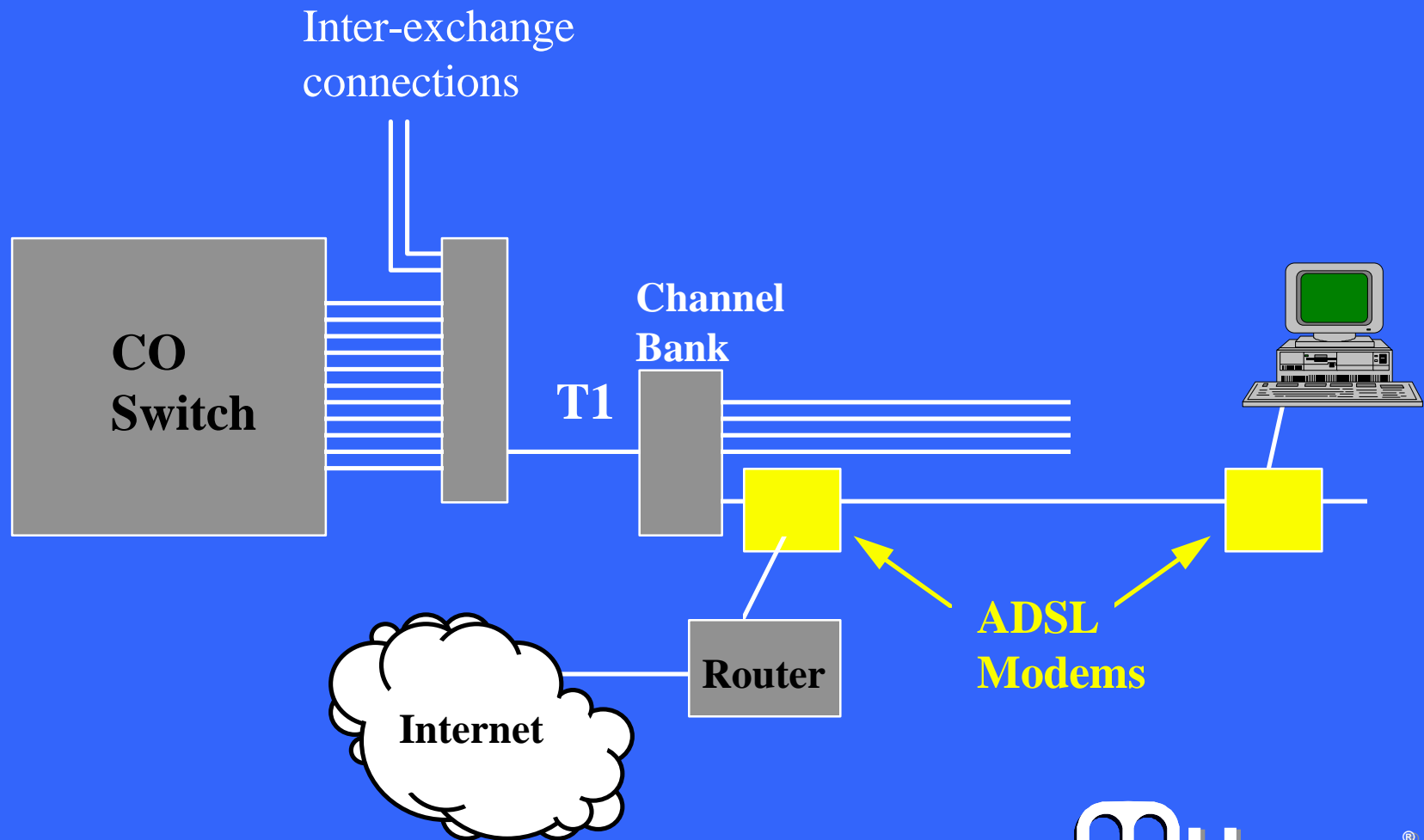
ADSL Modem - User perspective



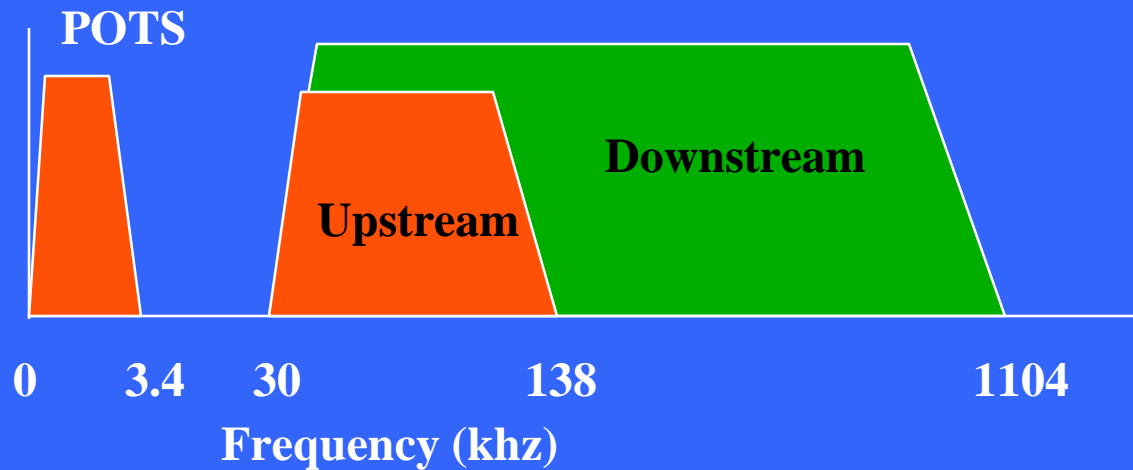
- High speed - say around 6Mbit/s
- \$35-50(?) per month service from phone service provider
- ..includes modem rental and unlimited(?) service access
- Modem vendor or service provider provides tech support
- Modems available thru' retail .. say 1998



ADSL Modem - Infrastructure



ADSL Spectrum



- Low speed HDSL/ SDSL .. T1 speeds
- ADSL/RADSL .. 1.5 - 12Mbit/s
- VDSL .. 50Mbit/s over short range

ADSL - Industry Activities

- Discrete Multitone (DMT)
 - ANSI Standard .. T1E1.4
 - Multiple technology sources
- Carrierless Amplitude Phase (CAP)
 - Not standard but more widely deployed
 - Single technology source
- Consortium RFP
 - Initial RFP from several major RBOCs
 - Likely to influence technology selection thru' 1998
- ADSL Forum

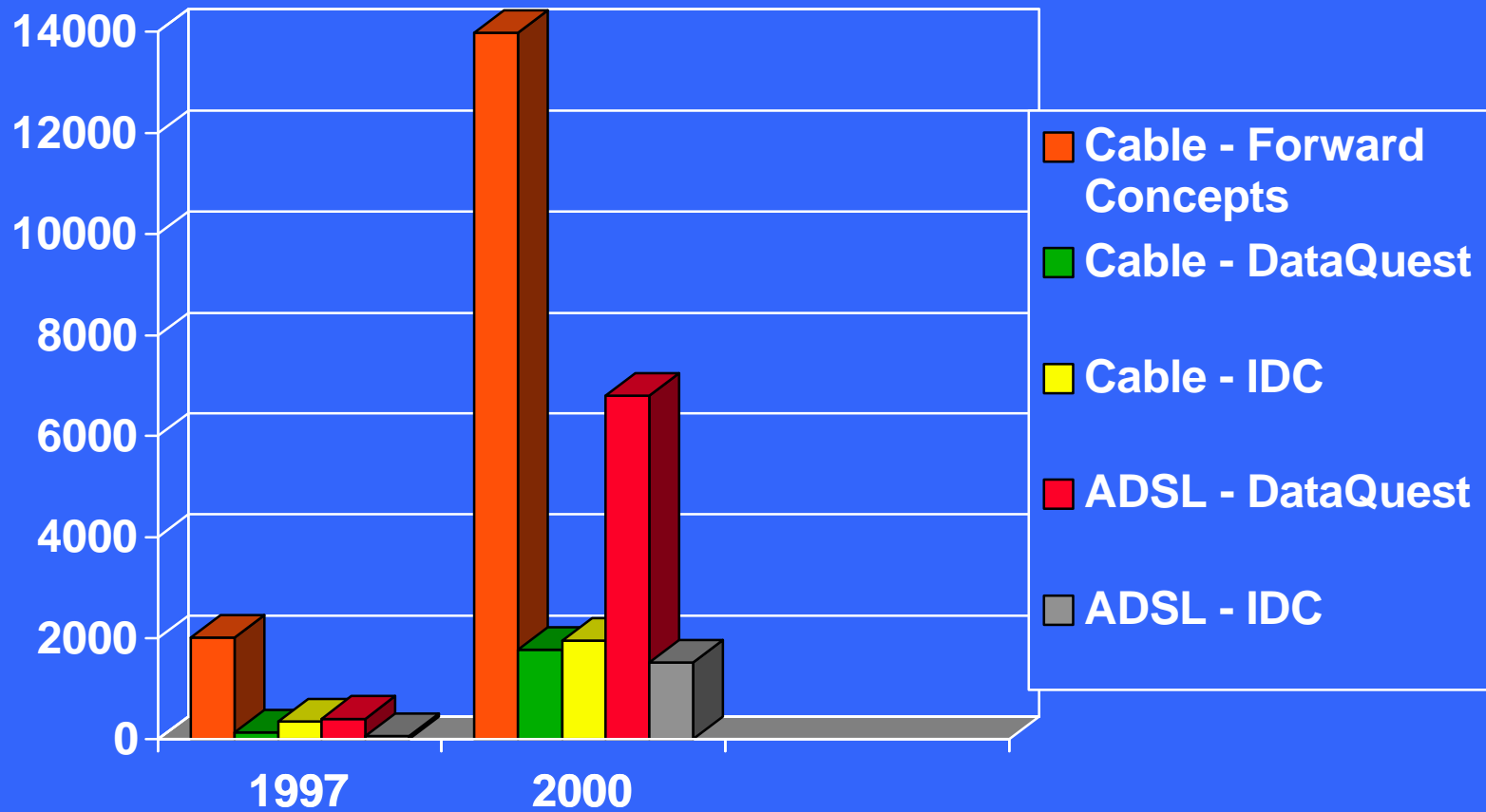


ISDN vs Cable vs ADSL?

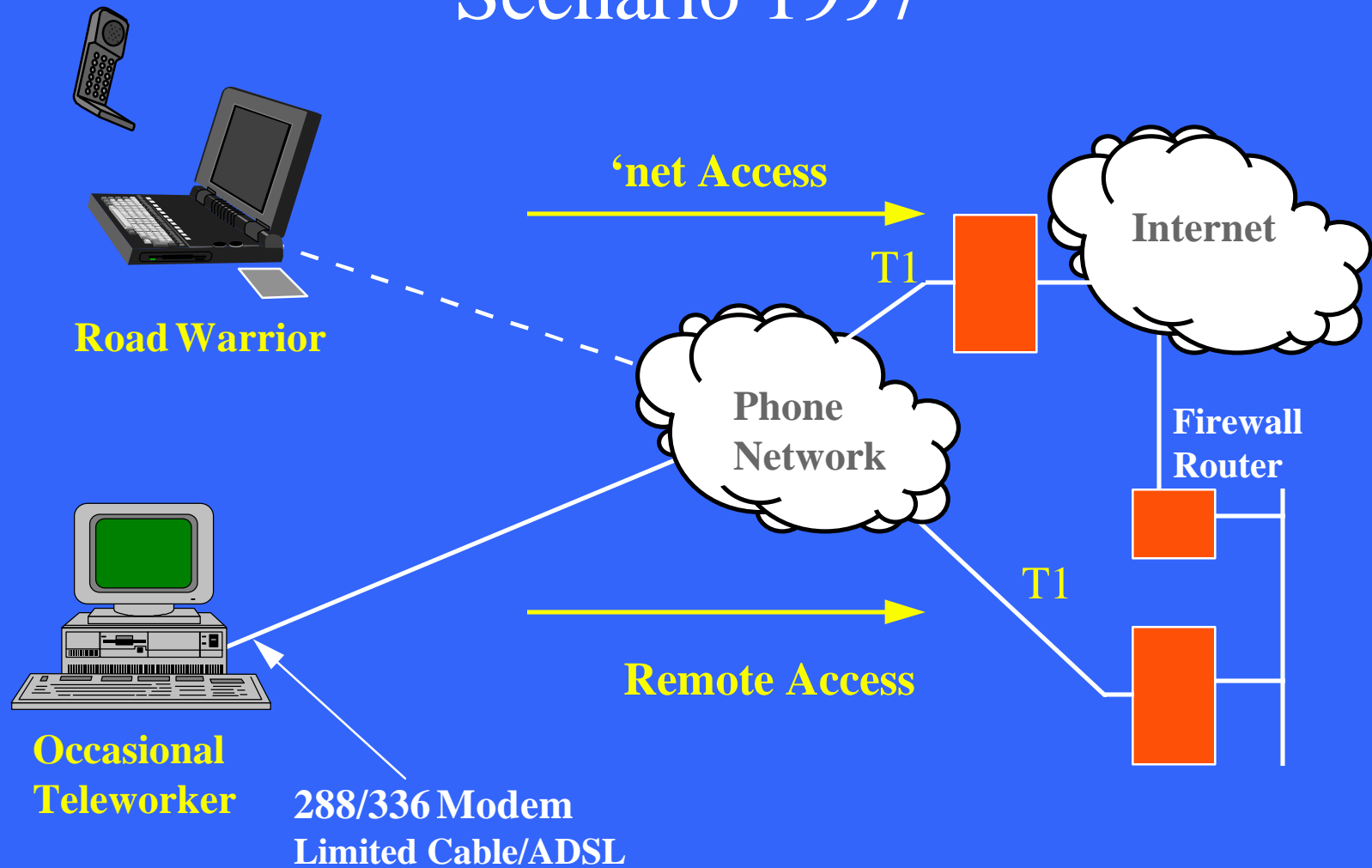
- ISDN - 64k dial
 - ideal for bandwidth on demand .. low delay
 - needs infrastructure upgrade AND needs to be supported in on-line service providers' POPs
- Cable Modems - 30Mbit/s shared
 - needs infrastructure upgrade AND needs CSO/MSO to provide connection to Internet or service provider
- ADSL - >6Mbit/s dedicated
 - needs infrastructure upgrade AND needs CSO/Telco to provide connection to Internet or service provider



Forecast - installed base



Scenario 1997

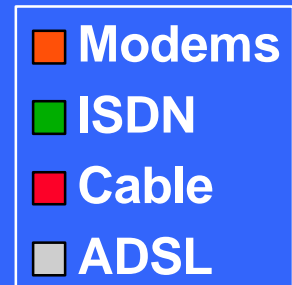
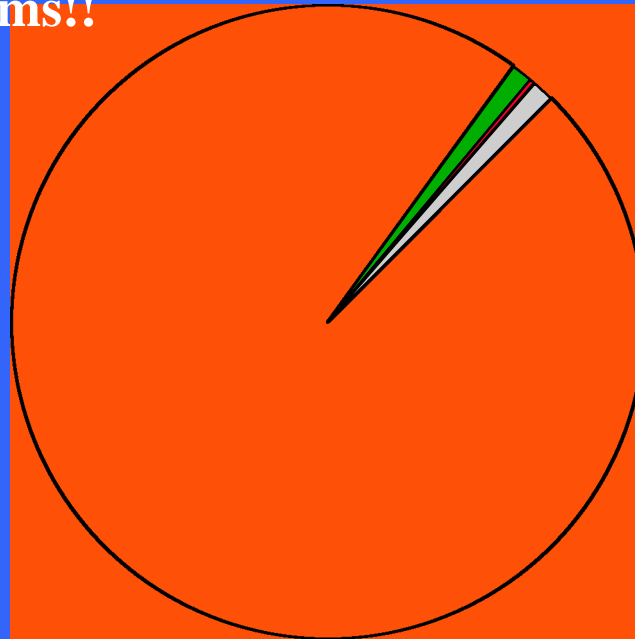


**Occasional
Teleworker**

288/336 Modem
Limited Cable/ADSL

Scenario 1997

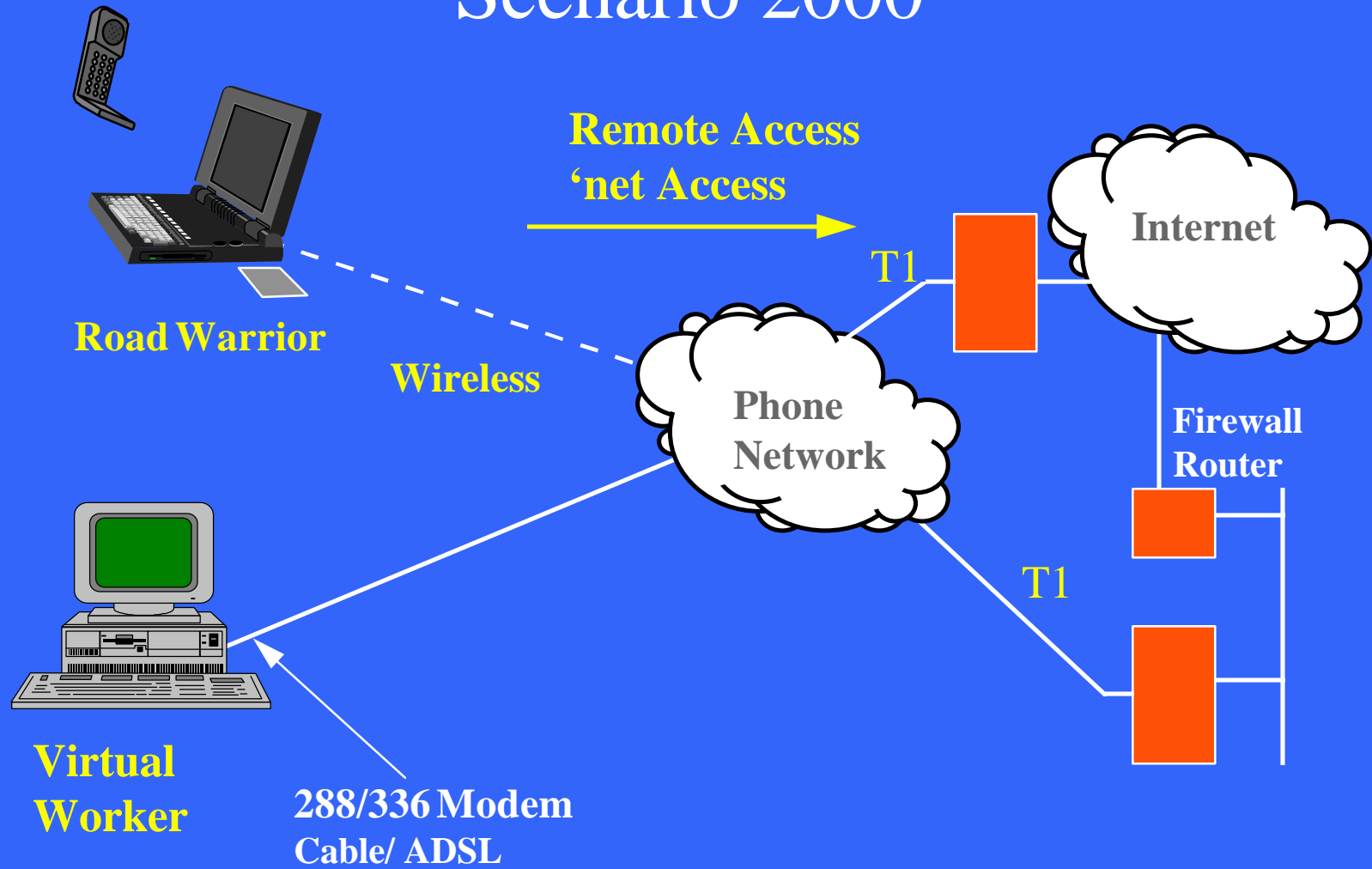
0.5 - 1 million ADSL and Cable Modem lines installed
0.5 million ISDN lines
80 million modems!!



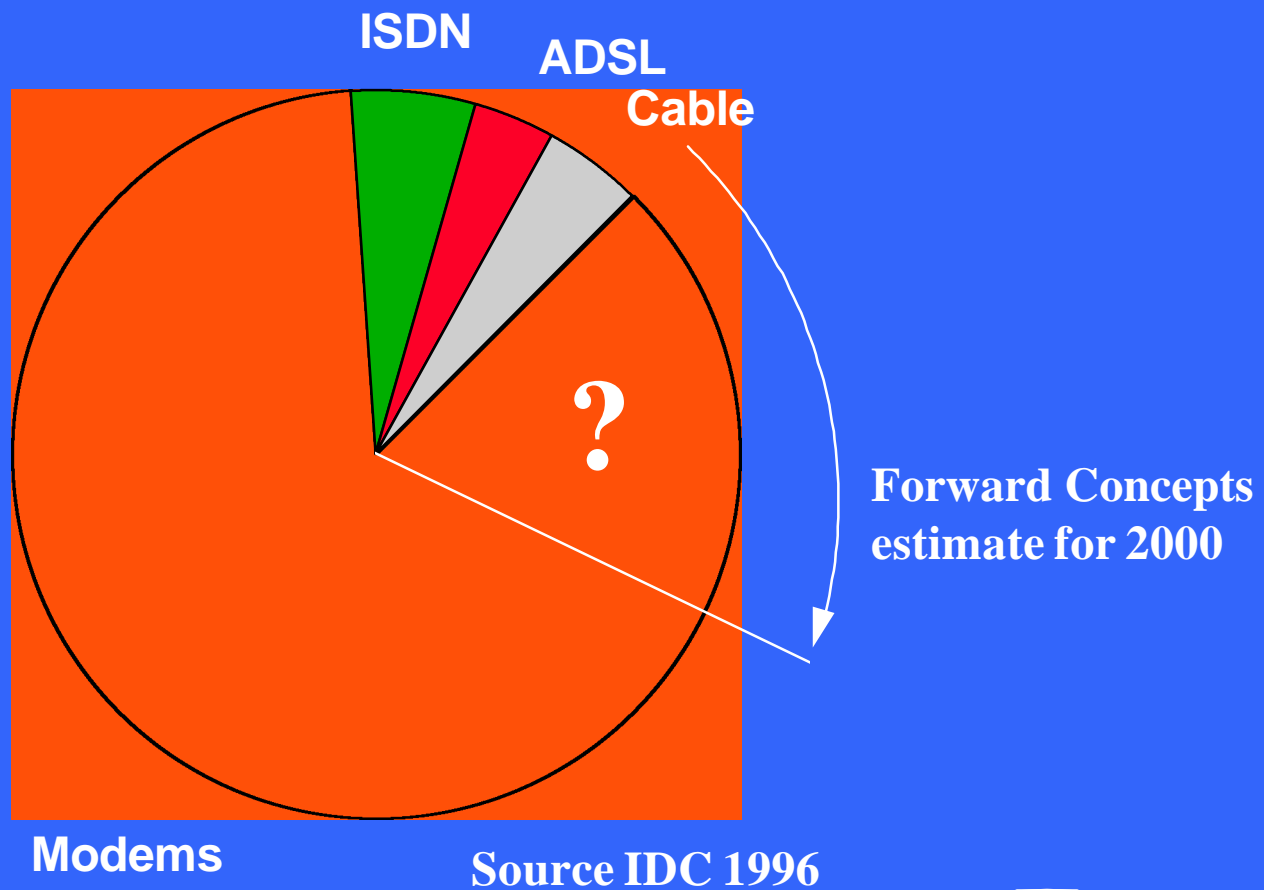
Source IDC 1996



Scenario 2000

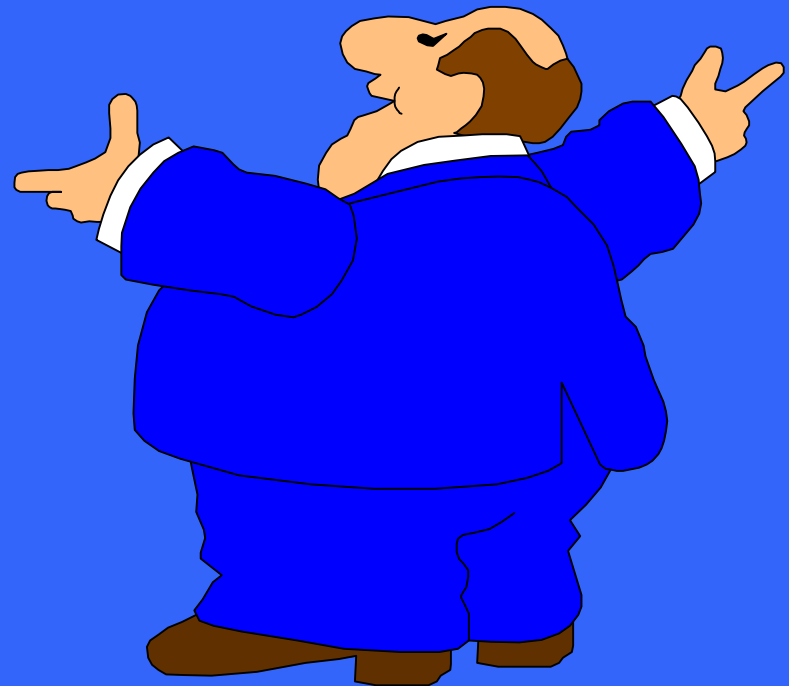


Scenario 2000



Drivers?

How would you like a free ten megabit per second modem, a zero cost unlimited access Internet account and free access to Playboy's new on-line video supermodel Web site?



Drivers?

- User satisfaction with current service?
 - depends on content provider and available bandwidth
- Relative cost of services
 - depends on Telco/ Cable Company
- Performance of network and servers
 - time taken to upgrade infrastructure
- Competition between service providers
- Emerging applications
 - Telecommuting, videoconferencing



Summary

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