IT & TELECOMMUNICATIONS IMPACT ON DEVELOPING COUNTRIES

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EDUCATION

(THE ACADEMIC COMMUNITY IS THE STARTING POINT)

HEALTH SERVICES

TELECOMMUNICATIONS

TRANSPORTATION (ROADS, RAIL, AIR)

TOPICS FOR DISCUSSION

- POLICY OBJECTIVES
- UNIVERSAL SERVICE AND UNIVERSAL ACCESS
- INTERNET - WHAT DOES IT MEAN?
- INTERNET CONCERNS
- IP TELEPHONY
- DIGITAL DIVIDE
- SATELLITE AND INTERNET INDUSTRIES
- WTO AGREEMENT
- IP VIA SATELLITE
- S-CURVES
- WWW SITES
- SATELLITE COLLISION PROBLEM

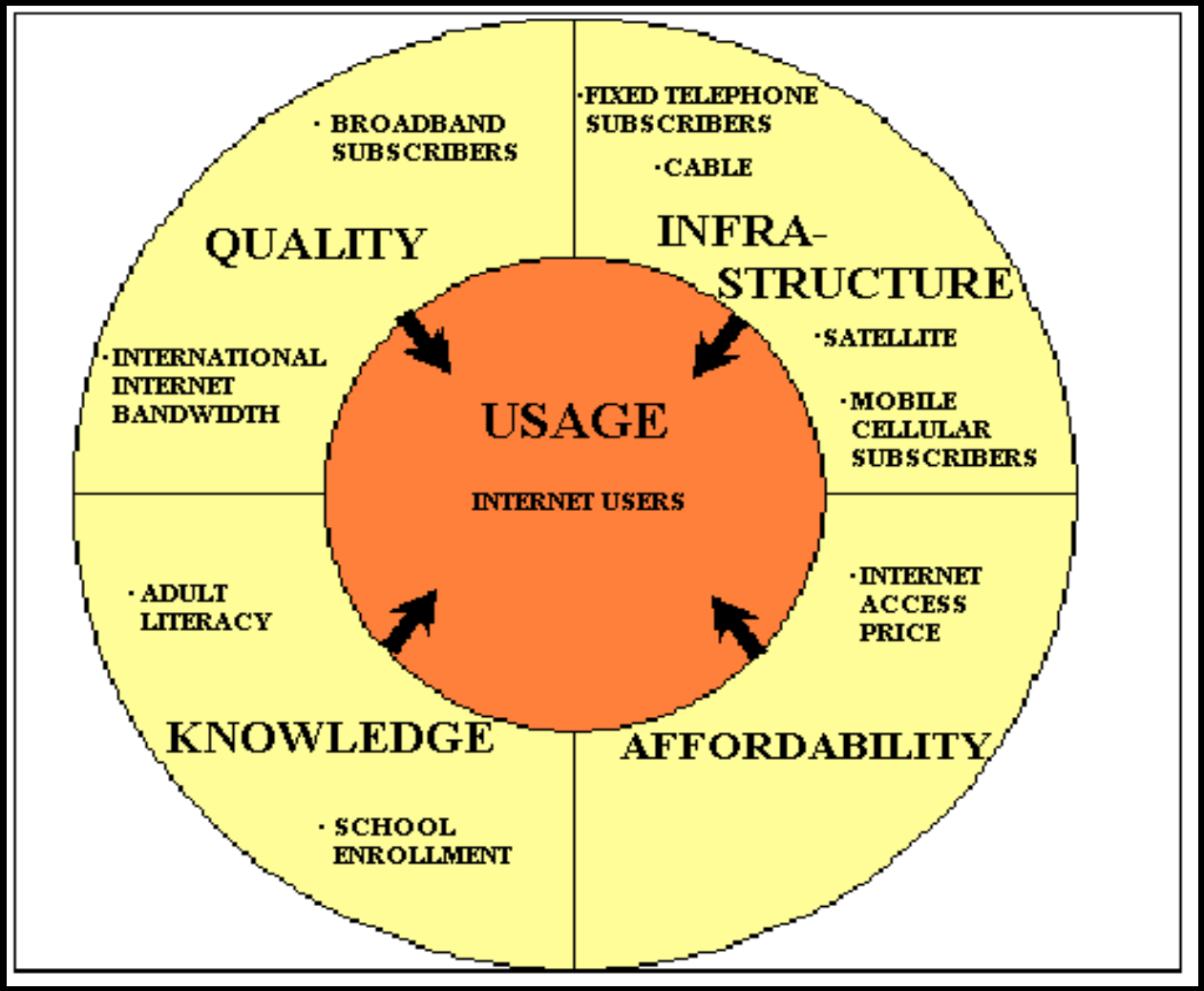
POLICY OBJECTIVES

- **FOSTER COMPETITIVE AND INNOVATIVE INTERNET CONNECTION, AND MULTIMEDIA INDUSTRIES**
- **MINIMIZE REGULATION AND ENACT FLEXIBLE REGULATORY POLICIES**
- **PROMOTE MARKET ACCESS AND ADOPTION OF OPEN, NON-DISCRIMINATORY, TRANSPARENT POLICIES**

UNIVERSAL SERVICE AND UNIVERSAL ACCESS

- **IT IS UNDERSTOOD THAT MARKET SOLUTIONS WILL NOT ENSURE THE EXPANSION OF NETWORKS TO ECONOMICALLY LESS VIABLE (RURAL) AREAS**
- **UNIVERSAL SERVICE OR UNIVERSAL ACCESS OBLIGATIONS, AND FUNDING ARE A NATIONAL POLICY ISSUE**

INFORMATION AND COMMUNICATIONS TECHNOLOGY FACTORS FOR ACCESS



SOURCE: ITU.

INTERNET

THE INTERNET HAS ENABLED THE CREATION OF BUSINESSES WITHOUT MUCH CAPITAL. IT HAS ENLARGED THE COMPETITION - - NOT ONLY THE SHOP DOWN THE STREET BUT THE SHOP HALFWAY AROUND THE WORLD. GEOGRAPHICAL BOUNDARIES ARE DISAPPEARING.

THE INTERNET REVOLUTION

- A STUDY IN YEAR 2000 CALCULATED THAT USE OF INTERNET E-MAIL IN THE U.S. INCREASED PRODUCTIVITY OVER YEAR 1999 BY A VALUE OF $13,000 PER EMPLOYEE
- THE SAME STUDY FOUND THAT EMPLOYEES SAVE 326 HOURS PER YEAR BY USING E-MAIL (THERE ARE 2100 HOURS IN THE U.S. GOVERNMENT WORK YEAR)
- NOT WITHOUT A DOWNSIDE, THE SAME STUDY FOUND THAT EACH EMPLOYEE WASTES 115 HOURS PER YEAR WITH PERSONAL E-MAIL AND COPING WITH SPAM

DAILY E-MAIL GROWTH

1999 - 3.5 BILLION

2003 - 11 BILLION

DOMAINS

.AERO
.ARPA
.BIZ
.COM
.COOP
.(COUNTRY CODES)
.EDU
.GOV
.INFO
.INT
.MIL
.NET
.MUSEUM
.NAME
.ORG
.PRO

INTERNET CONCERNS

FRAUD

CYBERSTALKING

SECURITY

GAMBLING

MONEY LAUNDERING

DRUG TRAFFICKING

PORNOGRAPHY

TAXES

SPAM

QUALITY

INTELLECTUAL PROPERTY RIGHTS

IP TELEPHONY AND THE GLOBAL TELECOM MARKET

YEAR 2000 - GLOBAL TELECOMMUNICATIONS MARKET WAS $1 TRILLION

YEAR 2000 - GLOBAL INTERNET PROTOCOL TELEPHONY (VoIP) MARKET OF $500 MILLION

(FIVE TEN-THOUSANDTHS OR 0.05%)

PSTN AND IP TELEPHONY

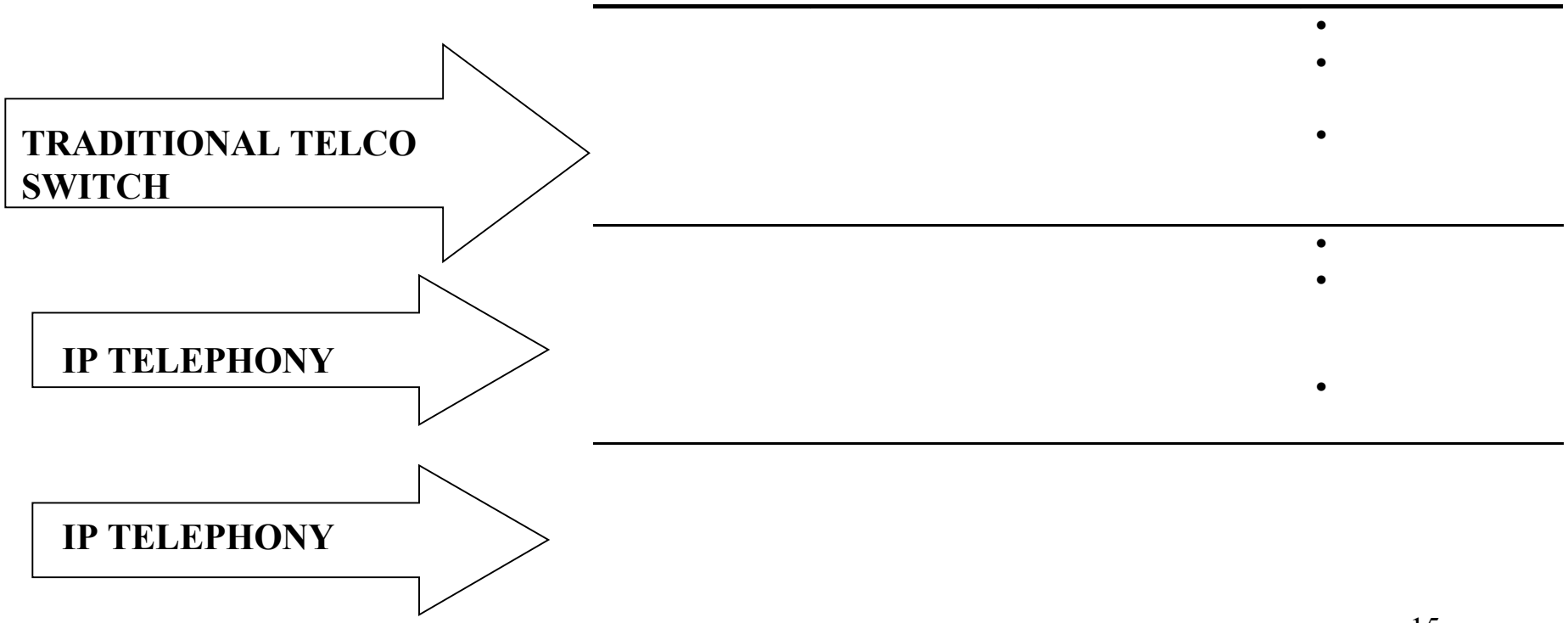
- PSTN IS BASED ON CIRCUIT-SWITCHED TECHNOLOGY, EVOLVED AS A VOICE NETWORK (HIGHLY REGULATED)
- INTERNET BASED ON PACKET-SWITCHED TECHNOLOGY, EVOLVED AS A DATA NETWORK (LARGELY UNREGULATED)
- INTERNET IN 2000 WAS 3 % OF GLOBAL INTERNATIONAL TRAFFIC TOTAL

PSTN AND IP TELEPHONY RELATIVE COSTS

- IP TELEPHONY (VoIP) CAN BE OFFERED AT PRICES SIGNIFICANTLY BELOW THOSE FOR PSTN TELEPHONY
- PSTN PRICING IS DISTANCE- SENSITIVE - - PRICING OF IP TELEPHONY IS LARGELY INDEPENDENT OF DISTANCE (LIKE SATELLITE COMMUNICATIONS)
- VoIP TODAY MEANS A TRADE-OFF BETWEEN QUALITY AND COST

VoIP VS CIRCUIT NETWORK COST

SOLUTIONINVESTMENTCAPACITYADVANTAGESCLASS 5SWITCHU



VoIP PERMITTED

ANGOLA
ANTIGUA AND BARBUDA
ARGENTINA
AUSTRALIA
AUSTRIA
BELGIUM
BHUTAN
CANADA
CHINA
CONGO
COSTA RICA
CYPRUS
CZECH REPUBLIC
DENMARK
DOMINICAN REPUBLIC
ESTONIA
ETHIOPIA
FINLAND
FRANCE
GAMBIA
GERMANY
GREECE
GUATEMALA
GUYANA
HONG KONG SAR
HUNGARY
ICELAND
INDIA
IRELAND
ITALY
JAPAN
KENYA
KOREA (REP)
KYRGYZSTAN
LUXEMBOURG
MADAGASCAR
MALAYSIA
MALTA
MEXICO
MOLDOVA
MONGOLIA
NEPAL
NETHERLANDS
NEW ZEALAND
PERU
PHILIPPINES
POLAND
PORTUGAL
SINGAPORE
SLOVAK REPUBLIC
SPAIN
SRI LANKA
ST. LUCIA
ST. VINCENT
SWEDEN
SWITZERLAND
TONGA
UGANDA
UNITED KINGDOM
UNITED STATES
VIET NAM

EUROPEAN COMMISSION VOICE INTERNET POLICY

INTERNET TELEPHONY IN GENERAL FALLS OUTSIDE THE DEFINITION OF VOICE TELEPHONY AND NO SPECIAL LICENSE IS REQUIRED

DATA AND TEXT VS VOICE

- SOME COUNTRIES HAVE CHOSEN TO PROMOTE INTERNET FOR TEXT AND DATA SERVICES BUT NOT FOR VoIP
- MOTIVE MAY BE TO PROTECT INCUMBENT OPERATORS FROM POTENTIAL COMPETITION
- THOSE OPERATORS MAY BE ILL-PREPARED FOR THE FUTURE GLOBAL ENVIRONMENT

CONVERGENCE TO INTERNET

- **TREND IS TOWARDS THE CONSOLIDATION OF VOICE, VIDEO AND DATA SERVICES IN THE INTERNET**

- **PROGRESS TOWARD THIS CONSOLIDATION WILL BE VIA DEVELOPMENTS SUCH AS UBIQUITOUS BANDWIDTH, INCREASED EASE OF USE, GREATER CONNECTIVITY AND IMPROVED SECURITY**

NEW INTERNET MULTIMEDIA APPLICATIONS

SOFTWARE TO DOWNLOAD:

- MUSIC
- PHOTOGRAPHS
- GAMES AND ENTERTAINMENT TO MOBILE WIRELESS DEVICES
- LOCATION-BASED MAPPING
- PORTABLE DOCUMENT FORMAT (.PDF)
- LINUX
- VIRUS PROTECTION
- INTERACTIVE MESSAGING

DIGITAL DIVIDE

- ONLY 5 TO 6 % OF THE WORLD HAS ACCESSED INTERNET AND 90 % OF THEM ARE IN INDUSTRIALIZED COUNTRIES

- AFRICA AND MIDDLE EAST ACCOUNT FOR JUST 1 % OF INTERNET USERS

PROBLEM AND SOLUTIONS

PROBLEM:

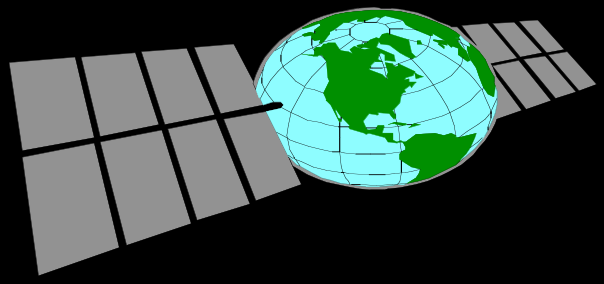
TECHNOLOGY HAS WIDENED THE DIGITAL DIVIDE BETWEEN DEVELOPED AND DEVELOPING COUNTRIES.

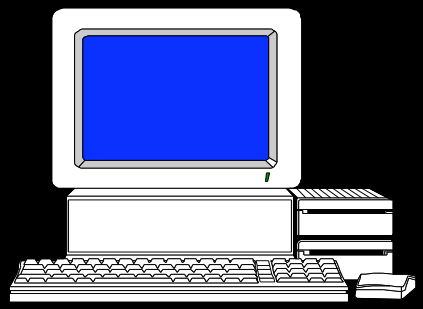
SOLUTION: *

1. **IMPROVE EDUCATIONAL SYSTEMS, AND**
2. **EXPAND TELECOMMUNICATION NETWORKS**

***ILO at the World Economic Forum, Davos, 2001**

SATELLITE AND INTERNET INDUSTRIES STAND TO MUTUALLY BENEFIT





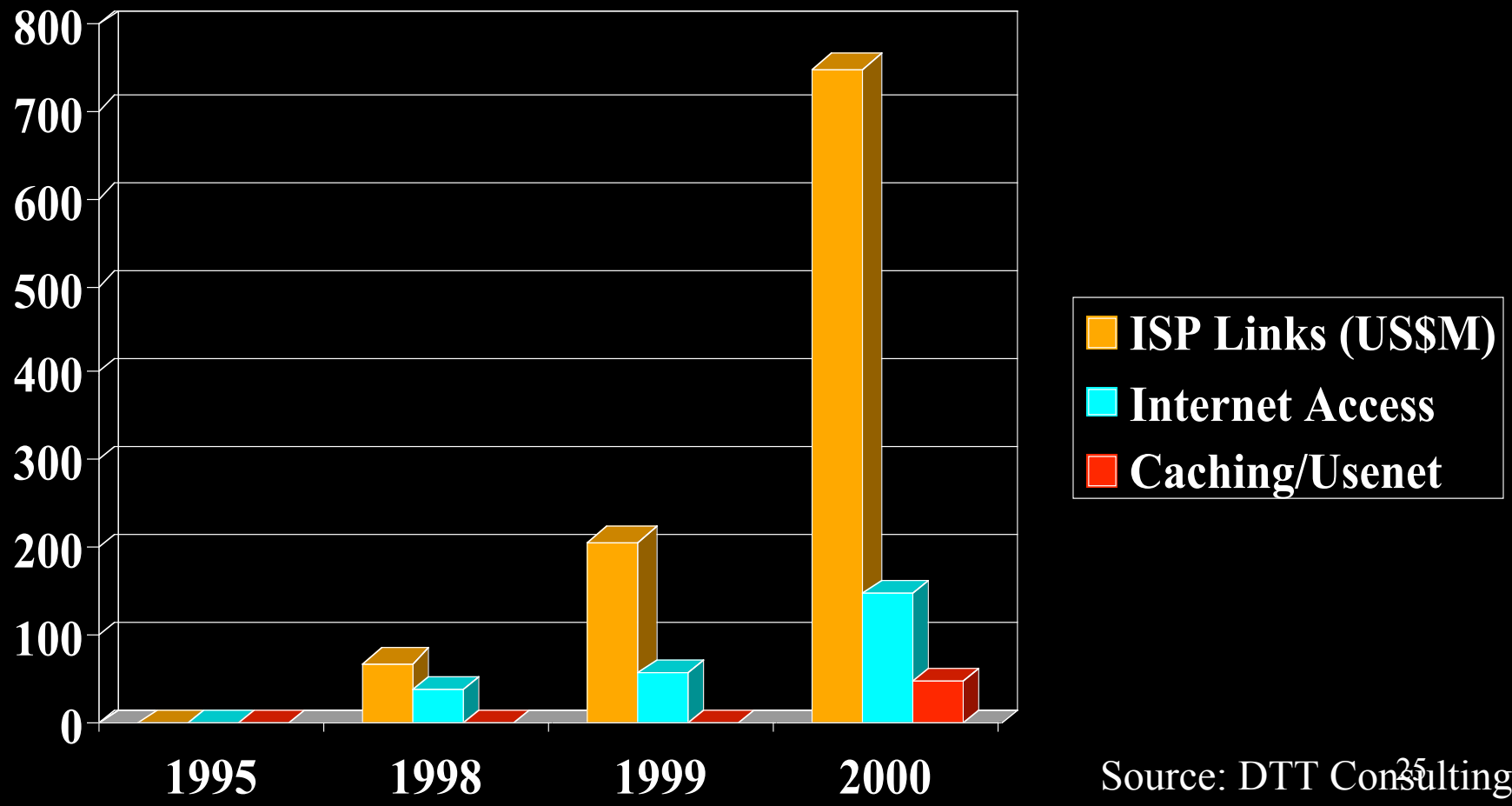
- Satellites represent the only Internet access alternative in many rural areas and developing nations.
- Satellites provide instant infrastructure to ISPs.
- Satellites provide a cost advantage over wireline networks in areas with sparse population.
- Satellites provide an efficient means of Internet access for customers with asynchronous Internet usage patterns and from the ability to multicast content.
- Satellites allow residential and business customers to bypass the local loop with speeds higher than the transmission rate received through a standard phone line.

- Internet transmission represents fastest growing segment of the FSS industry. (Source: Merrill Lynch)
- Internet traffic over satellites doubles every six months. (Source: Industry Reports).
- Internet traffic is projected to constitute a major revenue stream for the new generation of satellite systems in the Ka and V bands.

WTO AGREEMENT

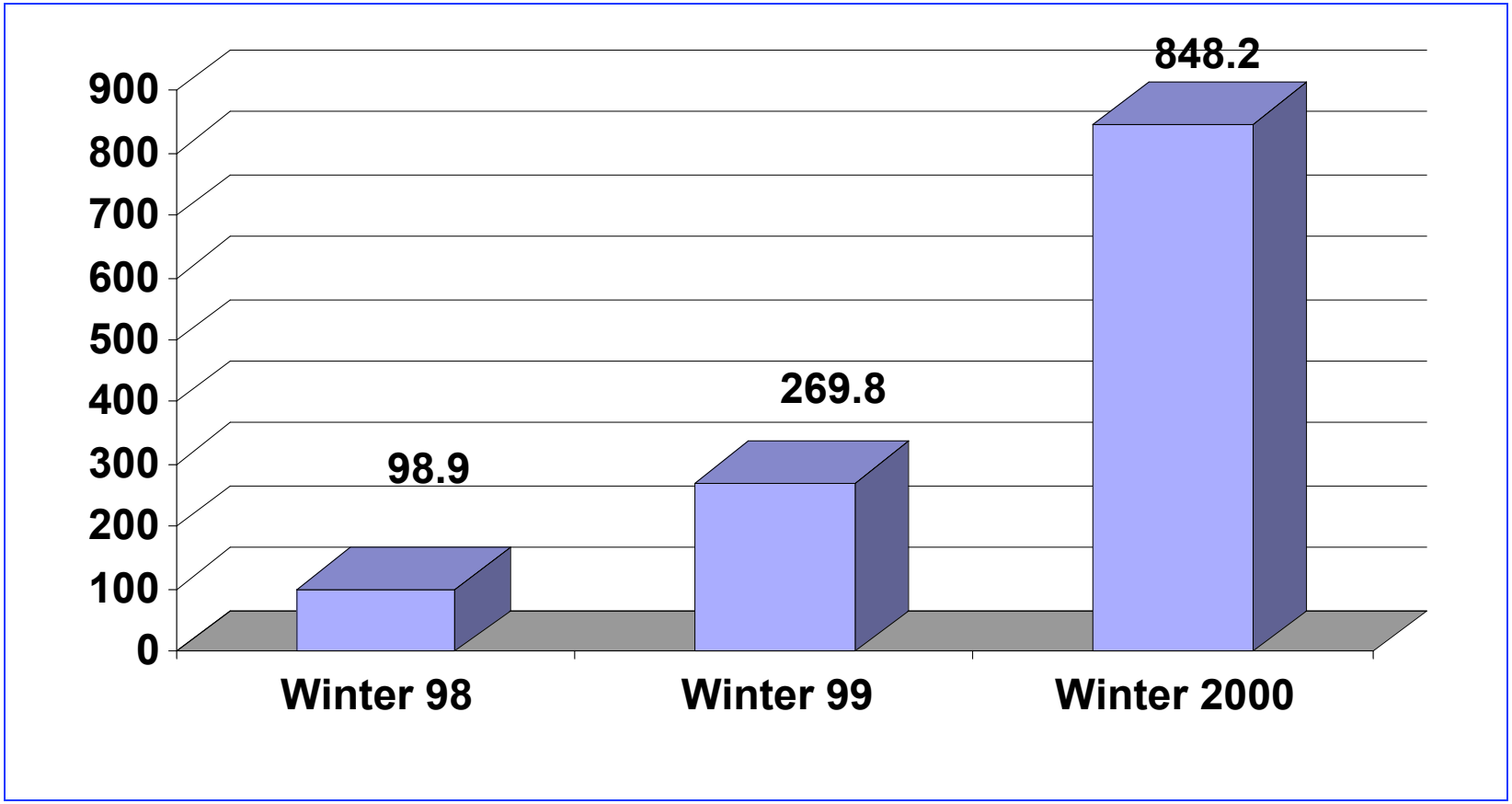
- **OPENS MARKETS FOR BASIC TELECOMMUNICATION SERVICES, INCLUDING SATELLITE SERVICES OTHER THAN DTH, DBS, AND DARS SERVICES**
- **OPENS MARKETS FOR SATELLITE SERVICES IN 49 COUNTRIES WHICH REPRESENT 80% OF TOTAL GLOBAL MARKET FOR SATELLITE SERVICES**
- **AGREEMENT SHOULD FOSTER INTERNET VIA SATELLITE INDUSTRY**

IP VIA SATELLITE: A SERVICE EMERGES

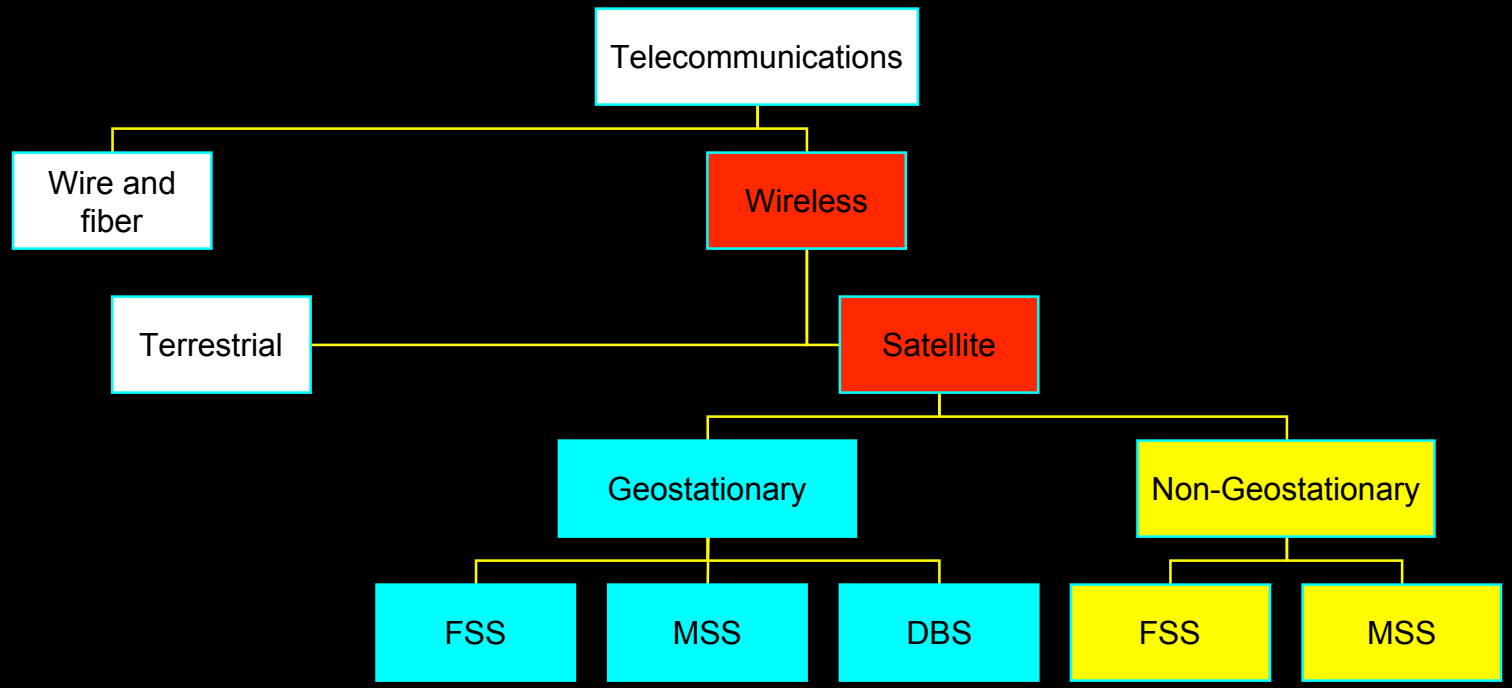


Source: DTT Consulting

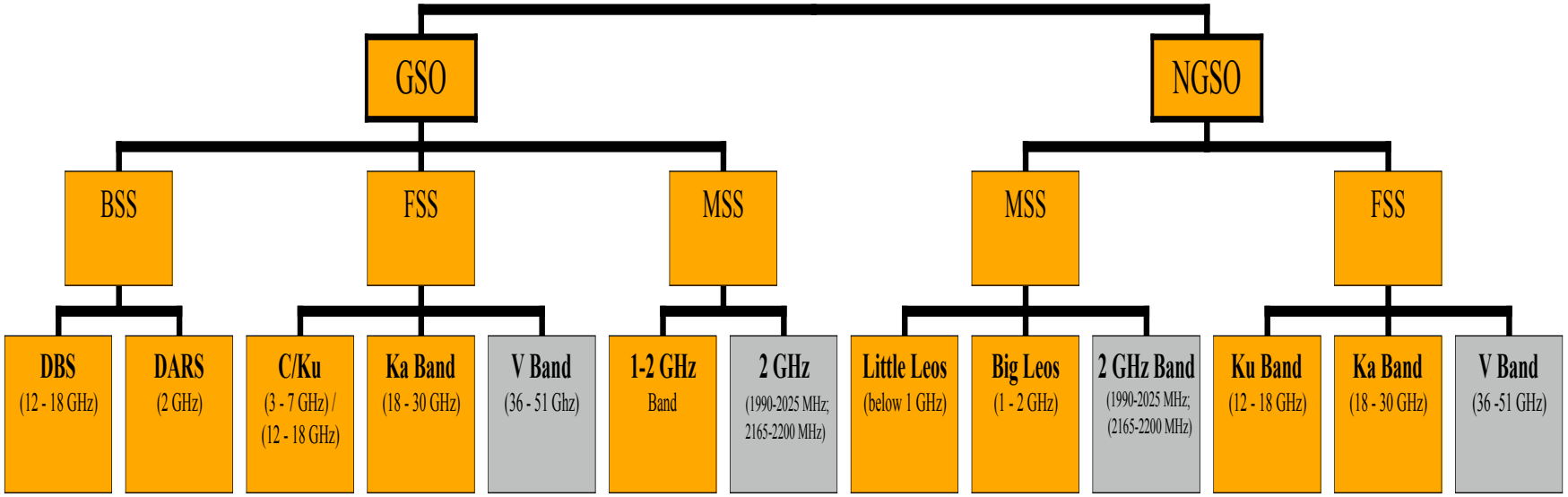
VALUE OF IP VIA SATELLITE MARKET



TELECOMMUNICATIONS AND SATELLITES

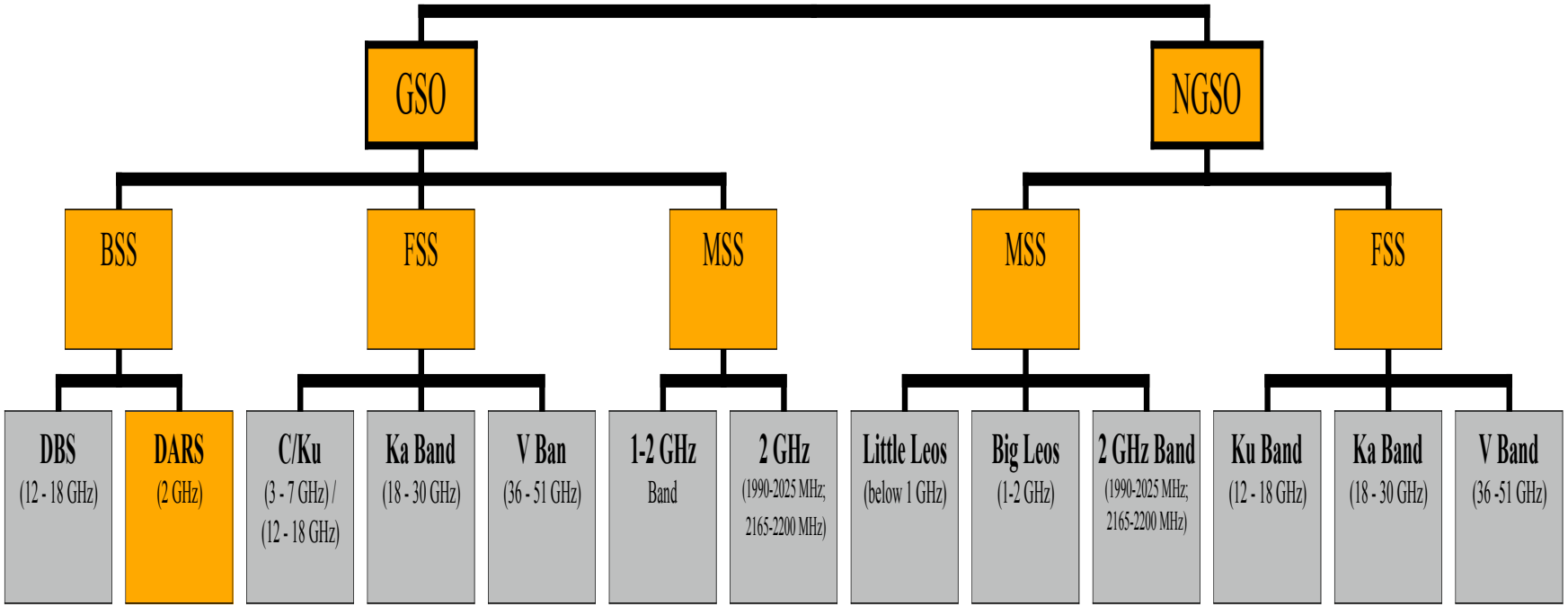


SATELLITE INDUSTRY STRUCTURE BY BANDS



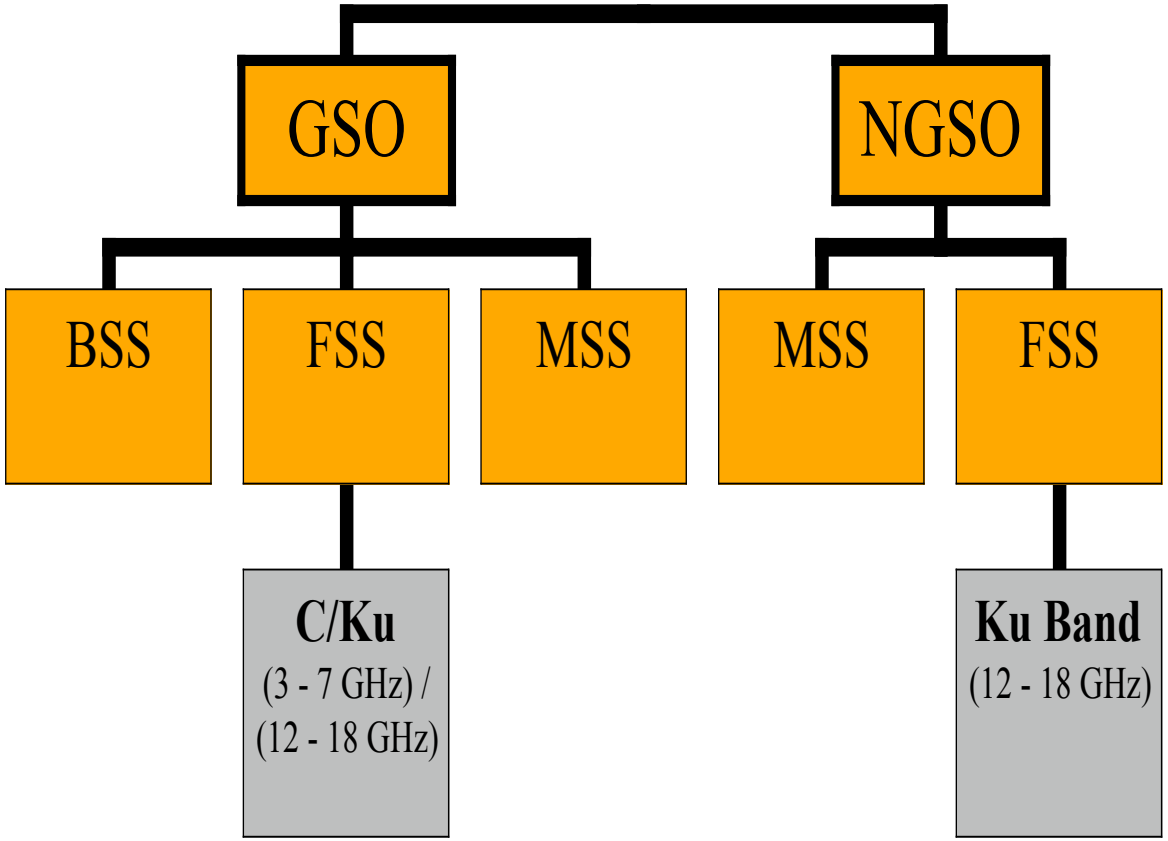
No licenses have been issued yet.

BANDS CURRENTLY OFFERING OR EXPECTING TO OFFER SOME TYPE OF INTERNET SERVICE



Internet Bands

C & Ku BAND



- C and Ku Bands used by GSO satellites account for most of the Internet traffic today
- Thirty-three 36 MHz equivalent transponders devoted to Internet service

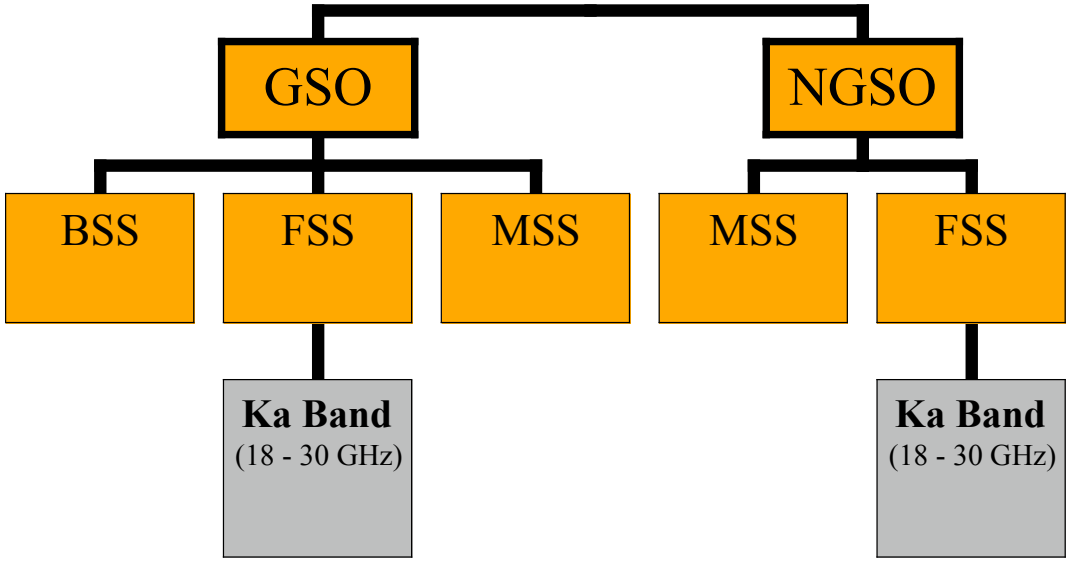
(Source: DTT consulting).

- 70% of new transponder leases are Internet related

•(Source: LMGT)

- Direct-to-consumer Internet access quickly emerging

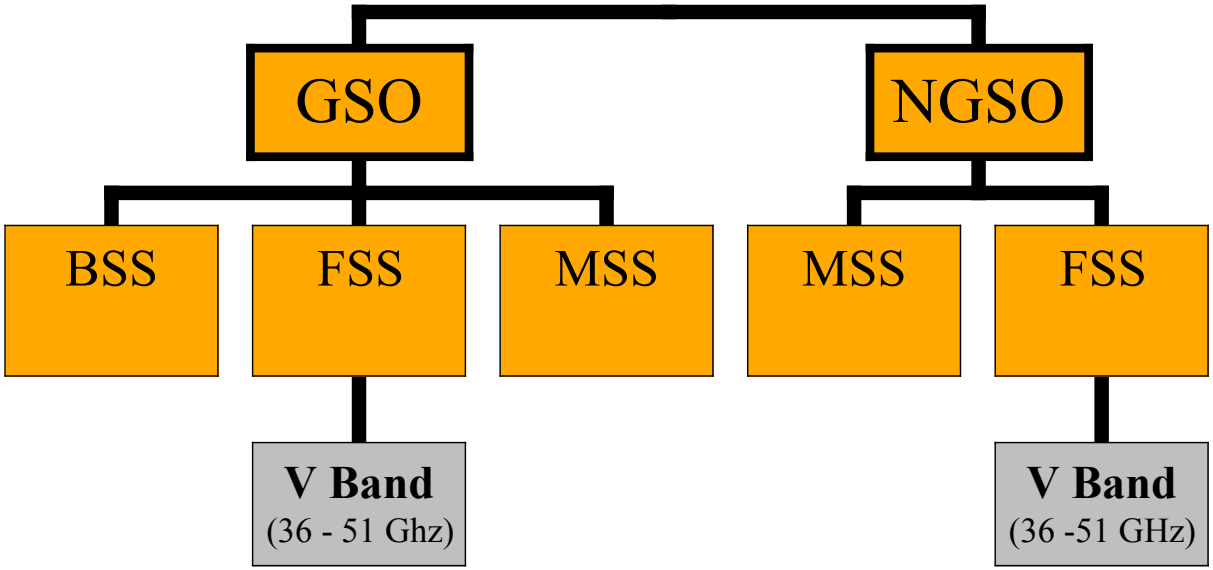
Ka BAND



- Alternative to highly congested C and Ku Bands
- Ka band systems promise advanced, high speed networks at speeds 64 Mbps and over
- Proposed services: high speed Internet & Intranet access; data trunking; video conferencing; distance learning; tele-medicine; private data networks
- Currently 9 licensed GSO systems, and 3 pending applications for NGSO

- Recall “Teledesic” (LEO System) – license returned

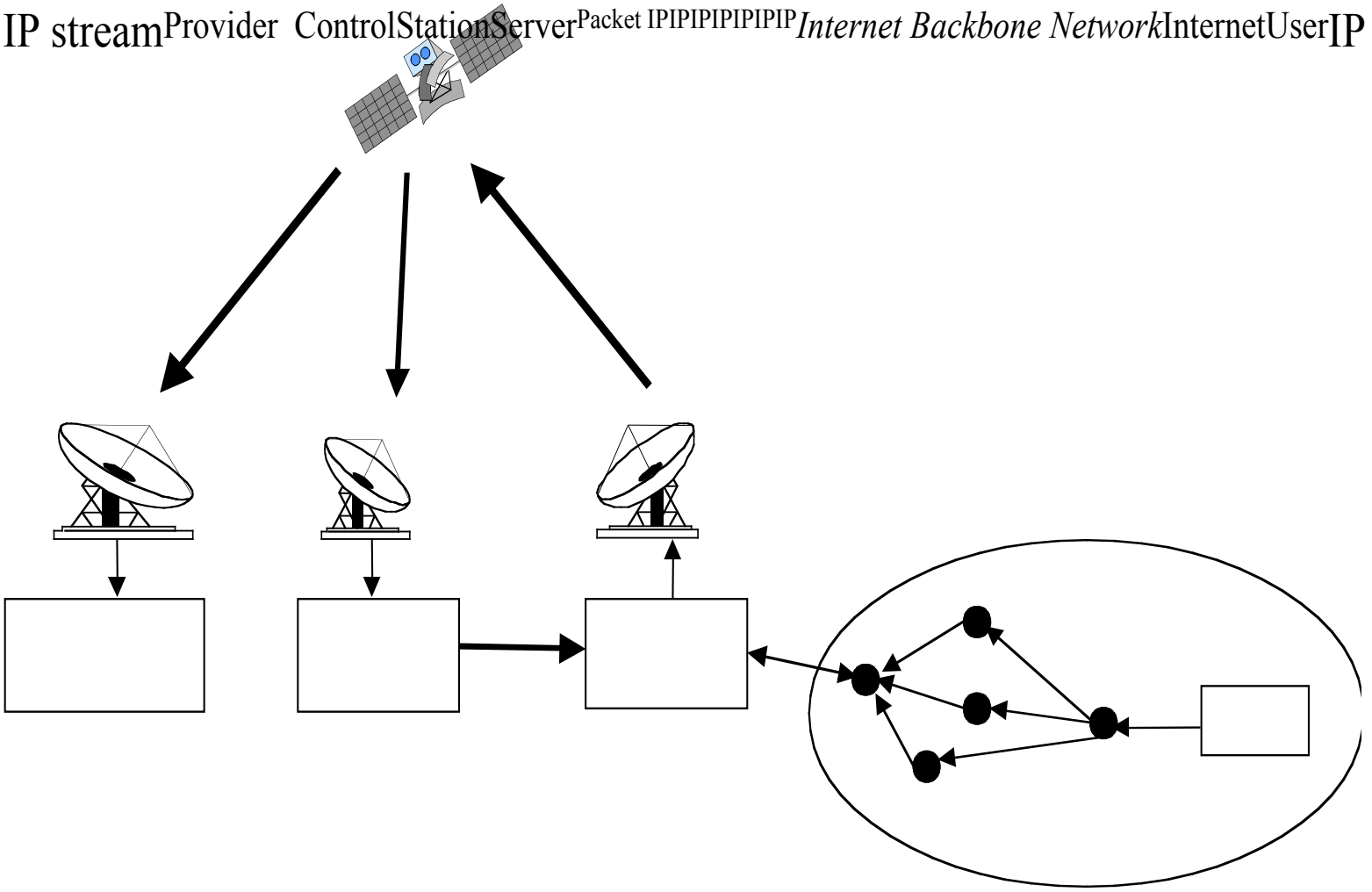
V BAND



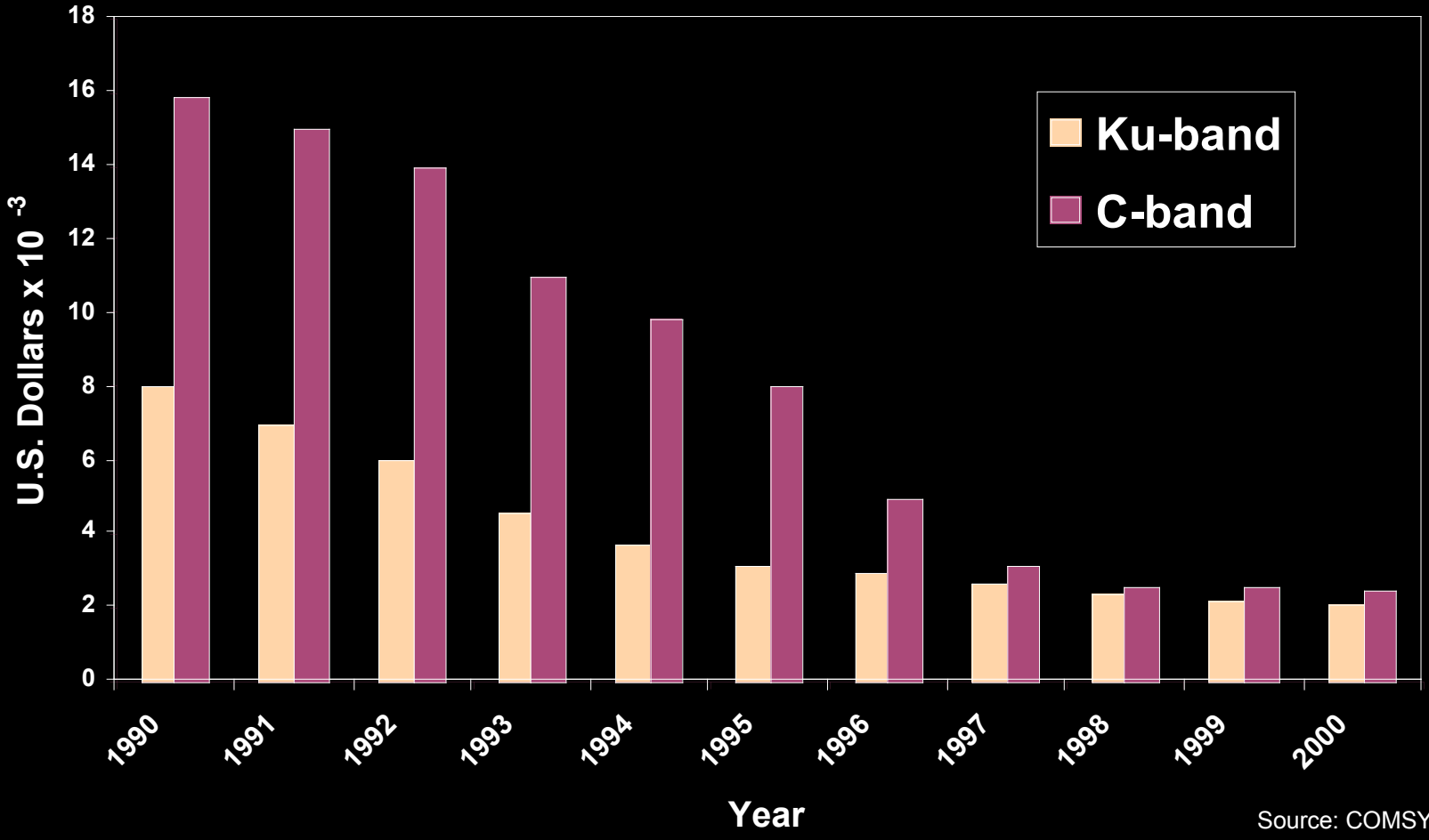
- 16 applicants originally requesting V band spectrum, down to 6 now (2 GSO and 4 NGSO)
- Proposed speeds of 64 Mbps and higher
- Proposed services similar to Ka band offerings, including high speed Internet access & Intranet; data trunking; video-conferencing
- Industry analysts believe the V band systems are likely to supplement the Ka systems currently in development

SATELLITE DTV AND IP

IP stream Provider Control Station Server Packet IPIPIPIPIPIPIP *Internet Backbone Network* Internet User IP



VSAT TERMINAL PRICING TRENDS



Source: COMSYS

INTERNET ACCESS VIA SATELLITE (GSO)

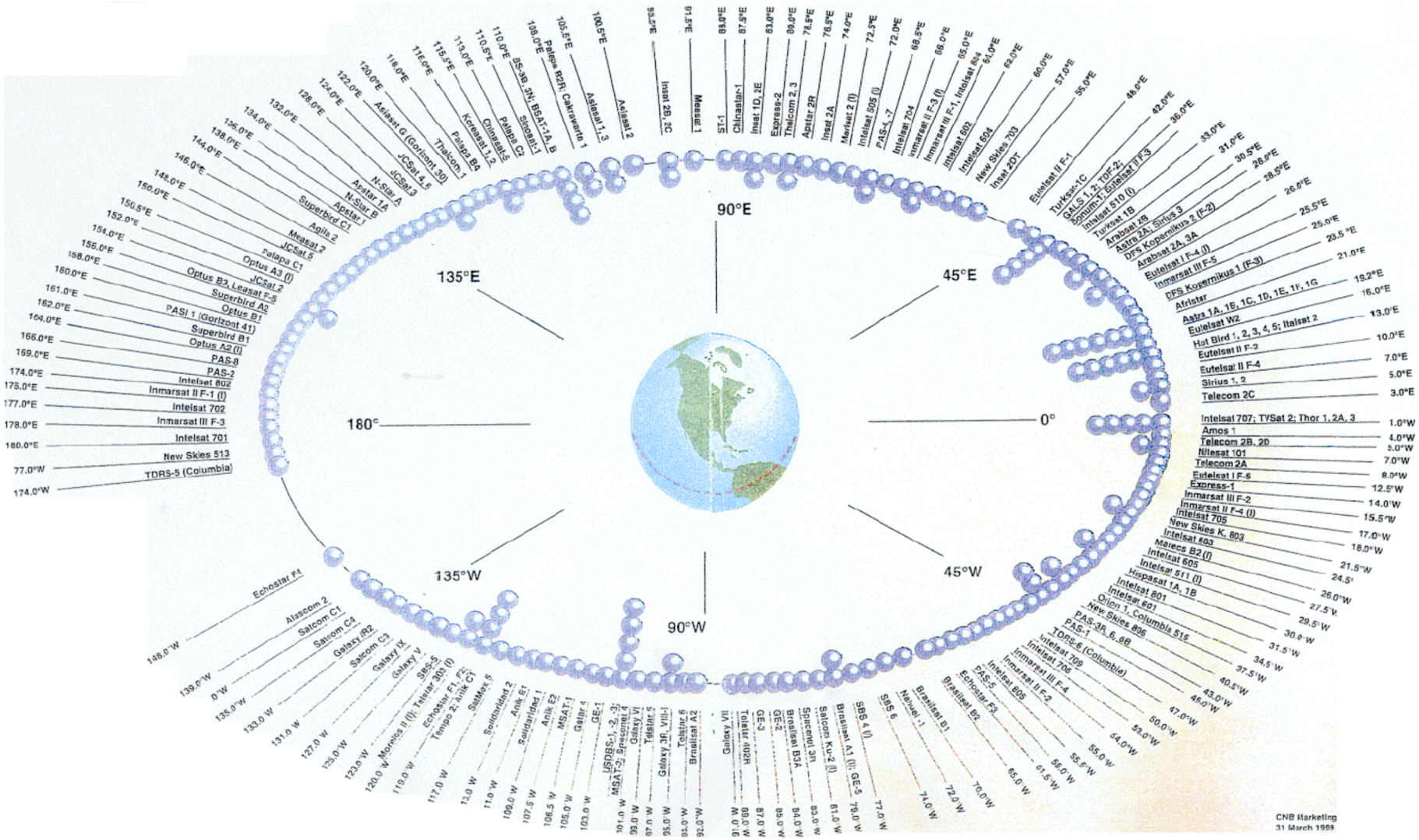
GILAT - - FIRST TO SERVICE (V-SAT)

STARBAND - - YEAR 2000

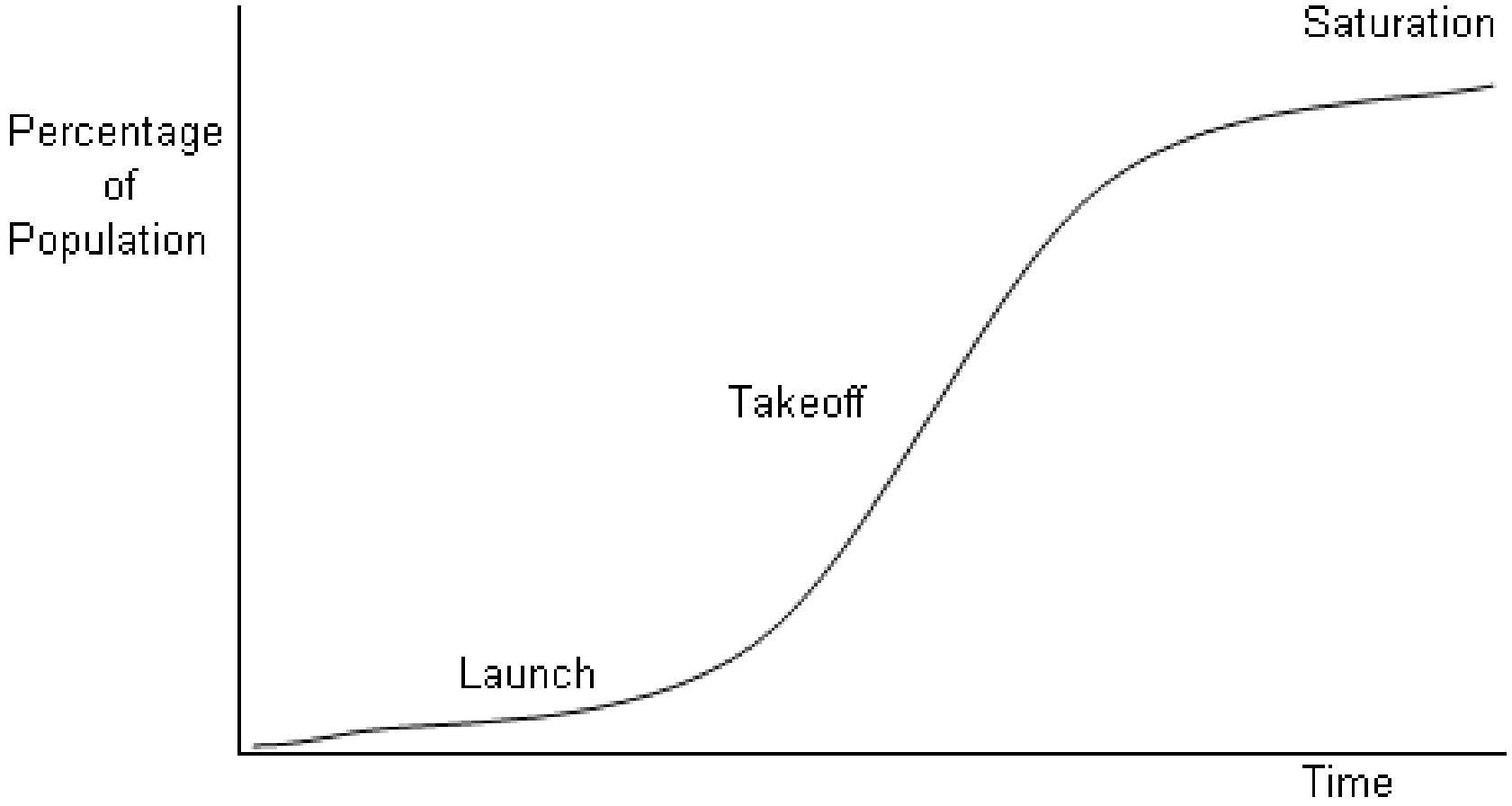
DIRECT PC - - YEAR 2000

BOEING CONNEXION (AIRCRAFT) - - 2003

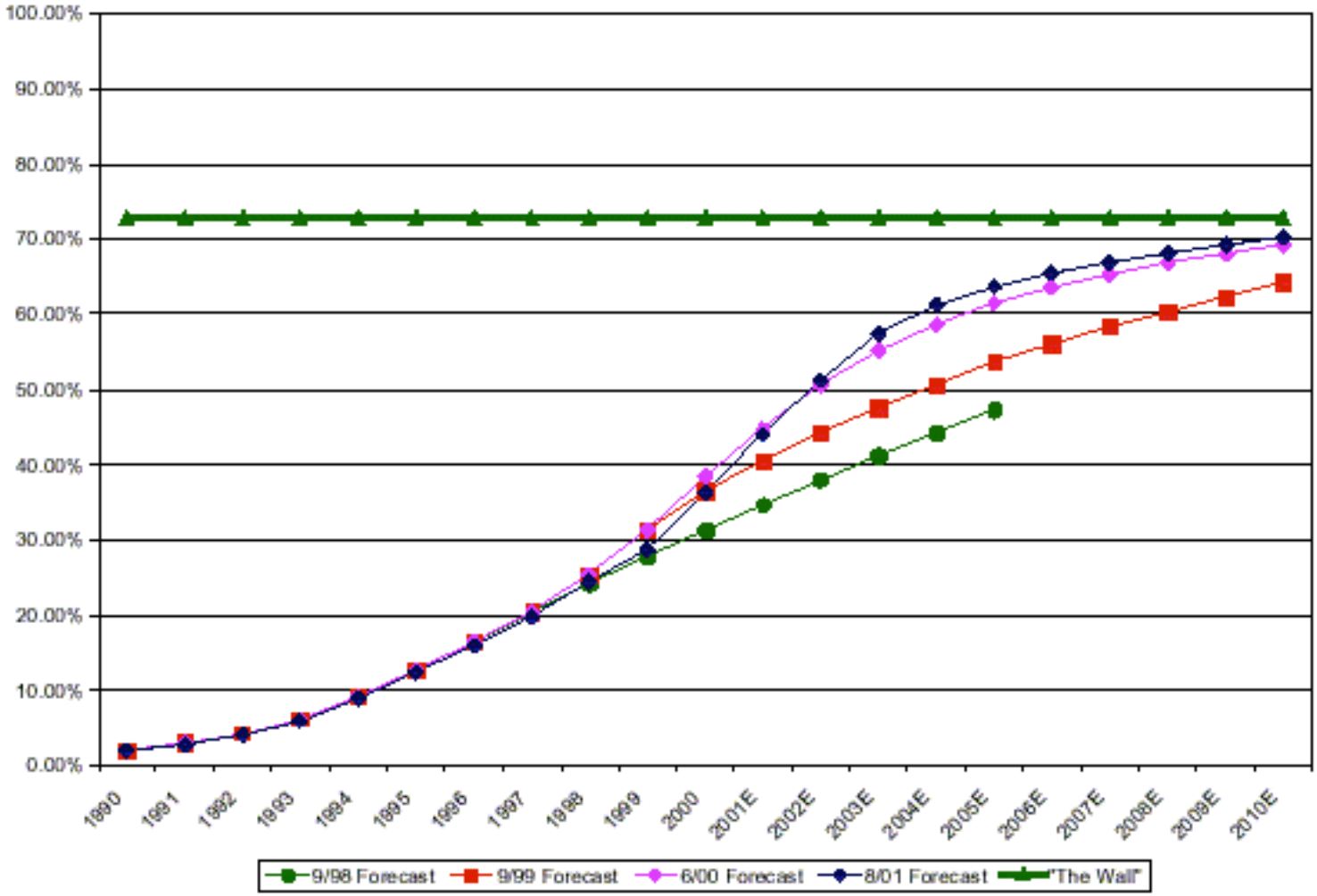
GEOSTATIONARY ORBIT SATELLITES



GENERIC "S-CURVE"

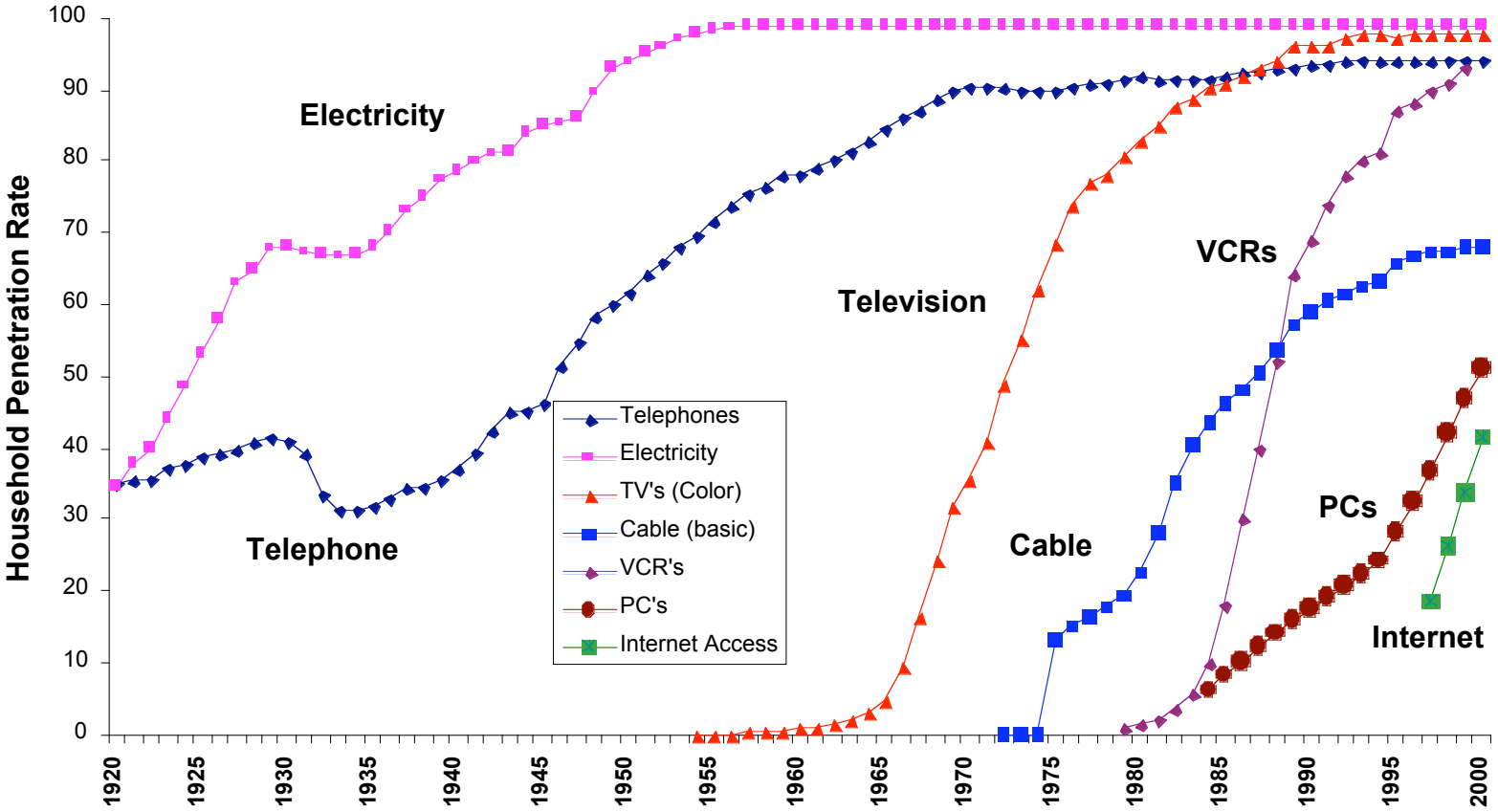


GROWTH OF U.S. WIRELESS PENETRATION



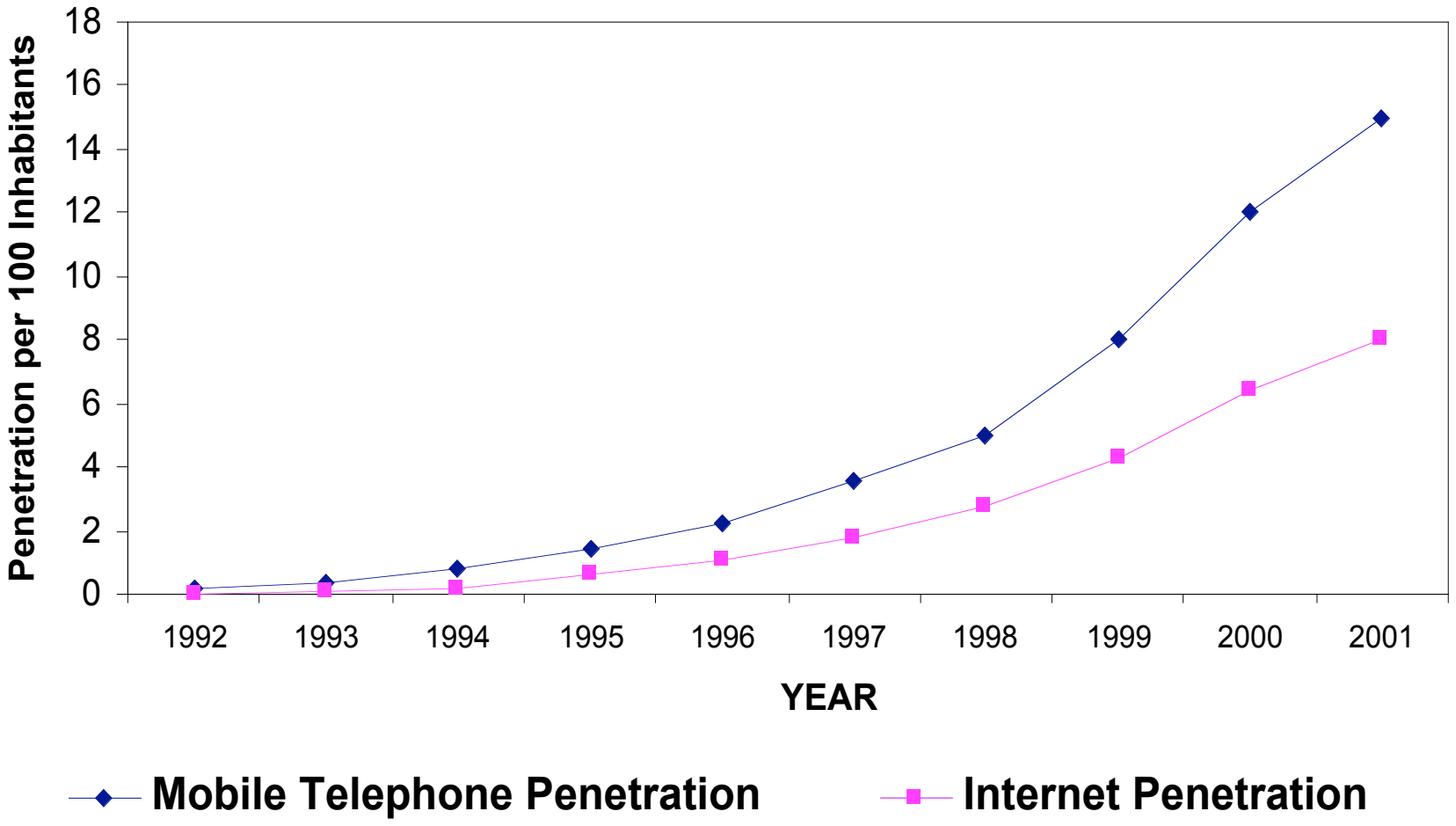
Source: CTIA, 1990 and 2000 Census, and RJA estimates.

"S-CURVES" FOR VARIOUS TECHNOLOGIES



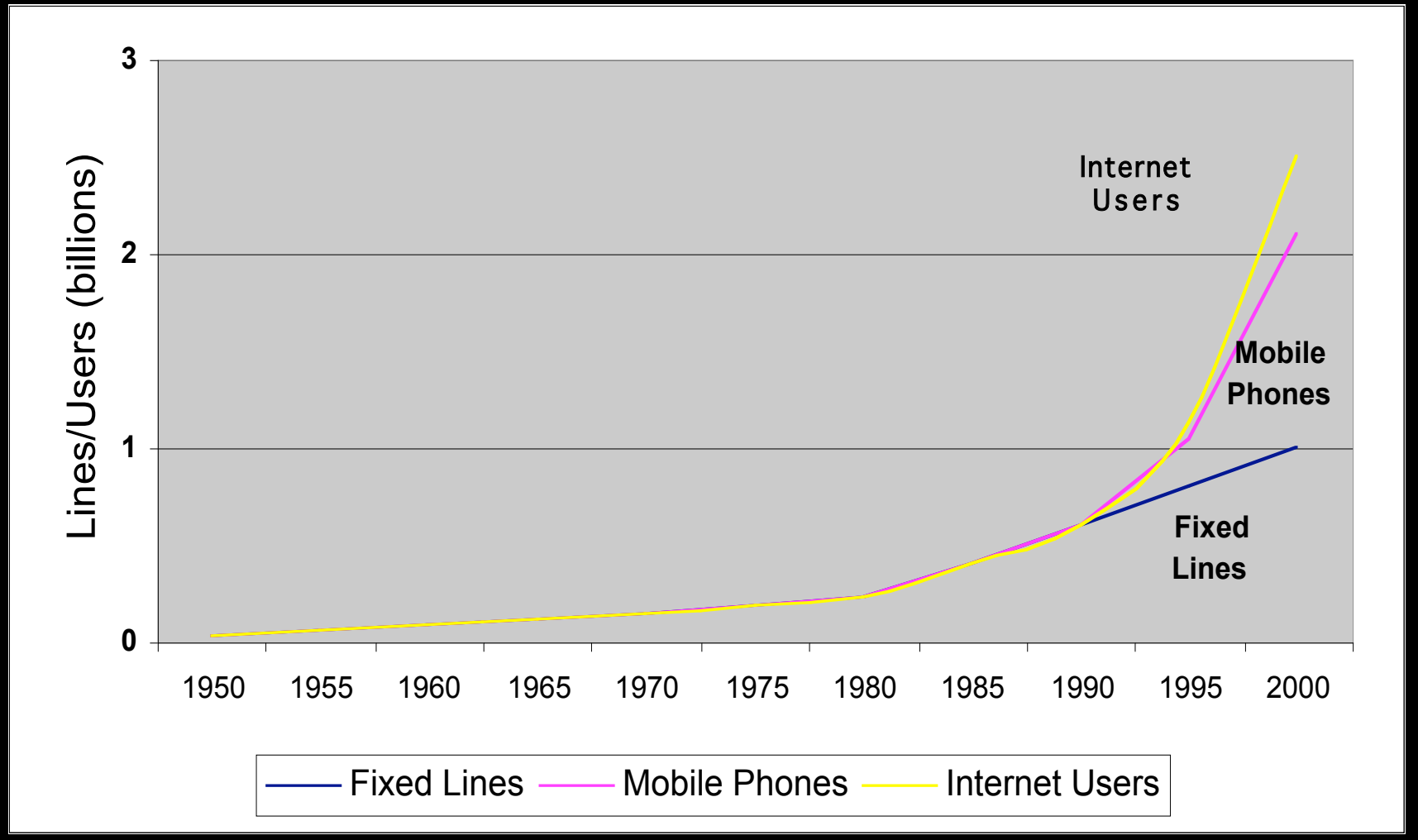
Sources: Telephone and electricity industry data from 1920-1970 from Historical Statistics of the United States: Colonial Times to 1970, Part 2, p. 783. 1970-present and from Statistical Abstract of the United States, various years. Cable data from A.C. Nielsen Co. data as reported by the National Cable Television Association (NCTA). VCR, PC, and TV data from Consumer Electronics Association, E-Brain (http://www.ebrain.org/). Internet data from U.S. Department of Commerce (http://www.ntia.doc.gov/ntiahome/fttn00/chartscontents.html).

GLOBAL DIGITAL MOBILE AND INTERNET PENETRATION



Source: ITU World Telecommunication Indicators Database.

GLOBAL S-CURVES: 1950-2001



Source: ITU World Telecommunication Indicators Database.

WWW SITES OF INTEREST

WWW.CNN.COMWWW.ERO.DKWWW.IARU.ORGWWW.I

SATELLITE PROBLEM

INTERESTING FACTS:

About 180 satellites in geostationary orbit

Tangential velocity on Earth at the equator is about 1000 m/h (0.44 km/s)

Tangential velocity at GSO is about 6575 m/h (3 km/s)

RELEVANT FACTS:

Diameter of Earth = 8000 miles (12,800 km)

Geostationary orbit (GSO) above Earth = 22,300 miles (35,680 km)

International (ITU) standard for GSO stationkeeping is +/- 0.1 degree N-S and E-W (now subject to further study for debris ammelioration)

QUESTION:

What is the approximate probability of a collision between GSO satellites given a requirement for 2 degree satellite spacing?

ONE SIMPLE SOLUTION

- CALCULATE ANGULAR DISTANCE (CONSIDER AS LINEAR) FOR 2 DEGREES AT GSO
- ASSUMING +/- 0.1 DEGREE TO DEFINE A STATIONKEEPING SOLID ANNULAR RING (CYLINDER), CALCULATE VOLUME OF THE CYLINDER
- ASSUME SATELLITES CAN BE REPRESENTED BY A CYLINDER OF 50 m LENGTH AND 4 m DIAMETER, CALCULATE RATIO OF VOLUMES OF THE TWO CYLINDERS