TOPICS FOR DISCUSSION
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• ICT PROBLEMS, SOLUTIONS, FACTORS AND POLICIES – WHY?
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• ICT PROBLEMS, SOLUTIONS, FACTORS AND POLICIES – WHY?
• ECONOMICAL ICT TECHNOLOGY
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1. IMPROVE EDUCATIONAL SYSTEMS, AND
2. EXPAND TELECOMMUNICATION NETWORKS
INFORMATION AND COMMUNICATIONS TECHNOLOGY FACTORS FOR ACCESS

SOURCE: ITU.
• IT IS UNDERSTOOD THAT MARKET SOLUTIONS WILL NOT ENSURE THE EXPANSION OF NETWORKS TO ECONOMICALLY LESS VIABLE (RURAL) AREAS OR TO DISABLED INDIVIDUALS
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ICT POLICY OBJECTIVES
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- FOSTER COMPETITIVE AND INNOVATIVE INTERNET CONNECTION, AND MULTIMEDIA INDUSTRIES
ICT POLICY OBJECTIVES

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WHY?
ICT POLICY *ROUGHLY CORRELATES TO ECONOMY*
ICT POLICY ROUGHLY CORRELATES TO ECONOMY*

- 19% OF QATAR’S POPULATION USES THE INTERNET; PER CAPITA INCOME - $20,700
- 17% OF CAYMAN ISLANDS’ POPULATION USES INTERNET; PER CAPITA INCOME - $35,000
- 1% OF SYRIA’S POPULATION USES THE INTERNET; PER CAPITA INCOME - $1,160
- < 1% OF GHANA’S POPULATION USES THE INTERNET; PER CAPITA INCOME - $270


- FEBRUARY 2005 REPORT TO EU COMMISSION
LOW-COST COMPUTERS AND MOBILE HANDSETS*

MIT MEDIA LABORATORY HAS DEVELOPED AN EXPERIMENTAL LAPTOP USING LINUX, A 1 GBYTE SOLID-STATE MEMORY (NO HARD DISC), LOW-COST BATTERIES WITH HAND-CRANK CHARGER, AND LOW-COST MINIATURE REAR PROJECTION SCREEN (HALF THE COST OF A LAPTOP TODAY IS THE SCREEN).

COST ≈ $100

GSM ASSOCIATION HAS DEVELOPED A LOW-COST HANDSET IN RESPONSE TO DEMAND FROM DEVELOPING COUNTRIES. STATED GOAL IS “TO HELP CONNECT THE UNCONNECTED PEOPLE OF THE WORLD”. EIGHTEEN OPERATORS AND MANUFACTURERS (AIS, BHARTI, COMPAL, COMPEQ, GLOBE, INFINEON, MAXIS, MOTOROLA, NOKIA, ORASCOM, ROYAL PHILIPS, SAMSUNG, SINGTEL, SMART, TECHFAITH, TELENOR, TEXAS INSTRUMENTS, AND TURKCELL) ARE PARTICIPATING IN THIS INITIATIVE. SIX MILLION PHONES ARE BEING DISTRIBUTED IN THE FIRST PHASE OF THIS PROGRAM CALLED “EMERGING MARKET HANDSET INITIATIVE”.

COST GOAL < $40 (ACTUAL = $46, DEPENDING ON TAXES)
(SEEKING A UNIT THAT COSTS < $30)
WORLDWIDE INTERNET AND MOBILE PENETRATION PER 100 POPULATION

SOURCE: ITU WORLD TELECOMMUNICATION INDICATORS DATABASE, 2004

ITU, DEC. 2004: ICT WORLDWIDE VALUE = $1.1 TRILLION
INTERNET?
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.
INTERNET USERS
(JUNE 2004)

ASIA-PACIFIC  223 MILLION
NORTH AMERICA  175 MILLION
EUROPE  173 MILLION
OTHER  129 MILLION

GLOBALLY  700 MILLION
(OUT OF 6.4 BILLION - -

11%)
• TREND IS TOWARDS THE CONSOLIDATION OF VOICE, VIDEO AND DATA SERVICES IN THE INTERNET
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• PROGRESS TOWARD THIS CONSOLIDATION WILL BE VIA DEVELOPMENTS SUCH AS UBIQUITOUS BANDWIDTH, INCREASED EASE OF USE, GREATER CONNECTIVITY AND IMPROVED SECURITY
INTERNET BANDWIDTH GROWTH

SOURCE: TELEGRAPHY RESEARCH, GLOBAL INTERNET GEOGRAPHY 2004
MAJOR DOMAINS*

- .ASIA
- .AERO
- .ARPA
- .BIZ
- .COM - 47%
- .COOP
- .COUNTRY CODES: (.de - 12%
  and .uk – 8%)
- .EDU
- .EU
- .GOV
- .MOBI
- .INFO
- .INT
- .JOBS**
- .MAIL
- .MIL
- .MUSEUM
- .NAME
- .NET – 7%
- .ORG – 4%
- .PRO
- .TEL
- .XXX (PENDING)

*BOTH JAPANESE AND CHINESE CHARACTERS ARE NOW IN
INTERNET CONCERNS
INTERNET CONCERNS

FRAUD - AUTHENTICITY
INTERNET CONCERNS

FRAUD - AUTHENTICITY
CYBERSTALKING OR VOYERISM
INTERNET CONCERNS

FRAUD - AUTHENTICITY
CYBERSTALKING OR VOYERISM
GAMBLING
INTERNET CONCERNS

FRAUD - AUTHENTICITY
CYBERSTALKING OR VOYERISM
GAMBLING
MONEY LAUNDERING
INTERNET CONCERNS

FRAUD - AUTHENTICITY
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FRAUD - AUTHENTICITY
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INTERNET CONCERNS

FRAUD - AUTHENTICITY
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SPAM
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SPAM
QUALITY
INTELLECTUAL PROPERTY RIGHTS
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SPAM
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INTELLECTUAL PROPERTY RIGHTS
VIRUSES
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VIRUSES
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INTERNET CONCERNS

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VIRUSES
CULTURE
SECURITY (PRIVACY)
INTERNET CONCERNS

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DRUG TRAFFICKING
PORNOGRAPHY
TAXES
SPAM
QUALITY
INTELLECTUAL PROPERTY RIGHTS
VIRUSES
CULTURE
SECURITY (PRIVACY)
WIRELESS NUMBER DIRECTORY
WHAT IS VoIP / INTERNET VOICE?

VOICE OVER INTERNET PROTOCOL (VoIP) ALLOWS TELEPHONE CALLS USING A COMPUTER NETWORK -- A DATA NETWORK, LIKE THE INTERNET:

– VoIP CONVERTS THE VOICE SIGNAL FROM YOUR TELEPHONE INTO A DIGITAL SIGNAL THAT TRAVELS OVER THE INTERNET THEN CONVERTS IT BACK AT THE OTHER END SO YOU CAN SPEAK TO ANYONE WITH A REGULAR PHONE NUMBER.

– WHEN PLACING A VoIP CALL USING A PHONE WITH AN ADAPTER, YOU'LL HEAR A DIAL TONE AND DIAL JUST AS YOU ALWAYS HAVE.

– VoIP ALSO ALLOWS YOU TO MAKE A CALL DIRECTLY FROM A COMPUTER USING A CONVENTIONAL TELEPHONE OR A MICROPHONE.
VOICE OVER INTERNET PROTOCOL

VoIP IS NOT JUST ANOTHER WAY OF PROVIDING TRADITIONAL TELEPHONE SERVICE. IT IS A NEW APPLICATION ON A NEW KIND OF NETWORK THAT WILL CREATE NEW OPPORTUNITIES FOR BUSINESSES AND CONSUMERS. VoIP WILL RAISE STANDARDS ISSUES THAT NEED SOLUTIONS SUCH AS:

• ARRANGEMENTS FOR FINANCE / PSTN CONNECTION
• SUPPORTING EMERGENCY RESPONSE NEEDS OF PUBLIC SAFETY AUTHORITIES, ESPECIALLY AS RELATED TO THE RESPONSE LOCATION
• VoIP TECHNOLOGIES HELPING ACCESSIBILITY AND USABILITY OF COMMUNICATIONS NETWORKS BY PERSONS WITH DISABILITIES
• SECURITY AND LEGAL ISSUES NEED RESOLUTION IN RESPONSE TO APPROPRIATE LEGAL REQUIREMENTS
• OTHER STANDARDS ISSUES RAISED BY VOIP
IP FOR PERSONS WHO ARE DEAF

IP BROADBAND (DSL OR CABLE MODEM) CAN SUPPORT VIDEO CALLING, AND BECAUSE A PC CAN BE USED FOR VIDEO, IN MANY CASES THE ONLY COST TO THE CONSUMER IS A USB VIDEO CAMERA

1 IP VIDEO CALLING WILL LIKELY BECOME WIDELY USED IN THE NEAR FUTURE, BOTH FOR BUSINESS AND HOME CALLERS
1 THIS WILL BENEFIT THE DEAF AND HARD-OF-HEARING COMMUNITIES, AS THEY WILL BE ABLE TO USE SIGN LANGUAGE AND LIP READING ON VIDEO CALLS, AND AFFORD THE INEXPENSIVE HARDWARE

GALLAUDET UNIVERSITY IS ALREADY EXPERIMENTING WITH VIDEO CALLING, AND EVEN HAS INSTALLED MANY "VIDEO TELEPHONE BOOTHS" ON ITS CAMPUS, FOR STUDENTS TO MAKE IP VIDEO CALLS TO EACH OTHER.
VoIP FOR PERSONS WHO ARE BLIND

Technology and cost limitations of PSTN phones create barriers for access by blind users (for example, a blind user cannot see a display with caller ID on it).

VoIP "phones" can actually be created by installing a software-based telephone onto a standard PC with audio card and speakers, and then can be easily and cheaply customized for accessibility features.

- PCs (Windows and Apple) already have quite a bit of existing "accessibility features" that the VoIP softphone can take advantage of, such as text-to-speech for audible caller ID and message waiting indication.
- It is much cheaper to make a blind-accessible telephone based on a PC, than to create special hardware for a standalone phone, and this makes blind-friendly telephones affordable for more users.
PSTN AND IP TELEPHONY
PSTN AND IP TELEPHONY

• PSTN IS BASED ON CIRCUIT-SWITCHED TECHNOLOGY, EVOLVED AS A VOICE NETWORK (HIGHLY REGULATED)
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)
PSTN AND IP TELEPHONY

• PSTN IS BASED ON CIRCUIT-SWITCHED TECHNOLOGY, EVOLVED AS A VOICE NETWORK (HIGHERLY REGULATED)

• INTERNET BASED ON PACKET-SWITCHED TECHNOLOGY, EVOLVED AS A DATA NETWORK (LARGELY UNREGULATED)

• INTERNET IS HEADED TO REPLACE THE PSTN BY A “NEXT GENERATION NETWORK” (NGN) – ITU-T STUDY GROUP 13
VoIP AND PSTN RELATIVE COSTS
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• IP TELEPHONY (VoIP) CAN BE OFFERED AT PRICES SIGNIFICANTLY BELOW THOSE FOR PSTN TELEPHONY
VoIP AND PSTN RELATIVE COSTS

- IP TELEPHONY (VoIP) CAN BE OFFERED AT PRICES SIGNIFICANTLY BELOW THOSE FOR PSTN TELEPHONY
- PSTN PRICING IS DISTANCE-SENSITIVE WHILE PRICING OF IP TELEPHONY IS LARGELY INDEPENDENT OF DISTANCE (LIKE SATELLITE COMMUNICATIONS)
VoIP AND PSTN RELATIVE COSTS

• IP TELEPHONY (VoIP) CAN BE OFFERED AT PRICES SIGNIFICANTLY BELOW THOSE FOR PSTN TELEPHONY

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• VoIP TODAY MEANS A TRADE-OFF BETWEEN QUALITY AND COST
## VoIP vs SWITCHED CIRCUIT NETWORK COST

<table>
<thead>
<tr>
<th>SOLUTION</th>
<th>INVESTMENT</th>
<th>CAPACITY</th>
<th>ADVANTAGES</th>
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<tbody>
<tr>
<td>CLASS 5 SWITCH</td>
<td>US $20 MILLION</td>
<td>20,000 LINES</td>
<td>• QUALITY</td>
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<td>• PROVEN TECHNOLOGY</td>
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<tr>
<td>INTERNET POP</td>
<td>US $0.1 MILLION</td>
<td>400,000 MINUTES PER MONTH</td>
<td>• EFFICIENCY</td>
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<td>• NEW SERVICES POTENTIAL</td>
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<td></td>
<td></td>
<td>• SCALABILITY</td>
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<tr>
<td>IP FULL OPERATION</td>
<td>US $3 TO 5 MILLION</td>
<td>35 MILLION MINUTES PER MONTH</td>
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### TRADITIONAL TELCO SWITCH

### IP TELEPHONY

### IP TELEPHONY
VoIP PERMITTED

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<tr>
<th>Angola</th>
<th>Guatemala</th>
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64/189
GLOBAL INTERNATIONAL TRAFFIC
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- VoIP APPEARS TO HAVE A NOTABLE IMPACT IN LATIN AMERICA, WHERE SWITCHED TRAFFIC VOLUMES DECREASED IN 2002.

- VoIP TRAFFIC TO INDIA, PAKISTAN, AND BANGLADESH MORE THAN DOUBLED IN 2003 OVER 2002
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- VoIP IS STILL PRIMARILY USED TO BYPASS HIGH SETTLEMENT RATES IN DEVELOPING COUNTRIES
FIXED LINE TRAFFIC GROWTH
2001 TO 2002

NOTES: GLOBAL TRAFFIC WAS 155.2 BILLION MINUTES IN 2002. DATA DO NOT INCLUDE VoIP TRAFFIC.

SOURCE: TELEGRAPHY RESEARCH 2003
MOBILE AND FIXED TELEPHONE SUBSCRIBERS (WORLDWIDE) AS A FUNCTION OF YEARS HAS PROVEN

Source: ITU World Telecommunication Indicators Database and ITU projections.
2002 GLOBAL MOBILE TERMINAL SHIPMENTS (1000’s) BY TECHNOLOGY

SOURCE: WWW.STRATEGYANALYTICS.COM
<table>
<thead>
<tr>
<th>Economy</th>
<th>Growth Rate (%)</th>
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<tbody>
<tr>
<td>Benin</td>
<td>121.8</td>
</tr>
<tr>
<td>Tanzania</td>
<td>122.7</td>
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<td>Tunisia</td>
<td>122.8</td>
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<tr>
<td>Malawi</td>
<td>129.4</td>
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<tr>
<td>Morocco</td>
<td>133.4</td>
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<tr>
<td>Uganda</td>
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<tr>
<td>Kenya</td>
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<tr>
<td>Egypt</td>
<td>169.0</td>
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<tr>
<td>Seychelles</td>
<td>209.7</td>
</tr>
</tbody>
</table>

Source: ITU Internet Reports 2002: Internet for a Mobile Generation.
MOBILE SUBSCRIBERS IN AFRICA (MILLIONS)

Source: ITU Internet Reports 2002: Internet for a Mobile Generation.
MOBILE SUBSCRIBERS IN THE AMERICAS
(MILLIONS)

Source: ITU Internet Reports 2002: Internet for a Mobile Generation.
WORLD TRADE ORGANIZATION (WTO) AND TELECOMMUNICATION TRADE LIBERALIZATION

• WTO MEMBERSHIP ALLOWS MEMBERS TO MAKE BINDING TREATY COMMITMENTS IN SPECIFIC SECTORS, INCLUDING TELECOMMUNICATIONS SERVICES

• GENERAL AGREEMENT ON TRADE IN SERVICES (GATS) AS OF OCTOBER 2003:
  – 105 WTO MEMBERS HAVE MADE SPECIFIC GATS COMMITMENTS IN SOME OR ALL ASPECTS OF TRADE IN TELECOMMUNICATIONS SERVICES
  – 98 IN BASIC TELECOMMUNICATIONS; ORIGINAL COMMITMENTS IN 1997 KNOWN AS BASIC TELECOM AGREEMENT

SOURCE: ITU TELECOMMUNICATIONS INDICATORS
WTO AND TELECOMMUNICATIONS SERVICES

- WTO REFERENCE PAPER, ADOPTED BY MAJORITY OF MEMBERS MAKING COMMITMENTS IN BASIC TELECOMMUNICATIONS, IMPOSES OBLIGATIONS REGARDING:
  - COMPETITIVE SAFEGUARDS
  - INTERCONNECTION
  - UNIVERSAL SERVICE
  - LICENSING
  - REGULATOR INDEPENDENCE
  - SCARCE RESOURCE ALLOCATION (E.G., NUMBERS, SPECTRUM)

SOURCE: ITU TELECOMMUNICATIONS INDICATORS
WHY GATS COMMITMENTS IN TELECOMMUNICATIONS SERVICES ARE UNIQUE

- GATS COMMITMENTS IN TELECOMMUNICATIONS ENTAIL COMPLEX DOMESTIC SECTORAL REFORMS, INCLUDING THE INTRODUCTION OF COMPETITION AND THE ESTABLISHMENT OF AN EFFECTIVE REGULATOR AND REGULATIONS

- FUNCTIONS AS A MULTILATERAL INVESTMENT AGREEMENT, GRANTING RIGHTS TO THE SERVICE SUPPLIERS OF OTHER WTO MEMBERS, ALLOWING SOME FOREIGN OWNERSHIP AND CONTROL IN TELECOMMUNICATIONS

- WTO REFERENCE PAPER FUNCTIONS AS A MULTILATERAL AGREEMENT REGARDING COMPETITION REGULATION, IMPOSING A COMMON SET OF PRO-COMPETITIVE REGULATORY PRINCIPLES
WHY GATS COMMITMENTS IN TELECOMMUNICATIONS MATTER TO DEVELOPING COUNTRIES

• COMMITMENTS FUNCTION AS A WELL-KNOWN SIGNALING DEVICE TO INVESTORS AND FOREIGN SERVICE SUPPLIERS

• COMMITMENTS CAN CREATE MOMENTUM FOR FURTHER DOMESTIC SECTOR REFORM, AND IT CAN ALSO ANCHOR THOSE REFORMS WITHIN AN INTERNATIONAL LEGAL FRAMEWORK TO GUARD AGAINST POLICY REVERSAL

• DEPENDING ON SPECIFICS, COMMITMENTS COULD PROMOTE CONSUMER WELFARE AND TELEDENSITY, COMPETITION, AND PRIVATIZATION INITIATIVES
EFFECT OF WTO ON GROWTH OF FIXED LINES IN SUB-SAHARAN AFRICA

- COUNTRIES WITH WTO TELECOMS COMMITMENTS PERFORM BETTER
  - GREATER FIXED LINE PENETRATION
  - FASTER GROWTH

- COUNTRIES WITHOUT BASIC TELECOM COMMITMENTS HAVE GREATER FIXED LINE PENETRATION IF THE INCUMBENT IS PRIVATIZED
EFFECT OF WTO ON GROWTH OF MOBILE LINES IN SUB-SAHARAN AFRICA

- COUNTRIES WITH BASIC TELECOM COMMITMENTS HAVE GREATER MOBILE SUBSCRIPTION
- COUNTRIES WITHOUT BASIC TELECOM COMMITMENTS HAVE GREATER PENETRATION IF THERE IS COMPETITION IN MOBILE

![Graph showing cellular subscribers per 100 population over years](chart.png)

YEAR

CELLULAR SUBSCRIBERS PER 100

WTO TELECOMS COMMITMENT (ALL COMPETITIVE)

NO WTO TELECOMS COMMITMENT - COMPETITIVE

NO WTO TELECOMS COMMITMENT - NON-COMPETITIVE


0.000 0.500 1.000 1.500 2.000 2.500 3.000 3.500 4.000 4.500
EFFECT OF WTO ON REVENUES IN SUB-SAHARAN AFRICA

- COUNTRIES WITH BASIC TELECOM COMMITMENTS PERFORMED BETTER
  - GREATER SECTOR REVENUES THAN COUNTRIES WITHOUT BASIC TELECOM COMMITMENTS
  - FASTER GROWTH RATES
WTO CONCLUSIONS

- GATS COMMITMENTS ACT AS A MECHANISM FOR A COUNTRY TO ATTRACT MORE PRIVATE SECTOR INVESTMENT
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• AS EXISTING COMMITMENTS ARE FURTHER IMPLEMENTED AND NEW COMMITMENTS MADE, MORE REFINED METRICS WILL BE AVAILABLE TO FURTHER SUBSTANTIATE THESE FINDINGS
MOBILE SATELLITE TERMINAL COST TREND

SOURCE: INMARSAT
“ALL GOVERNMENT, INDEED EVERY HUMAN BENEFIT AND ENJOYMENT, EVERY VIRTUE, AND EVERY PRUDENT ACT, IS FOUNDED ON COMPROMISE…”

- Edmund Burke -

Irish philosopher, 1775