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<th>Special challenges for satellite communication.</th>
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SPECIAL CHALLENGES FOR SATELLITE COMMUNICATION

By

ALBERT CHUNG

Paper No. 8
Preface

- Introduction & History
- Growth in Satellite Communication Systems
- INTELSAT Overview
- Satisfying Customer Demands
- INTELSAT's Fleet & Services
The Evolution of Telecommunication

- the (first) wire age 1840 - 1900
- the wireless telegraphy age
- the age of sound broadcasting 1920
- the age of television broadcasting 1939 to current
- the satellite age.....to the future

The Satellite Age

Arthur C. Clarke’s vision in 1945:

The artificial satellite at the correct distance from the earth would make one revolution every 24 hours (ie. remaining stationary at the same spot). Three repeater stations, 120 degrees apart in the correct orbit could give television and microwave coverage to the entire planet.
The Launches begun.....

- Sputnik satellite launched by the then USSR in 1957, but not in geosynchronous orbit
- Comsat was set up in 1962 in the USA
- INTELSAT was founded in 1964
- INTELSAT launched its first communication satellite called the Early Bird on 2 April 1965; the first to be parked at the geosynchronous orbit
- Many other satellite launches were to follow....

Traffic Tariff Changes

- From selling traffic by the mile as was the custom with wireless telegraphy;
- Switched to selling satellite capacity by time in minutes, hours, weeks, months and years; round distance of 70,000km on uplink and downlink
Drivers for the Market Growth

- Deregulation
- Privatization
- Sheer size and geographic diversity
- Poor conventional infrastructure
- Modernization programs for rural and remote areas
- Massive economic growth

Satellite Orbits

Presented by Albert Chung
Some Milestones.....

1945 Arthur C Clarke makes prophecy
1957 Sputnik 1 was launched into lower earth orbit (LEO)
1960 Echo 1 & 2 were launched by USA (LEO)
1965 Early Bird was launched by INTELSAT (GEO)
1967 INTELSAT 2 was launched
1969 INTELSAT 3 was launched
1970 The 3 INTELSAT satellites, spaced at 120° provided global communication; Clarke’s prophecy was realised

Evolution of Satellite Telecommunications

INTELSAT

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Evolution of Satellite Telecommunications

What is INTELSAT?

瘐 INternational TELEcommunications SATellite Organization

瘐 Located in Washington D.C.
INTELSAT... an Introduction

❖ Our Pedigree
  - Founded in 1964 by 11 member countries under International treaty

❖ First
  - Launched world’s first communications satellite

❖ Largest
  - Connects over 200 countries, territories and dependencies worldwide
INTELSAT... an Introduction

Now

- World's largest "highway in the sky"
- 26 satellites with 6 additional spacecrafts on order
- 142 Members countries
- International, regional and domestic communications
- 3 times the experience of closest competitor
- Plans to double capacity in next two years

The INTELSAT Core Mission

To provide advanced telecommunications services throughout the world on a non-discriminatory basis.
Current Satellites in Orbit

Launch Schedule
Operating Revenues by Product - 1996

Total Operating Revenues - $904M

- Broadcast
- Private Network
- Restoration
- PSN


US$ in Millions


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Customer Investment in Earth Segment

Estimated in excess of $6 Billion

Satisfying Customer Demands

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Contents

- What are customers demanding now?
- What technological path is INTELSAT following?
- New challenges: The future

Technological Trends

- Convergence of technologies:
  - telecommunications,
  - broadcasting,
  - entertainment, and
  - computer industries

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Customers Demands:
Part I

In applications:
- Multimedia
- Digital video
- Internet
- High-speed data

Customers Demands:
Part II

In resources:
- lower tariffs
- bigger bandwidths
- integrated infrastructure for delivering of different services
Customers Demands: Multimedia

- Video, (VHS quality or better)
- Audio, (CD quality)
- Text (or hypertext)
- Graphics (high resolution)... and *highly interactive*

Customers Demands: Digital Video

- Interactive DTH (and Pay Per View services)
- Video conference (high quality)
- Interactive entertaining
- Interactive business applications: Telemedicine, Training, Telework, Shared databases, etc.
Customers Demands:
Internet

- Multimedia content
- High quality of service
- Worldwide access
- Faster response

What Technological Path is INTELSAT Following?

- Transition towards new state-of-the-art spacecraft
- Support satellite-based high-speed data solutions (ATM, Frame Relay)
- Support standardization of Digital TV codec inter-working
- Smaller antennas

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Worldwide ATM Revenues (billions)
Source: Data Communications Magazine, September 1997

Customers Demands:
High-Speed Data; Revenues of Frame Relay (billions)  Source: INTELSAT
Number of Internet Hosts (and growing)
Source: Network Wizards, www.nw.com

Total Satellite Ground Segment Equipment
Market: Unit Shipment (World) 1996-2000
Source: Via Satellite Magazine, July 1997
New Challenges:
The Future

- Increase satellite power to reduce antenna sizes
- Increase spectral efficiency (bits/s/Hz)
- Support convergence of technologies:
  - telecommunications,
  - broadcasting,
  - entertainment, and
  - computer industries

Some Customer Demands.....
Banking Network

Rural Telephony

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Reservation Network

Banking and Financial Services
Direct-to-Home

Interactive Television
Videoconference

Network Application
Telemedicine

Training and Educational Network
Mobile/Transportable Applications

Satellite News Gathering

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Direct-to-Aircraft

D.T.A.

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Internet .... Telecom 95 retrospective

INTELSAT Standard E-3 hub
INTELSAT Headquarters.
Washington D.C.

1 M Kuband VSAT
2 M kbit/s BPSK modulated, sequentially coded, 1/2 rate.

INTELSAT

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a TELECOM 95 retrospective .......

INTELSAT/TELECOM '95
Frame Relay via Satellite Pilot Service Demonstration

The INTELSAT SATELLITE-BASED FRAME RELAY DATA NETWORKING demonstration provides instantaneous access to the following applications:
1. PC-based videoconferencing
2. file sharing and transfers
3. INTERNET access
4. electronic mail
5. telephone/FAX connection

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INTELSAT Capacity for Asia Pacific

1. **IOR**
   - IS-703 at 57°E
   - IS-604 at 60°E
   - IS-602 at 62°E
   - IS-801 at 64°E
   - IS-704 at 66°E

2. **APR**
   - APR-1 at 83.5°E (Q1 1998)
   - K-TV at 95°E (Q1 1999)

3. **POR**
   - IS-802 at 174°E
   - IS-702 at 177°E
   - IS-701 at 180°E

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INTELSAT Space Segment

- Low cost
- Flexible Leases
  - 100 KHz to Full Transponder
- 1 year to 15 year term
- High gain setting for VSAT applications
- High reliability of 99.99%
- System integrity

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INTELSAT Advantages

- Leader in satellite telecommunications industry
- Space segment reliability level of over 99.99%
- Global connectivity
- Alternative capacity in event of launch failure
- Customer training through INTELSAT's Application Support and Training Programs
- Free feasibility study for customer's tailored network

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the end