Data Broadcasting - What Is It?

Yesterday

Today

Tomorrow

Multimedia Content

Internet / Network

Broadcast Channels

Variety/Complexity

Multimedia Content

Terrestrial

CABLE

SATELLITE

Terrestrial

CABLE

SATELLITE

Terrestrial

CABLE

SATELLITE

Terrestrial

CABLE

SATELLITE

Terrestrial

CABLE

SATELLITE

Terrestrial

CABLE

SATELLITE
MPEG Transport Stream - A Versatile Network

- Progressive but rapid evolution of broadcast channels towards MPEG2-Transport Stream
  - Satellite (70 %)
  - Cable (30 %)
  - Terrestrial (10 %)
- Various applications:
  - Video/Radio
  - Interactive TV
  - Data Broadcasting
  - Internet
**Internet Protocol (IP)**
The Most Common Form of Data

<table>
<thead>
<tr>
<th>IP Header - 20 bytes</th>
<th>TCP Header - 20 bytes</th>
<th>Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>Includes the source and destination IP addresses</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**IP Datagram**

TCP/IP Data contained within the IP datagram
Delivering IP over MPEG

**IP-to-MPEG Gateway**

<table>
<thead>
<tr>
<th>Application (e.g., FTP, HTTP, SMTP, etc.)</th>
<th>IP-to-MPEG Gateway</th>
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<tr>
<td>TCP</td>
<td>Ethernet (FDDI, Token Ring)</td>
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<td>MPEG Transport</td>
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- **Application** (e.g., FTP, HTTP, SMTP, etc.)
- **TCP**
- **UDP**
- **IP**
- **Ethernet** (FDDI, Token Ring)
- **MPEG Transport**
Methods of IP Encapsulation

- Data Delivery Types
  - Asynchronous Data
  - Synchronous Data
  - Synchronized Data

- Encapsulation Methods
  - Data Piping
  - Data Streaming
  - Addressable Section
Data Piping

or

IP Datagram ≤ 184 bytes

184 ≤ IP Datagram ≤ 368 bytes

MPEG

0xFF

4 Bytes

Stuffing, as needed

4 Bytes

MPEG

0xFF

4 Bytes

Stuffing, as needed
Data Streaming

IP Datagram ≤ 180 bytes  or  180 ≤ IP Datagram ≤ 364 bytes

MPEG  PES  or  MPEG  PES

4 Bytes Adaptation Field
4 Bytes
4 Bytes Adaptation Field
Addressable Section

IP Datagram 1
≤ 171 bytes

184 ≤ IP Datagram 2

Section 1

Section 2

Section 3...
Architectures

- **Unicasting**
  - Distribute content to a single user
  - Data is private and usually at the request of the user
    - e.g., Internet service

- **Multicasting**
  - Distribute content to a “broad audience”
  - Only those who join the multicast group access the content
  - Conserves bandwidth when content is desired by multiple users
Data Broadcasting Standards

- Advanced Television Systems Committee (ATSC) - Data Broadcast Standard, Doc. A/90
  
  http://www.atsc.org

- DVB - Specification for data broadcasting EN 301 192
  
  http://www.dvb.org/standards/index.html

- Content Specific Standards
  - OpenTV (Proprietary)
    
    http://www.opentv.com

  - ATVEF - Advanced Television Enhancement Forum
    
    http://www.atvef.com

  - ATSC DASE (Data Application Software Environment)
    
    Coming Soon

  - Multimedia Home Platform (MHP) - DVB TS 101 812
    
    http://www.dvb.org/standards/index.html
Broadcaster Needs

- Reliability
  - Cannot afford to interrupt the main program

- Flexibility
  - No *applied* business models yet
  - Need to preserve the ability to grow in any and all directions

- Multiple content insertion points
  - Need to have capability for primary and secondary diffusion
  - Local content creation
  - Local content control (editing)
Multicast Architecture

Studio

Satellite Receiver

SMPTE310M

Turquoise

OPENMUX

Pearl/Opal

Multicast Server

Ethernet

DVB-ASI

Amber Remux

DVB-ASI

Amethyst

DVB-ASI

SMPTE310M

Turquoise

Customer Premises

Receiver

Receiver Card

Transmitter Site

Transmitter
MPEG and IP Crossroads

<table>
<thead>
<tr>
<th>HTML / HTTP</th>
<th>MPEG2</th>
</tr>
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<tbody>
<tr>
<td>Unicast Applications</td>
<td>Multicast Applications</td>
</tr>
<tr>
<td>TCP</td>
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<td>IP</td>
<td></td>
</tr>
<tr>
<td>Ethernet</td>
<td>MPEG2-TS</td>
</tr>
<tr>
<td>LAN</td>
<td>Terrestrial / Satellite</td>
</tr>
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</table>

Audio/Video Access over Computer Network
Web access over DTV network
MPEG-2 over IP: Global Architecture

- MPEG2 Content
- Network Routers/Switches
- Broadband LAN
- IP over ADSL
- High Quality Audio/Video
- Home Television
- Web Page
- Files
- e-mail

- Satellite
- Terrestrial
- Home PC
- Television

THOMCAST COMMUNICATIONS Inc.
MPEG-2 over IP: How Does It Work?

- Gigabit Ethernet
- Multicast Enabled Switch
- Fast Ethernet

Multicast Server / Gateway
- PAX IP @ 224.0.1.1
- FOX IP @ 224.0.1.2
- NBC IP @ 224.0.1.3
- TF1 IP @ 224.0.1.4
- ZDF IP @ 224.0.1.5
- BBC IP @ 224.0.1.6
- RAI IP @ 224.0.1.7
- VOD 1 IP @ 224.0.1.8
- VOD N IP @ 224.0.1.N

Set Top Boxes
- PAX IP @ 224.0.1.1
- FOX IP @ 224.0.1.2
- TF1 IP @ 224.0.1.4
- VOD 1 IP @ 224.0.1.8
- VOD N IP @ 224.0.1.N

Multicast Enabled Switch
- Leave 224.0.1.1 Multicast group
- Join 224.0.1.2 Multicast group

Ethernet/IP

Channel Hopping
**Thomcast Initiatives**

- Integrating technology partners to provide flexible data broadcasting solutions
  - Desire to bring “Best In Class” products together
  - Work with open standards
  - Improve inter-operability of components
- Working in cooperation with PBS to test data broadcasting systems
  - Desire to deliver enhanced television content from central emission point
  - Working with member station WGBY as a test bed
  - Desire to branch out to other stations, Oregon Public Broadcasting and WGBH
What Have We Learned?

- MPEG transport provides a reliable mechanism for delivery of IP traffic
- Proposed business models are proliferate but none are yet proven
- Broadcasters need to be flexible in implementing solutions
  - No one can truly predict what services will become the best revenue generators
  - Bandwidth limitations in the terrestrial chain will limit capabilities to some extent
- Convergence of MPEG and IP provides additional content delivery opportunities
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