

TOWARDS A  
COMMUNICATION  
CONTINUUM

2005

# MULTICHANNEL CONTENT DELIVERY

Video - Broadband - WiFi/WiMax - 3G  
inputs to

NEW SCREENS  
for  
NEW VISIONS

Time - Location - Personalization - Interactivity

A COMMUNICATION CONTINUUM

# INCREASING COMPLEXITY

Single Communication Channels  
Multichannel Content Delivery

Multimedia  
Interactive Systems  
Cross-Media

Time - Location - Personalization - Interactivity

## A COMMUNICATION CONTINUUM

# INCREASING COMPLEXITY

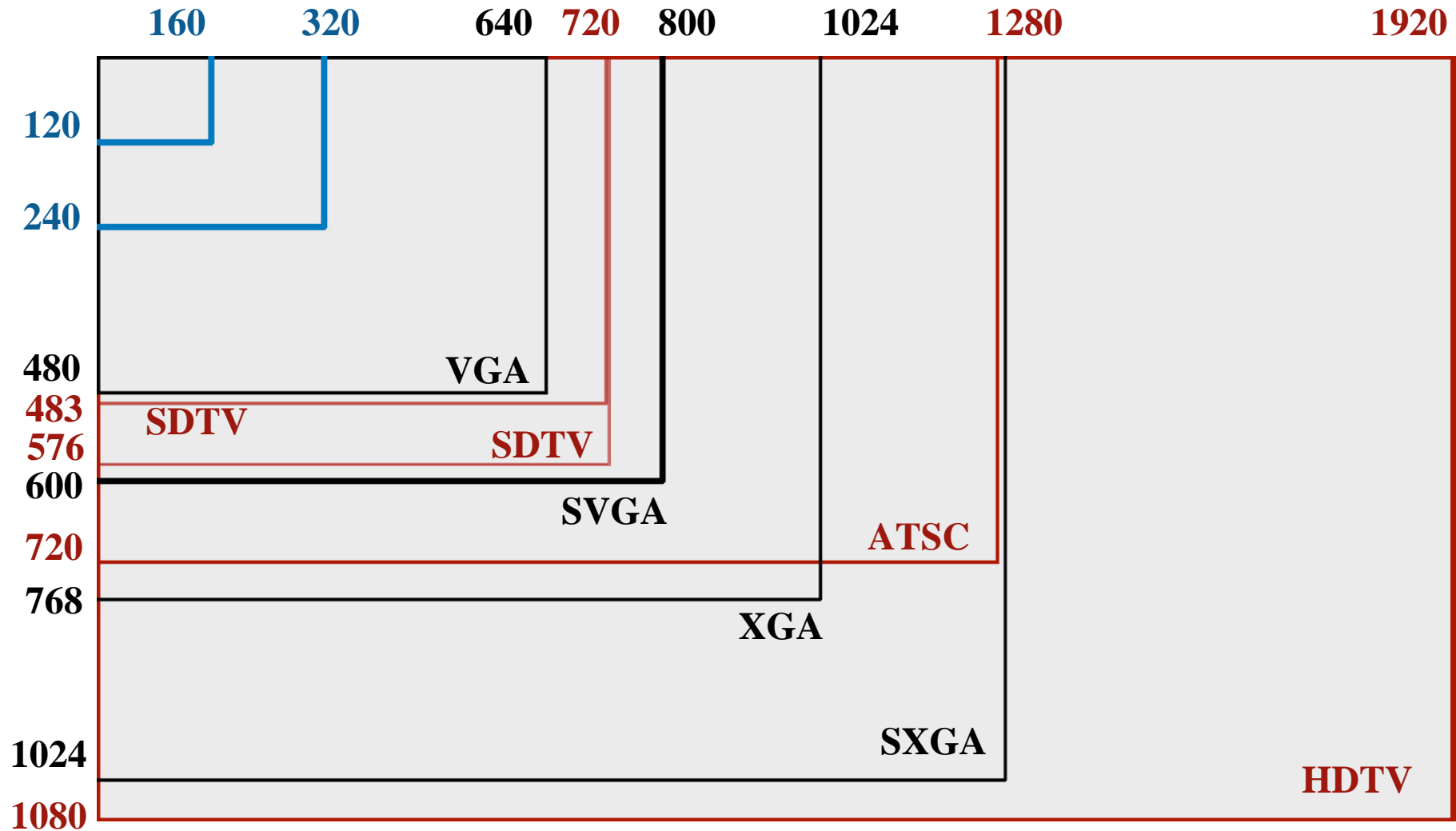
Any Size  
Different Types of Screens

Specialized Visualization  
of Content  
Adaptation to Context

Time - Location - Personalization - Interactivity

## A COMMUNICATION CONTINUUM

# RESOLUTIONS 1



# 3G PHONES



**SDTV**

**HDTV**



# HDTV



# HDTV

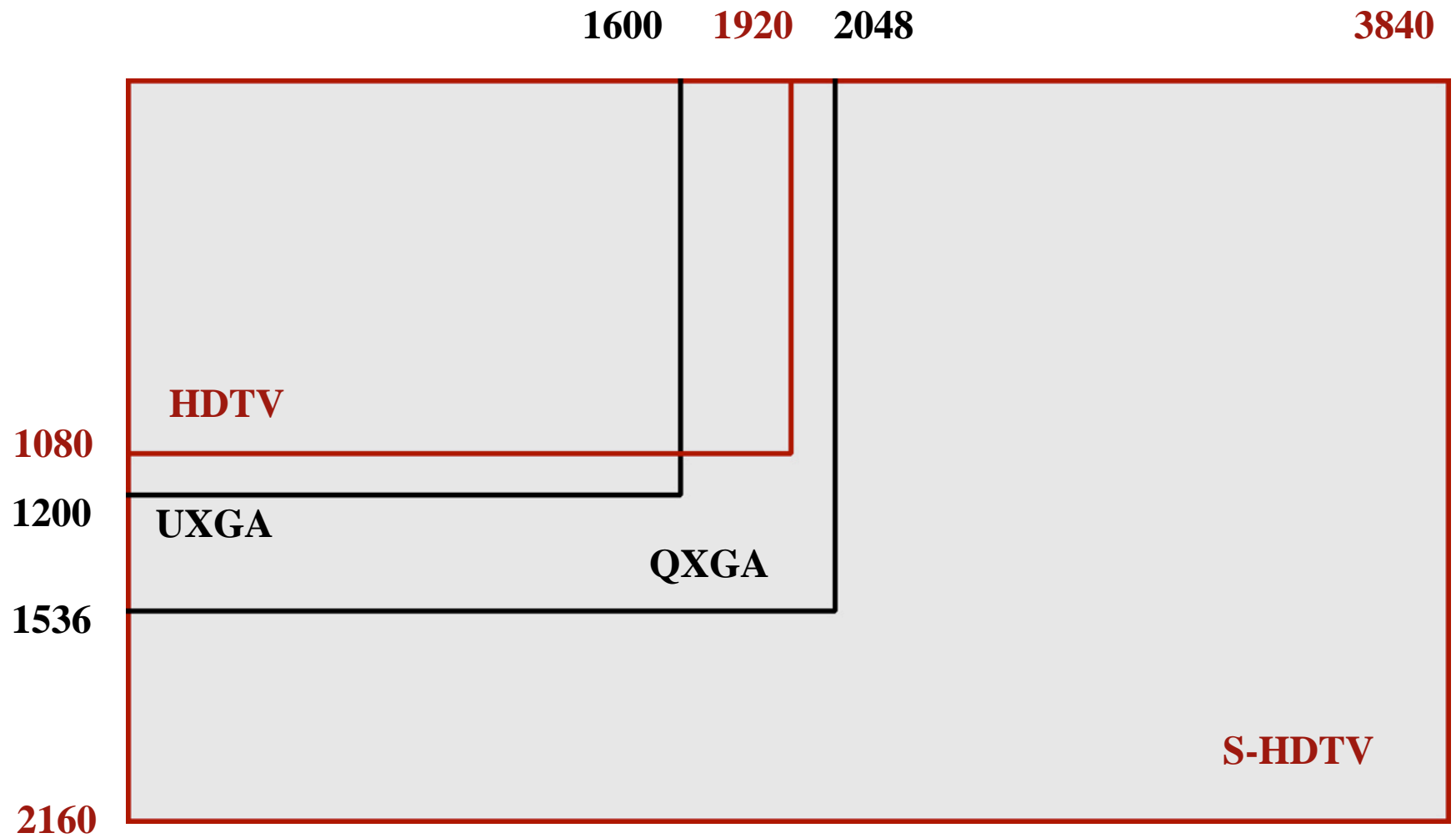
HDTV

1920 x 1080

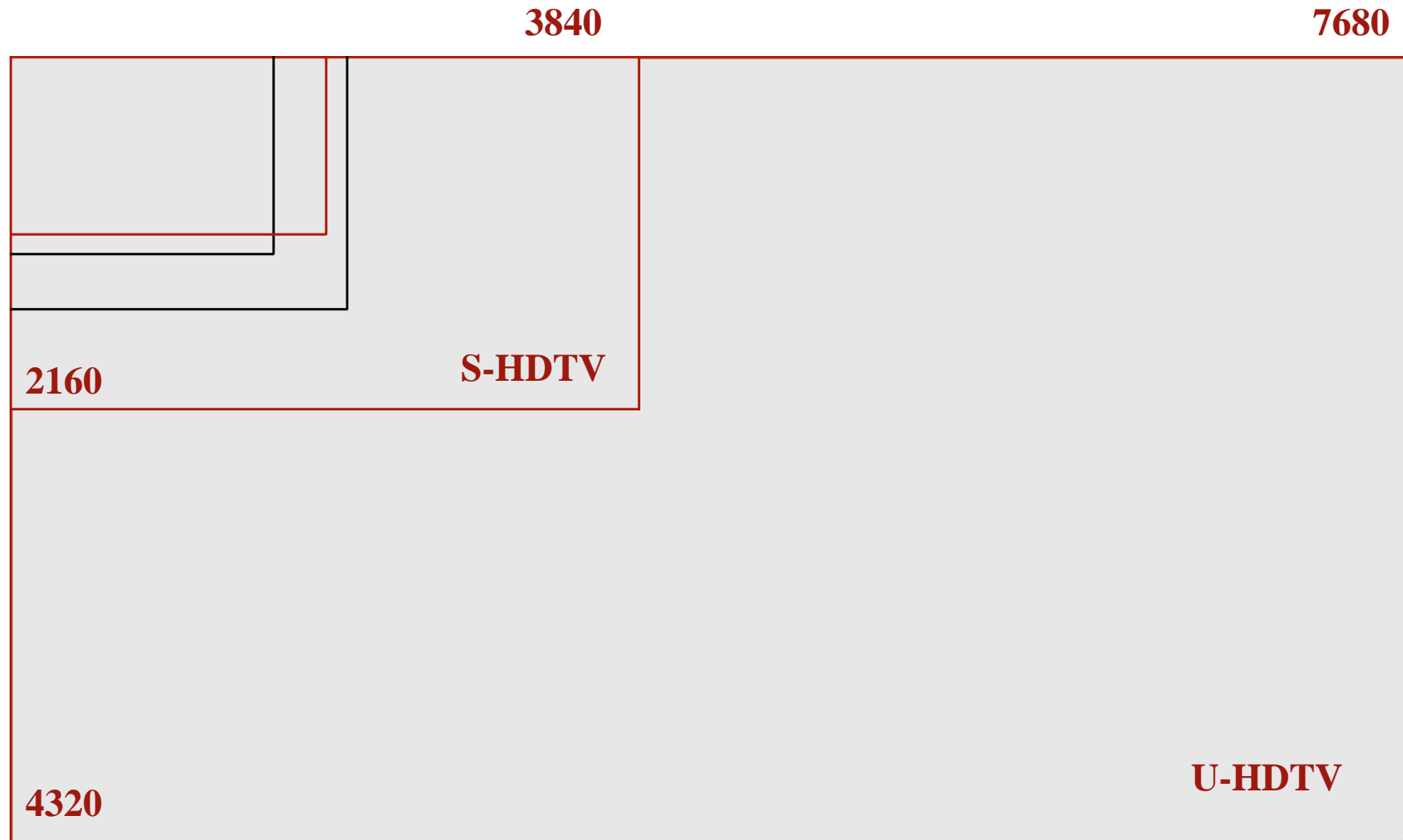
NTSC

720 x 486

# RESOLUTIONS 2



# RESOLUTIONS 3



# STANDARD DIGITAL TELEVISION

| Industry Code<br>SDI | Total<br>Lines Per<br>Frame | Active<br>Pixels per<br>line/frame | Vertical<br>Frequency<br>(Hz) | Horizontal<br>Frequency<br>(kHz) | Sampling<br>Frequency<br>(MHz) | Samples<br>per total<br>line | Interlace | Film<br>Rate<br>(Hz) | Film<br>Sequence |
|----------------------|-----------------------------|------------------------------------|-------------------------------|----------------------------------|--------------------------------|------------------------------|-----------|----------------------|------------------|
| 525I/60/2:1          | 525                         | 720x483                            | 60.00                         | 15.750                           | 13.514                         | 858                          | 2:1       | -                    | -                |
| 525P/60/3:2          | 525                         | 720x483                            | 60.00                         | 15.750                           | 13.514                         | 858                          | 2:1       | 24.00                | 3:2              |
| 525P/60/2:2          | 525                         | 720x483                            | 60.00                         | 15.750                           | 13.514                         | 858                          | 2:1       | 30.00                | 2:2              |
| 525I/59.94/2:1       | 525                         | 720x483                            | 59.94                         | 15.734                           | 13.500                         | 858                          | 2:1       | -                    | -                |
| 525P/59.94/3:2       | 525                         | 720x483                            | 59.94                         | 15.734                           | 13.500                         | 858                          | 2:1       | 23.98                | 3:2              |
| 525P/59.94/2:2       | 525                         | 720x483                            | 59.94                         | 15.734                           | 13.500                         | 858                          | 2:1       | 29.97                | 2:2              |
| 525P/24sf/2:2        | 525                         | 720x483                            | 48.00                         | 12.600                           | 17.325                         | 1375                         | 2:1       | 24.00                | 2:2              |
| 525P/23.97sf/2:2     | 525                         | 720x483                            | 47.95                         | 12.587                           | 17.308                         | 1375                         | 2:1       | 23.98                | 2:2              |
| 480P/60/2:2          | 525                         | 720x480                            | 60.00                         | 15.750                           | 13.514                         | 858                          | 2:1       | 30.00                | 2:2              |
| 480P/60/3:2          | 525                         | 720x480                            | 60.00                         | 15.750                           | 13.514                         | 858                          | 2:1       | 24.00                | 3:2              |
| 480P/59.94/2:1       | 525                         | 720x485                            | 59.94                         | 15.734                           | 13.500                         | 858                          | 2:1       | -                    | -                |
| 480P/59.94/2:1       | 525                         | 960x485                            | 59.94                         | 15.734                           | 18.000                         | 1144                         | 2:1       | -                    | -                |
| 480P/59.94/2:2       | 525                         | 720x480                            | 59.94                         | 15.734                           | 13.500                         | 858                          | 2:1       | 29.97                | 2:2              |
| 480P/59.94/3:2       | 525                         | 720x480                            | 59.94                         | 15.734                           | 13.500                         | 858                          | 2:1       | 23.98                | 3:2              |
| 625I/50/2:1          | 625                         | 720x575                            | 50.00                         | 15.625                           | 13.500                         | 864                          | 2:1       | -                    | -                |
| 625I/50/2:1          | 625                         | 960x575                            | 50.00                         | 15.625                           | 18.000                         | 1152                         | 2:1       | -                    | -                |
| 625P/50/2:2          | 625                         | 720x575                            | 50.00                         | 15.625                           | 13.500                         | 864                          | 2:1       | 25.00                | 2:2              |
| 625P/48/2:2          | 625                         | 720x575                            | 48.00                         | 15.000                           | 20.625                         | 1375                         | 2:1       | 24.00                | 2:2              |
| 625P/47.9/2:2        | 625                         | 720x575                            | 47.95                         | 14.985                           | 20.604                         | 1375                         | 2:1       | 23.98                | 2:2              |

# HIGH DEFINITION TELEVISION

| HD-SDI            |      |           |       |        |         |      |     |       |     |
|-------------------|------|-----------|-------|--------|---------|------|-----|-------|-----|
| 1080i/60/2:1      | 1125 | 1920x1080 | 60.00 | 33.750 | 74.250  | 2200 | 2:1 | -     | -   |
| 1080P/60/3:2      | 1125 | 1920x1080 | 60.00 | 33.750 | 74.250  | 2200 | 2:1 | 24.00 | 3:2 |
| 1080P/60/2:2      | 1125 | 1920x1080 | 60.00 | 33.750 | 74.250  | 2200 | 2:1 | 30.00 | 2:2 |
| 1035i/60/2:1      | 1125 | 1920x1035 | 60.00 | 33.750 | 74.250  | 2200 | 2:1 | -     | -   |
| 1035P/60/3:2      | 1125 | 1920x1035 | 60.00 | 33.750 | 74.250  | 2200 | 2:1 | 24.00 | 3:2 |
| 1035P/60/2:2      | 1125 | 1920x1035 | 60.00 | 33.750 | 74.250  | 2200 | 2:1 | 30.00 | 2:2 |
| 1080P/60/1:1      | 1125 | 1920x1080 | 60.00 | 67.500 | 148.500 | 2200 | 1:1 | 60.00 | 1:1 |
| 1080i/59.94/2:1   | 1125 | 1920x1080 | 59.94 | 33.716 | 74.176  | 2200 | 2:1 | -     | -   |
| 1080P/59.94/3:2   | 1125 | 1920x1080 | 59.94 | 33.716 | 74.176  | 2200 | 2:1 | 23.98 | 3:2 |
| 1080P/59.94/2:2   | 1125 | 1920x1080 | 59.94 | 33.716 | 74.176  | 2200 | 2:1 | 29.97 | 2:2 |
| 1035i/59.94/2:1   | 1125 | 1920x1035 | 59.94 | 33.716 | 74.176  | 2200 | 2:1 | -     | -   |
| 1080P/59.94/1:1   | 1125 | 1920x1080 | 59.94 | 67.433 | 148.352 | 2200 | 1:1 | 59.94 | 1:1 |
| 1080i/50/2:1      | 1125 | 1920x1080 | 50.00 | 28.125 | 74.250  | 2640 | 2:1 | -     | -   |
| 1080P/50/2:1      | 1250 | 1920x1080 | 50.00 | 31.250 | 74.250  | 2376 | 2:1 | -     | -   |
| 1080P/50/2:2      | 1125 | 1920x1080 | 50.00 | 28.125 | 66.825  | 2376 | 2:1 | 25.00 | 2:2 |
| 1080P/50/1:1      | 1125 | 1920x1080 | 50.00 | 56.250 | 148.500 | 2640 | 1:1 | 50.00 | 1:1 |
| 1080P/30/1:1      | 1125 | 1920x1080 | 30.00 | 33.750 | 74.250  | 2200 | 1:1 | -     | -   |
| 1080P/29.97/1:1   | 1125 | 1920x1080 | 29.97 | 33.716 | 74.176  | 2200 | 1:1 | -     | -   |
| 1080P/25/1:1      | 1125 | 1920x1080 | 25.00 | 28.125 | 74.250  | 2640 | 1:1 | -     | -   |
| 1080P/24/1:1      | 1125 | 1920x1080 | 24.00 | 27.000 | 74.250  | 2750 | 1:1 | -     | -   |
| 1080P/23.98/1:1   | 1125 | 1920x1080 | 23.98 | 26.973 | 74.176  | 2750 | 1:1 | -     | -   |
| 1080P/24st/2:2    | 1125 | 1920x1080 | 48.00 | 27.000 | 74.250  | 2750 | 2:1 | 24.00 | 2:2 |
| 1080P/23.98st/2:2 | 1125 | 1920x1080 | 47.95 | 26.973 | 74.176  | 2750 | 2:1 | 23.98 | 2:2 |
| 1080P/24/1:1      | 1125 | 1920x1080 | 24.00 | 27.000 | 74.250  | 2750 | 1:1 | 24.00 | 1:1 |
| 1080P/23.98/1:1   | 1125 | 1920x1080 | 23.98 | 26.973 | 74.176  | 2750 | 1:1 | 23.98 | 1:1 |
| 720P/60/1:1       | 750  | 1280x720  | 60.00 | 45.000 | 74.250  | 1650 | 1:1 | -     | -   |
| 720P/59.94/1:1    | 750  | 1280x720  | 59.94 | 44.955 | 74.176  | 1650 | 1:1 | -     | -   |
| 720P/59.94/3:2    | 750  | 1280x720  | 59.94 | 44.955 | 74.176  | 1650 | 1:1 | 23.98 | 3:2 |
| 720P/59.94/2:2    | 750  | 1280x720  | 59.94 | 44.955 | 74.176  | 1650 | 1:1 | 29.97 | 2:2 |
| 480P/59.94/1:1    | 525  | 720x483   | 59.94 | 31.469 | 27.000  | 858  | 1:1 | -     | -   |
| 480P/59.94/3:2    | 525  | 720x483   | 59.94 | 31.469 | 27.000  | 858  | 1:1 | 23.98 | 3:2 |
| 480P/59.94/2:2    | 525  | 720x483   | 59.94 | 31.469 | 27.000  | 858  | 1:1 | 29.97 | 2:2 |
| 1080P/48st/1:1    | 1125 | 1920x1080 | 24.00 | 27.000 | 18.563  | 1375 | 2:1 | -     | -   |
| 1080P/47.95st/1:1 | 1125 | 1920x1080 | 23.98 | 26.973 | 18.544  | 1375 | 2:1 | -     | -   |
| 480P/30/1:1       | 525  | 720x480   | 30.00 | 15.750 | 34.650  | 2200 | 1:1 | -     | -   |
| 480i/30/2:1       | 525  | 720x480   | 30.00 | 7.875  | 17.325  | 2200 | 2:1 | -     | -   |
| 480P/24/3:2       | 525  | 720x480   | 24.00 | 12.600 | 34.650  | 2750 | 1:1 | 9.60  | 3:2 |

# MPEG-2 PROFILES AND LEVELS

| Profile   | Simple<br>4:2:0      | Main<br>4:2:0          | 422<br>4:2:2         | SNR*<br>4:2:0        | Spatial*<br>4:2:0      | High<br>4:2:0, 4:2:2    |
|-----------|----------------------|------------------------|----------------------|----------------------|------------------------|-------------------------|
| Level     | I, B                 | I, B, P                | I, B, P              | I, B, P              | I, B, P                | I, B, P                 |
| High      |                      | 1920 x 115<br>80 Mb/s  |                      |                      |                        | 1920 x 1152<br>100 Mb/s |
| High-1440 |                      | 1440 x 1152<br>60 Mb/s |                      |                      | 1440 x 1152<br>60 Mb/s | 1440 x 1152<br>80 Mb/s  |
| Main      | 720 x 570<br>15 Mb/s | 720 x 576<br>15 Mb/s   | 720 x 608<br>50 Mb/s | 720 x 576<br>15 Mb/s |                        | 720 x 576<br>20 Mb/s    |
| Low       |                      | 352 x 288<br>4 Mb/s    |                      | 352 x 288<br>4 Mb/s  |                        |                         |

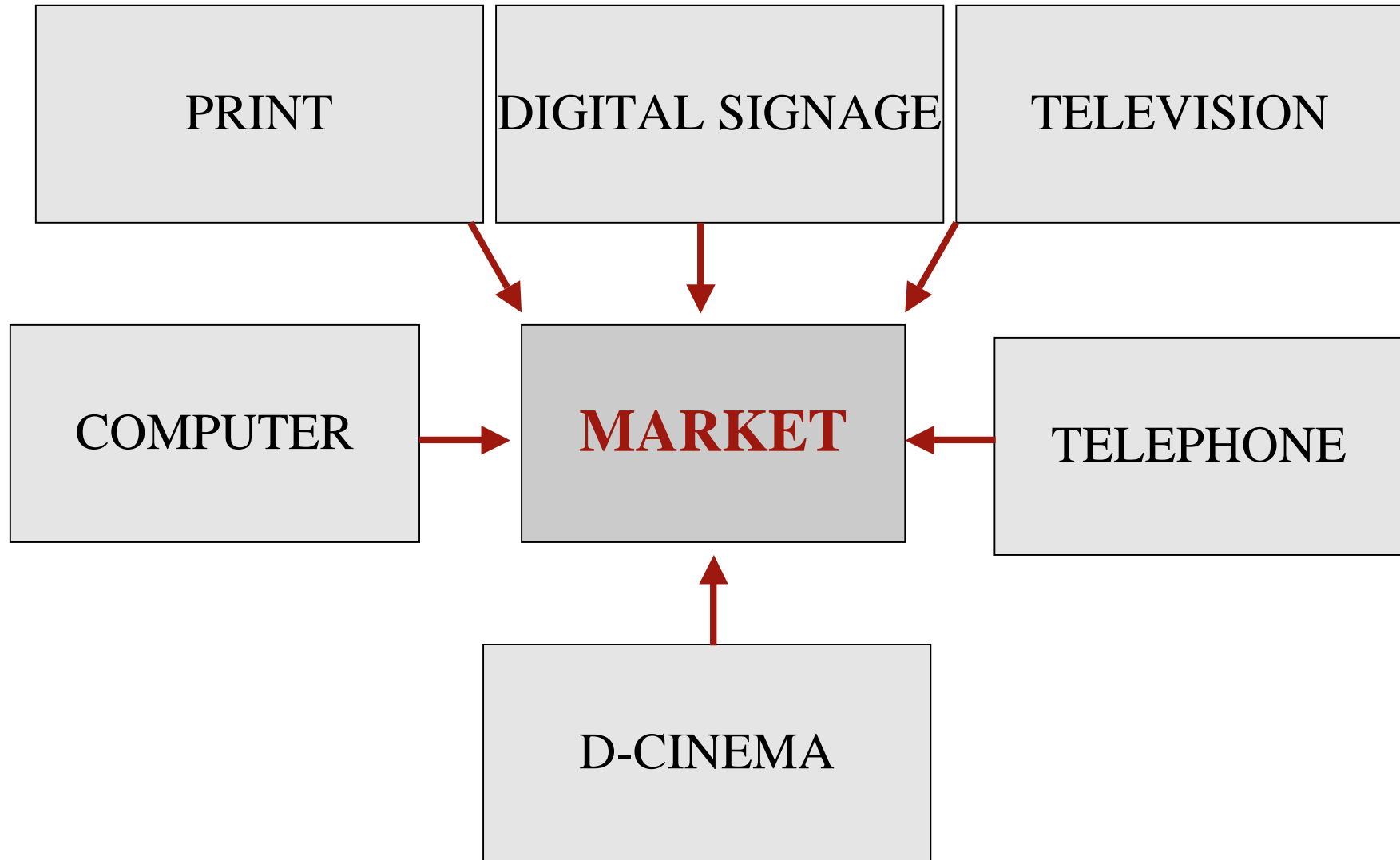
# DATA DENSITY - UNCOMPRESSED

| IMAGE          | 1 HOUR | TRANSFER RATE |
|----------------|--------|---------------|
| SDTV ! 0,83 MB | 76 GB  | 270 Mb/s      |
| HDTV ! 5,18 MB | 560 GB | 1,5 Gb/s      |
| SHD ! 38,33 MB | 4,4 TB | 8,2 Gb/s      |

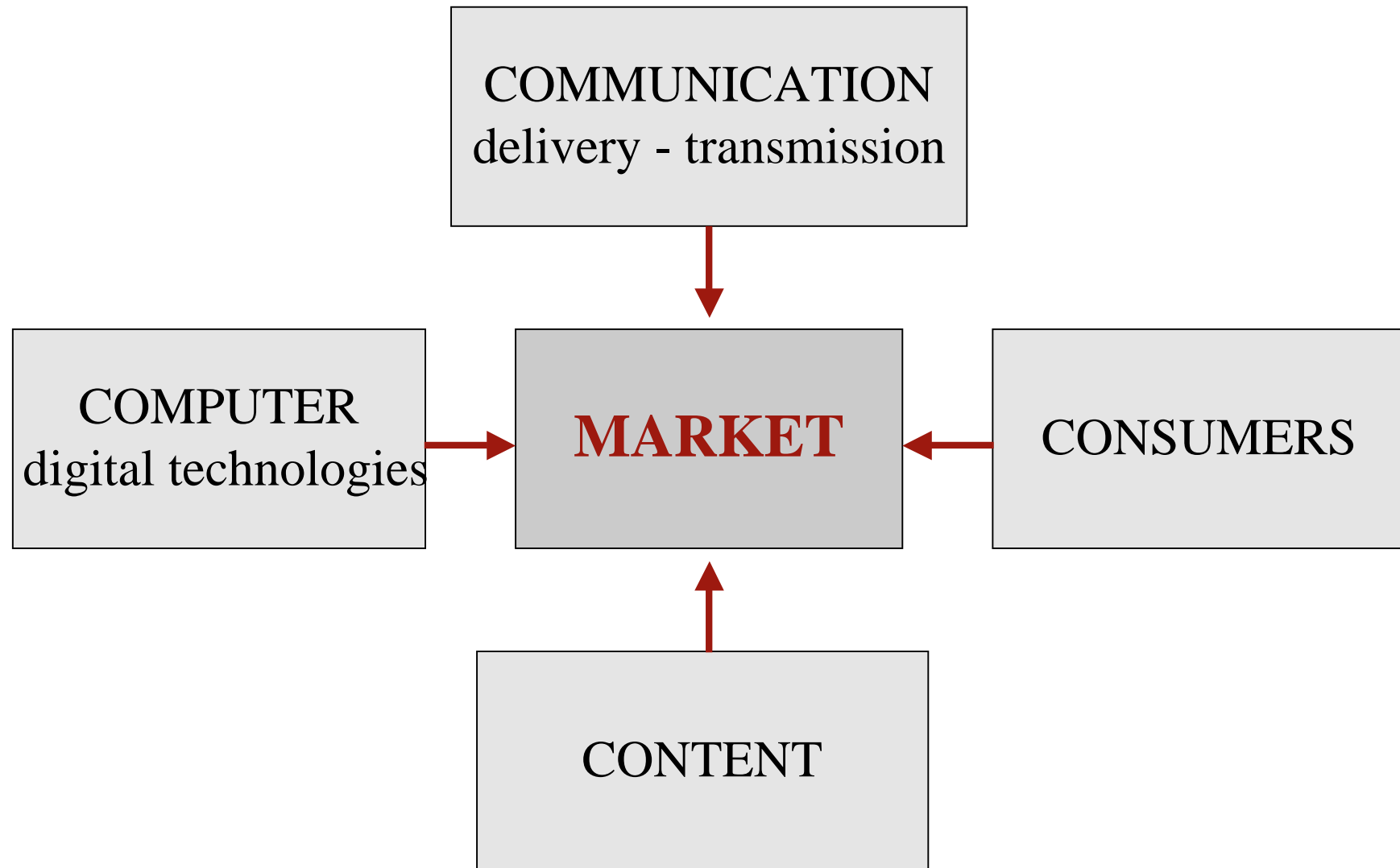
## Transmission Speed

|            |   |         |   |         |
|------------|---|---------|---|---------|
| UMTS       | ! | 2 Mbs   |   |         |
| ADSL       | ! | 720 Kbs | ⇒ | 10 Mbs  |
| S-ADSL     | ! | 10 Mbs  | ⇒ | 100 Mbs |
| WiMax      | ! | 15 Mbs  | ⇒ | 80 Mbs  |
| ATM        | ! | 34 Mbs  | ⇒ | 622 Mbs |
| Internet 2 | ! | 2,5 Gbs | ⇒ | 10 Gbs  |

# TECHNOLOGICAL CONVERGENCE



# GLOBAL CONVERGENCE



# NEW CONTENT

analogue / digital  
multiple media origin

# ARCHIVE

analogue / digital  
multiple media origin

# ANALOGUE TO DIGITAL CONVERSIONS

## DIGITAL COMMON FORMAT

**INGEST ONCE**  
**REPURPOSE MANY**  
(XML encoding)

## **FILE-BASED INFRASTRUCTURE**

ingest stage is crucial to the quality  
and efficiency  
of the system downstream

**PROCESSING**

**MAIN POST-PRODUCTION**

**MEDIA-ADAPTED  
POST-PRODUCTION**

# DATABASE FILE TRANSFORMS

Automatic  
Semi-automatic  
Manual Operations



**MAIN MASTERING**



**SECONDARY MASTERING**  
**(MEDIA-ADAPTED)**

# ENCODING FOR PLAYOUT

media - specific

# PLAYOUT

media - specific

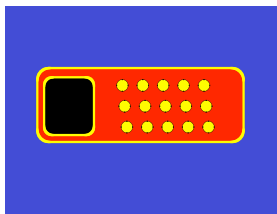
# DIGITAL ASSET MANAGEMENT

# DIGITAL RIGHTS MANAGEMENT

# FROM THE SMALL SCREEN TO THE MULTIMEDIA WORLD

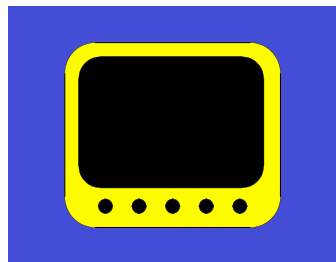
## DIGITAL VIDEO TECHNOLOGIES

**MULTIMEDIA  
MESSAGE  
SERVICE**



*very small screen*

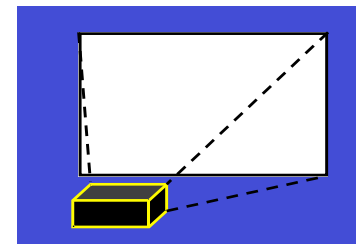
**DIGITAL  
TELEVISION**



*small screen*

**HDTV  
D-CINEMA**

**D-SIGNAGE**



*large screen*

# TOWARDS THE LARGE SCREEN

## basic procedures - multiple screens - high resolution

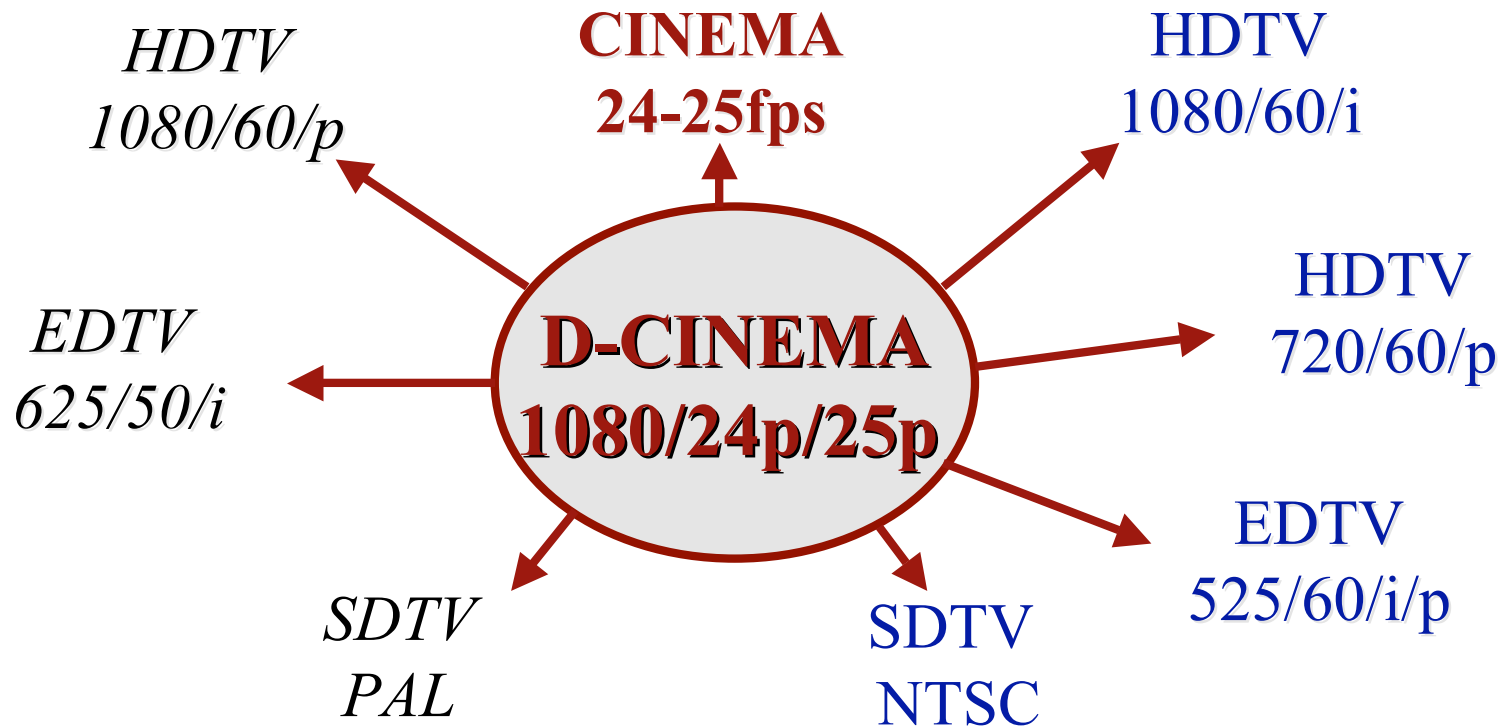


- high resolution
- fidelity

- wide band
- transparency

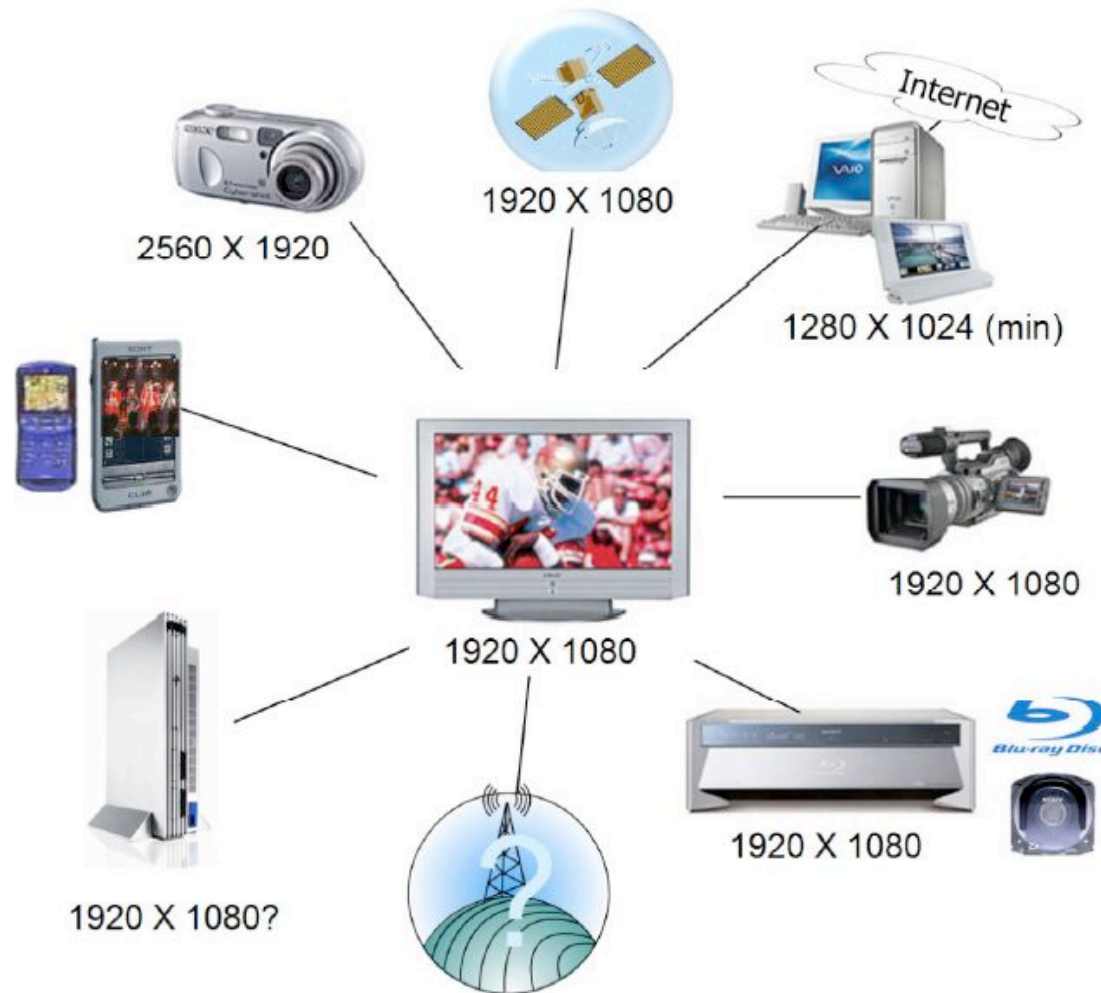
- high luminous flux
- high resolution
- fidelity

# A COMMON FORMAT ?



NOTE     **SDTV** = Standard Definition Television (the conventional analogue TV PAL o NTSC)  
           **EDTV** = Enhanced Definition Television (the digital TV DVB or ATSC)  
           **HDTV** = High Definition Television

# A COMMON FORMAT ?



# COMPETITION FOR THE AUDIENCE

# USER EXPERIENCE

# SMALL DIGITAL CAMERA DISPLAY



# POINT OF SALE



# DAYTIME IN FULL SUNLIGHT



# PLASMA - LCD - NEW SCREENS



# ANY SIZE SCREENS, ANYWHERE MULTIPLE INPUTS



# ANY SIZE SCREENS, ANYWHERE MULTIPLE INPUTS

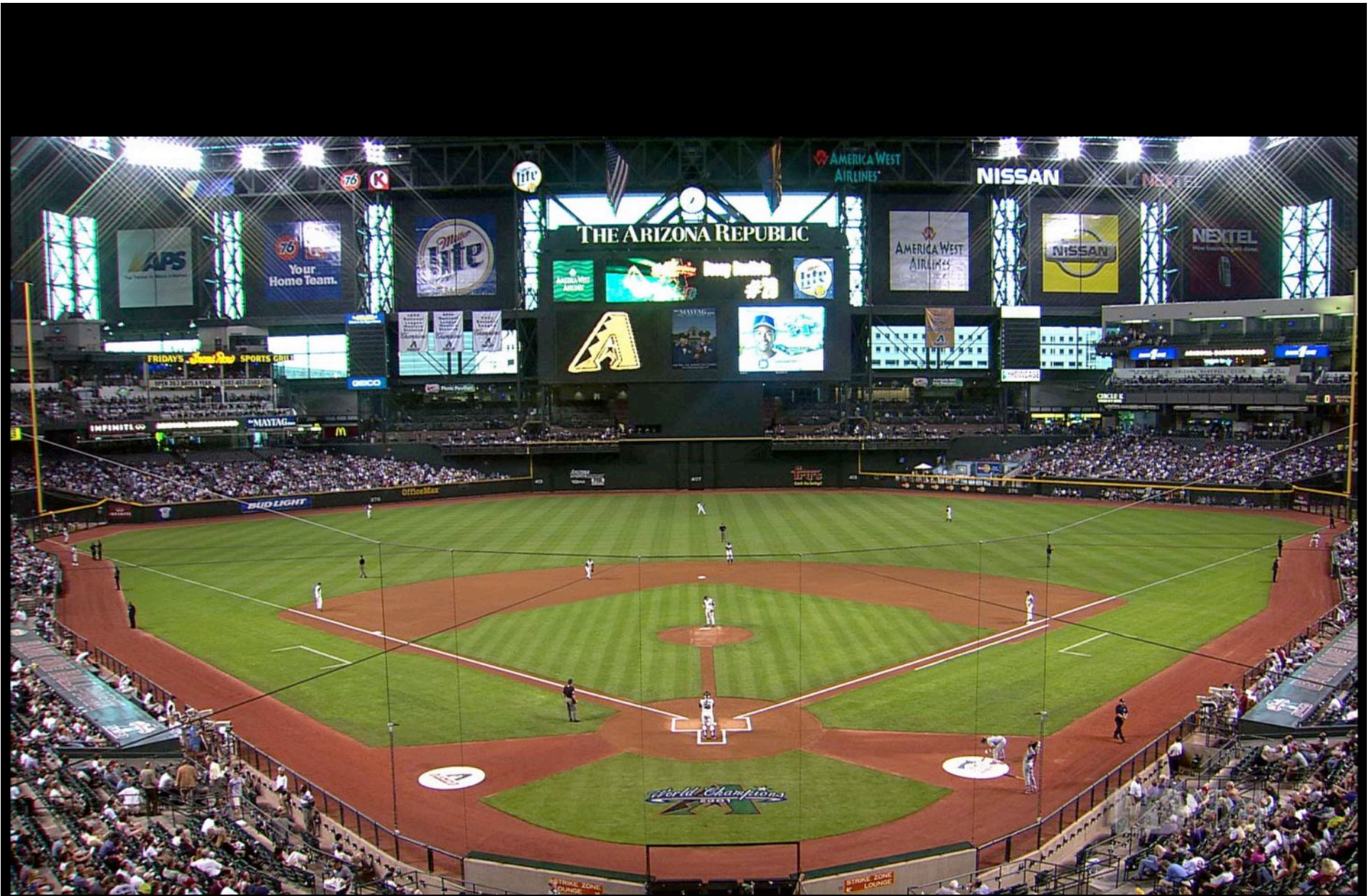


# INTERACTIVE POSTER



Prof. Cesare A. Massarenti

Imaging Systems Design



Prof. Cesare A. Massarenti

Imaging Systems Design

# New Markets

-1-

- Outdoors - along roads, urban locations, sports venues
- Indoors - stations, congress and exhibition halls, museums
- Point of sale
- Point of information
- Traditional and New Spaces

## NEW SCREENS for NEW VISIONS

Time - Location - Personalization - Interactivity

# New Markets

-2-

- Multiple Inputs
- Variable Dimensions and Formats
- Integration of different Screens

## NEW SCREENS for NEW VISIONS

Time - Location - Personalization - Interactivity

# New Markets

-3-

Initial cost higher than traditional signage, BUT

- Multiple messages on one screen
- Messages change in time according to location and audience
- Rapid turnover of information and messages
- Adaptation to content and context

**NEW SCREENS**  
for **NEW VISIONS**

Time - **Location** - Personalization - **Interactivity**

# New Markets

-4-

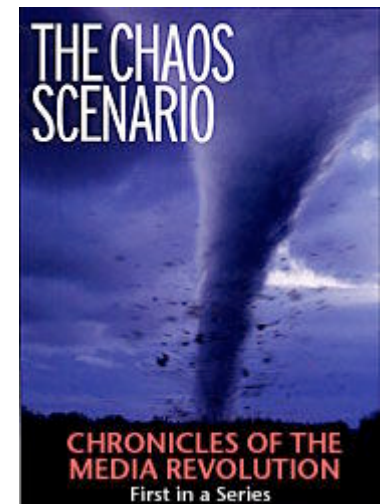
- High visibility, adaptation to ambient lighting conditions
- Low power consumption
- Low maintenance costs
- VERY HIGH COST EFFECTIVENESS

## NEW SCREENS for NEW VISIONS

Time - Location - Personalization - Interactivity

# The Mass Media Advertising Model is Dying

- “The television industry is undergoing a fundamental transformation that will make traditional advertising on TV redundant” *Deloitte & Touche*
- “Network TV audience has eroded an average of 2% a year for a decade...” *Nielsen*
- A 2000 survey showed that Americans devoted an average of a ratio of 8:1 hours to broadcast TV vs. the Internet. The projection for 2005 had the TV/Internet ratio just under 4:1.
- “U.S. household broadband penetration has gone from 8% in March 2000 to an estimated 56% in March of this year” *Nielsen/NetRatings*.
- Five percent of U.S. homes are equipped with DVRs, ... time-shifting of favorite programs render network schedules irrelevant, 70% of DVR users skip past TV commercials.



# Targeting The Shopper

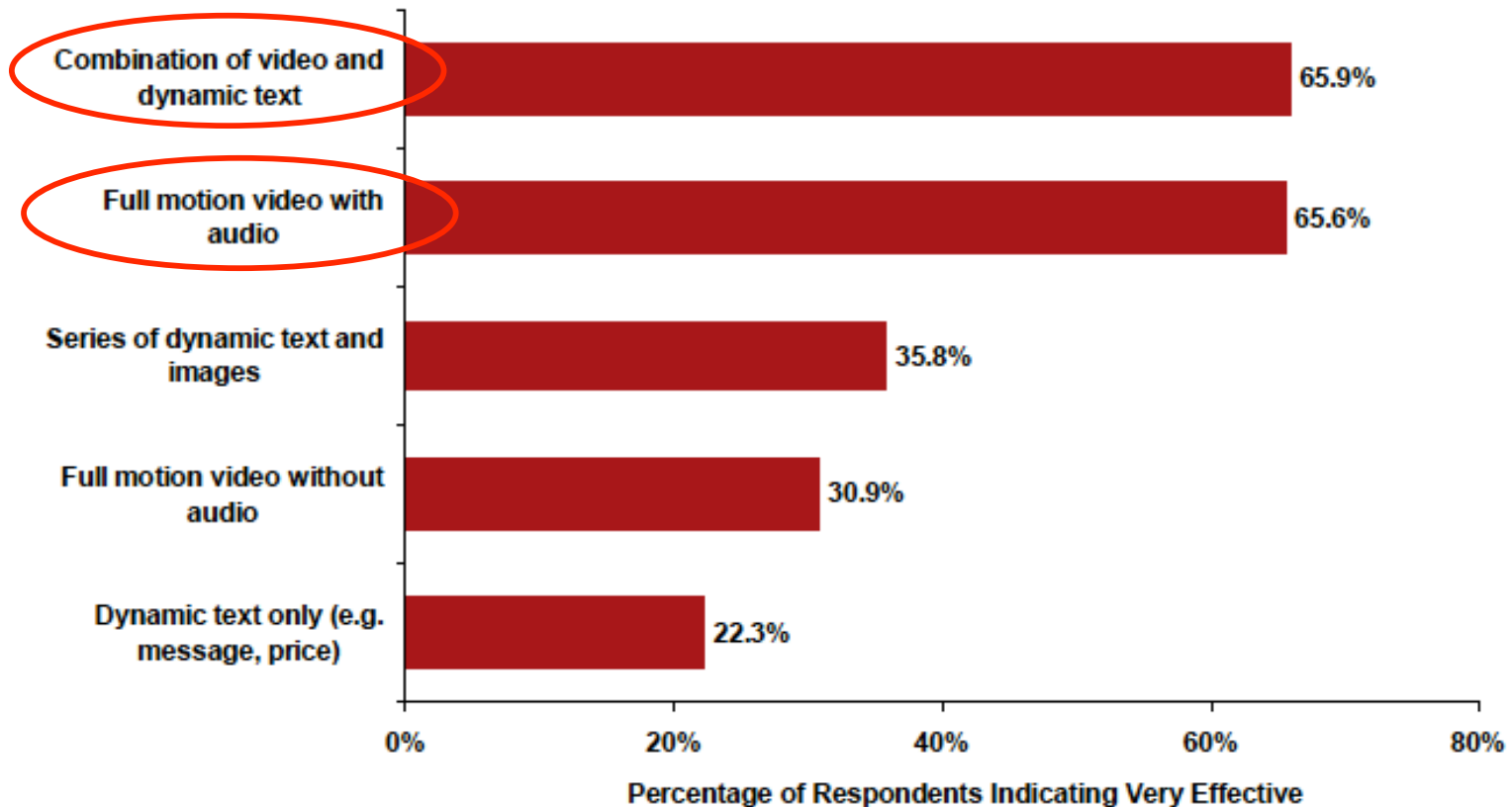


# Display Technology Choices



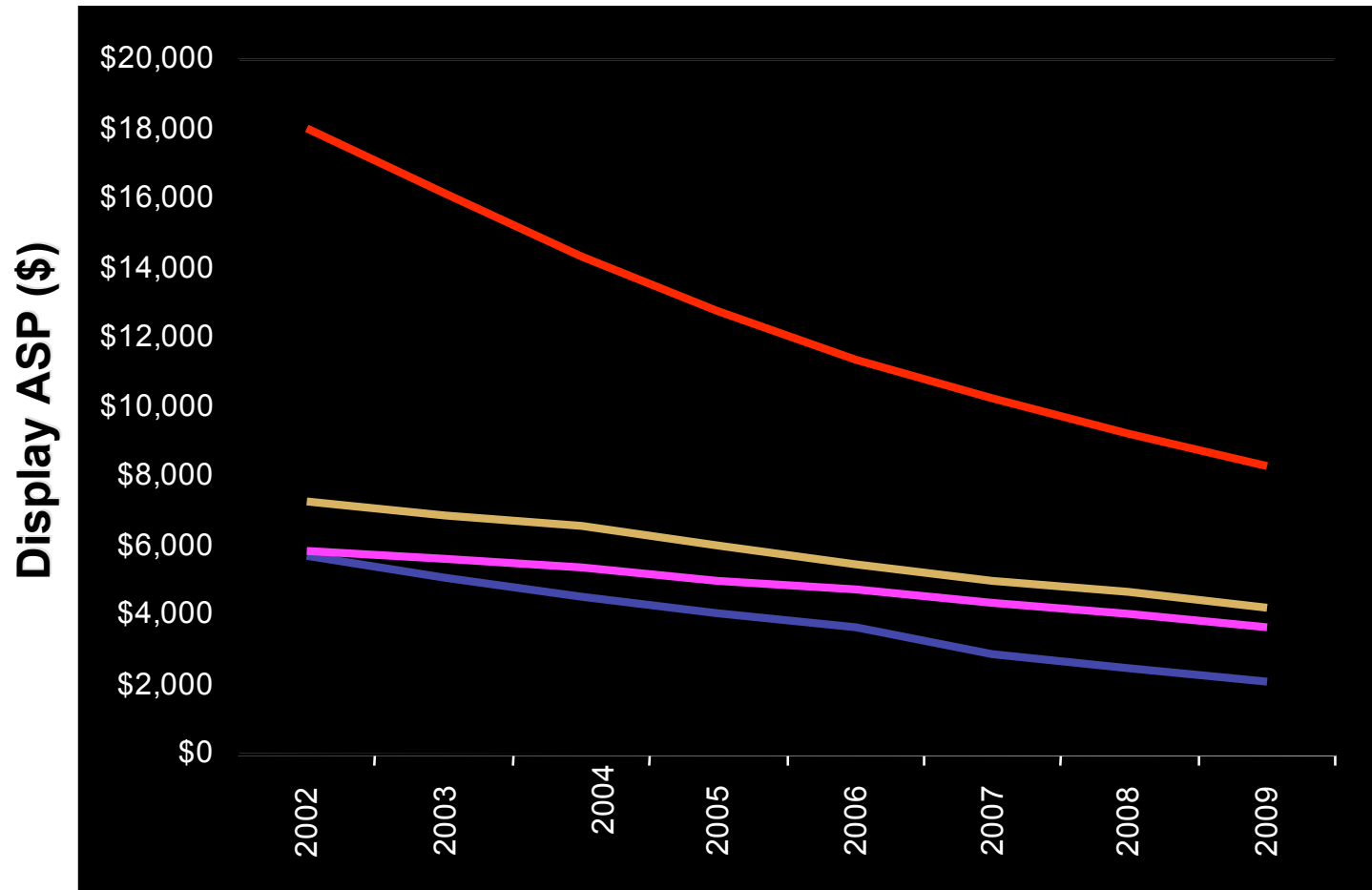
# Most Effective Content Formats

Given the locations, promotional messages you need to deliver and the differences in costs to create and manage content, please rate the effectiveness of the following formats of content for networked displays or in-store TV.



N = 349

# Display Prices



- LED Video (ASP/m<sup>2</sup>)
- Rear Projection (ASP/cube)
- LCD (ASP/Unit)
- Plasma (ASP/Unit)

# New Markets

-5-

Forecast:

Digital Signage will become a market worth 7-9 Billion dollars by 2007-2009

A COMMUNICATION CONTINUUM

# VOCAL FORMS OF ACCESS

- Set-Top-Box with voice control
- Home devices with voice control
- Devices in mobility with selective voice control

A COMMUNICATION CONTINUUM

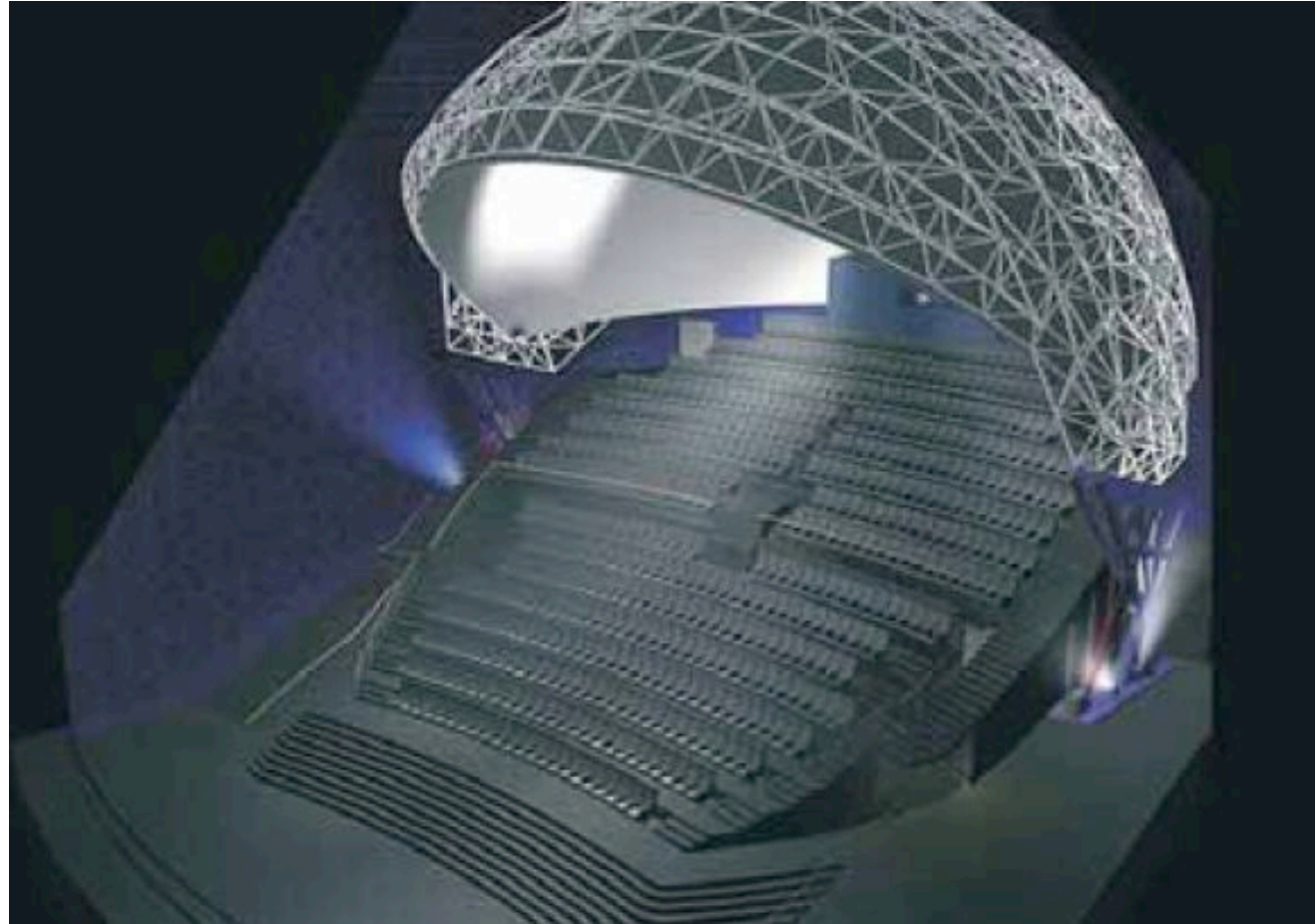
# ROLLABLE / PLIABLE SCREEN MATERIAL



# SCREEN ROLLED OUT OF A PEN



# 3D PROJECTION



# 3D DISPLAY



# 3D DISPLAY





many thanks to

**Chiara Boeri**

**Franco Visintin**