



Content Delivered.

Wisconsin Broadcasters Association
Society of Broadcast Engineers

Impacts of 3D Television on Video and Broadcasting

Dan Holden

Dan_Holden@cable.comcast.com

v.08

Impacts 3D Television

▶ Consumer-electronics Manufacturers

- ▶ Differentiator to encourage investment beyond HD

▶ Studios

- ▶ Monsters vs. Aliens – 60% of first week revenue generated by 3-D cinemas
- ▶ New Revenue Stream on TV

▶ Cable

- ▶ "We think 3D television delivered to the home may be a way for cable operators to differentiate themselves with consumers and we are very interested in the technology on display in this pavilion as a component of that effort," said Comcast CTO Tony Werner*.

- ▶ **CableLabs® Hosting 3D TV Pavilion at SCTE Cable-Tec Expo," Oct. 19, 2009

Types of 3D Television

▶ Anaglyph

- ▶ a stereoscopic picture consisting of two images of the same object, taken from slightly different angles, in two complementary colors, usually red and cyan (green-blue, and other color combinations possible)

▶ Stereoscopic

- ▶ three-dimensional for giving the illusion of depth from two-dimensional images or reproductions, as of a photograph or motion picture
- ▶ Circular Polarized Glasses/Active Shutter Glasses

▶ Auto-stereoscopic

- ▶ method of displaying three-dimensional images that can be viewed without the use of special headgear or glasses
- ▶ Will be used for digital signage

3D Live



▶ Cameras

- ▶ 2 Lenses
- ▶ Stereo Camera
- ▶ Bailing Wire and Duct Tape Approach

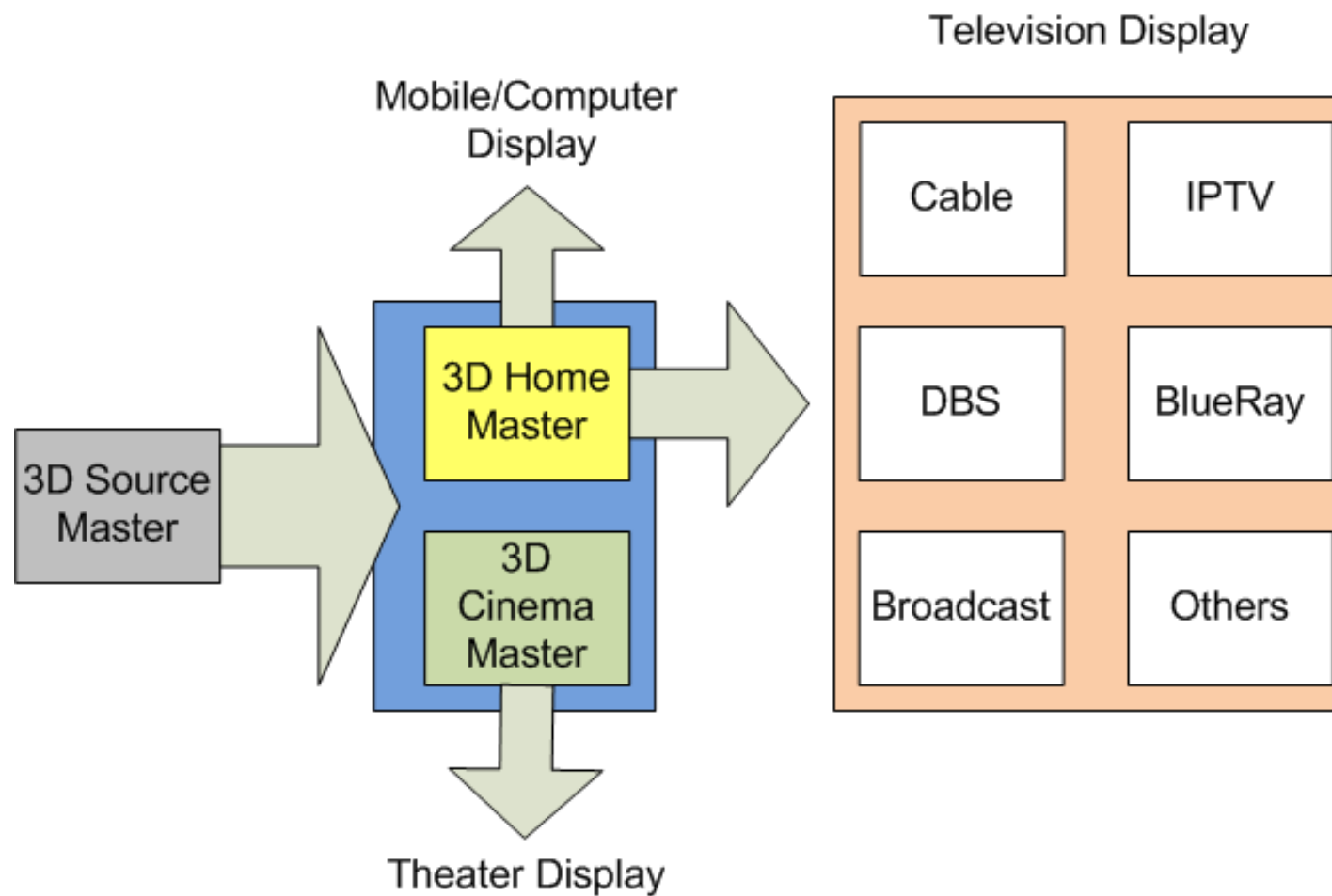
▶ Capture

- ▶ Computer Generated - Two Views in Parallel with Angular Separation
- ▶ Stereo Paired Images (Left/Right Capture)
- ▶ 2-D Plus Depth Mapping Using Range Finders

3D Content Creation

- ▶ Live Capture
 - ▶ Stereo Paired Images (Left/Right Capture)
- ▶ All cameras in the production 3D?
 - ▶ If not, how will 3D and 2D streams be differentiated?
- ▶ How will signaling work with second encode at the MSO?
- ▶ Metadata requirements
- ▶ Triggers to switch from 2D to 3D, and 3D to 2D

Distribution



Common Types of 3D Spatial Compression (1/2 resolution)

▶ **Checkerboard**

- ▶ a stereoscopic picture consisting of two images of the same object, taken from slightly different angles, in two complementary colors, usually red and cyan (green-blue, and other color combinations possible)

▶ **Side-by-side**

- ▶ three-dimensional for giving the illusion of depth from two-dimensional images or reproductions, as of a photograph or motion picture

▶ **Page flip**

- ▶ method of displaying three-dimensional images that can be viewed without the use of special headgear or glasses
- ▶ Will be used for digital signage

▶ **Over/Under**

- ▶ Better horizontal resolution
- ▶ Current choice by Cable

VOD

- ▶ Low Opportunity Cost
- ▶ Unicast – Support for multiple formats
- ▶ Trickfile generation
 - ▶ Currently many standards at the pumps
 - ▶ Single standard for CDN
- ▶ Metadata standards

3D Advertising

- ▶ Elimination of Break?
 - ▶ Product placement zooms
- ▶ How to achieve a smooth transition in a break
 - ▶ 2D break in 3D content
- ▶ In your face zooming
 - ▶ Cars driving into living room
 - ▶ Same as hot audio issue

Compression

- ▶ Interleaving – Conversion of Side-by-side (and other) to Top-Bottom and MVC
 - ▶ Done before satellite broadcast
 - ▶ At the headend, for local content
 - ▶ At the STB or edge
- ▶ Multi View Coding
- ▶ 2D plus Depth

Key Issues For Delivery to TV

- ▶ LACK OF STANDARDS
 - ▶ Required for Linear Broadcast
 - ▶ VOD Allows Support for Multiple Standards
- ▶ Lack of Deployed 3D Displays
- ▶ Lack of 3D Content
- ▶ Cost of Production
- ▶ Training

Work Remaining

- ▶ **Interleaving – Conversion of Side-by-side (and Other) to Top-Bottom and MVC**
 - ▶ Done Before Satellite Broadcast
 - ▶ At the Headend, for Local Content
 - ▶ At the STB or Edge
- ▶ **Multi View Coding (MVC)**
- ▶ **3-D Signaling**
 - ▶ Auto Switching from 2D to 3D
 - ▶ Advertising
- ▶ **Bugs**
 - ▶ How to Place 2D and 3D Bugs “with in” 3D Content
- ▶ **3D Graphics**

Get Involved

- ▶ **Society of Motion Picture and Television Engineers (SMPTE)**
 - ▶ Project “3D to the Home”
 - ▶ 3D Home Master
- ▶ **Society of Cable Telecommunications Engineers (SCTE)**
 - ▶ 3D Over Cable Project
 - ▶ Over/Under and Set Top Box Requirements
- ▶ **Entertainment Technology Center (ETC@USC)**
 - ▶ Great Lab at USC
- ▶ **Digital Video Broadcasting (DVB)**

▶ 3D – The Look of Things to Come