

3D: A TECHNICAL GUIDE



3D Technologies - Anaglyph

Anaglyph



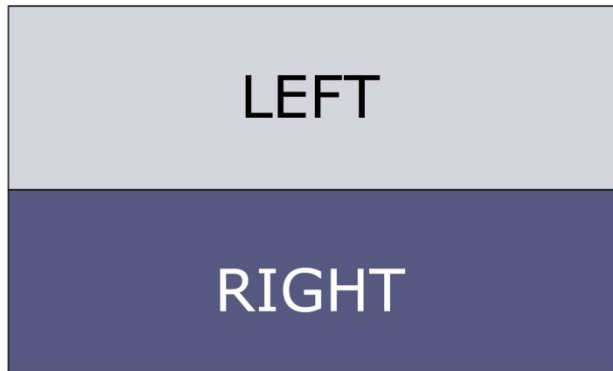
3D Technologies – 50% Resolution

ABOVE/BELOW

LEFT

RIGHT

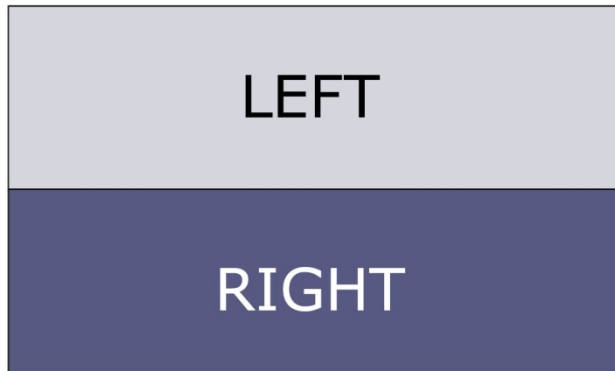
3D Technologies – 50% Resolution



SIDE BY SIDE



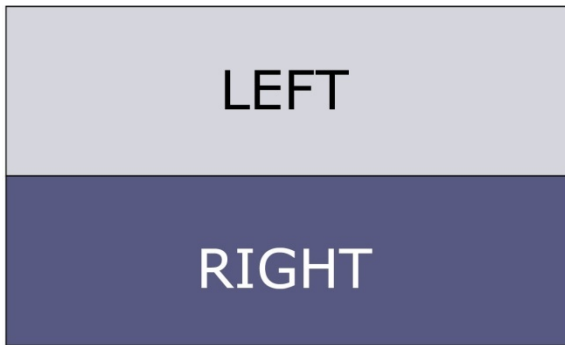
3D Technologies – 50% Resolution



CHECKERBOARD

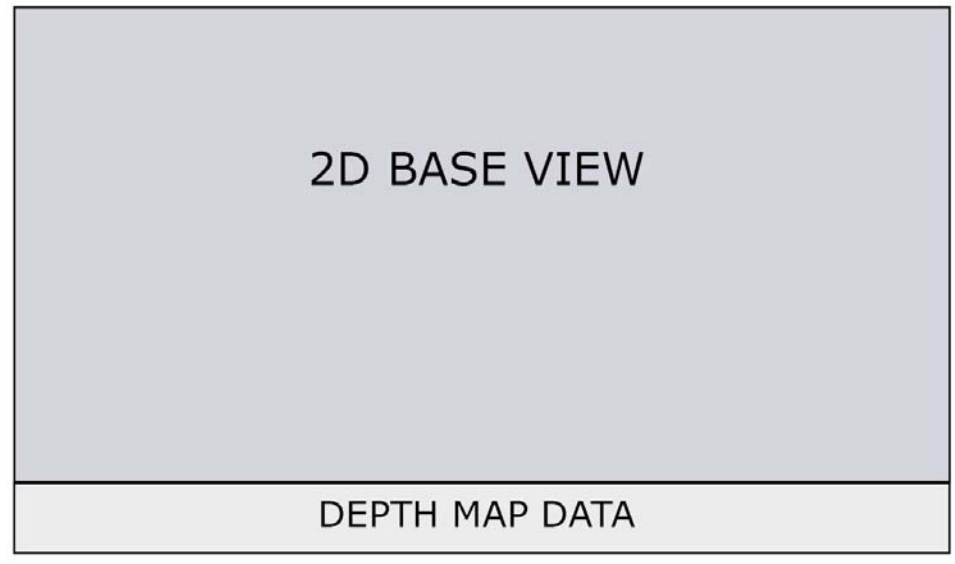
	1	2	3	4	5	6	7	8	9	10	→	1919	1920
1	L	R	L	R	L	R	L	R	L	R		L	R
2	R	L	R	L	R	L	R	L	R	L		R	L
3	L	R	L	R	L	R	L	R	L	R		L	R
4	R	L	R	L	R	L	R	L	R	L		R	L
1079	L	R	L	R	L	R	L	R	L	R		L	R
1080	R	L	R	L	R	L	R	L	R	L		R	L

3D Technologies – >50% Resolution



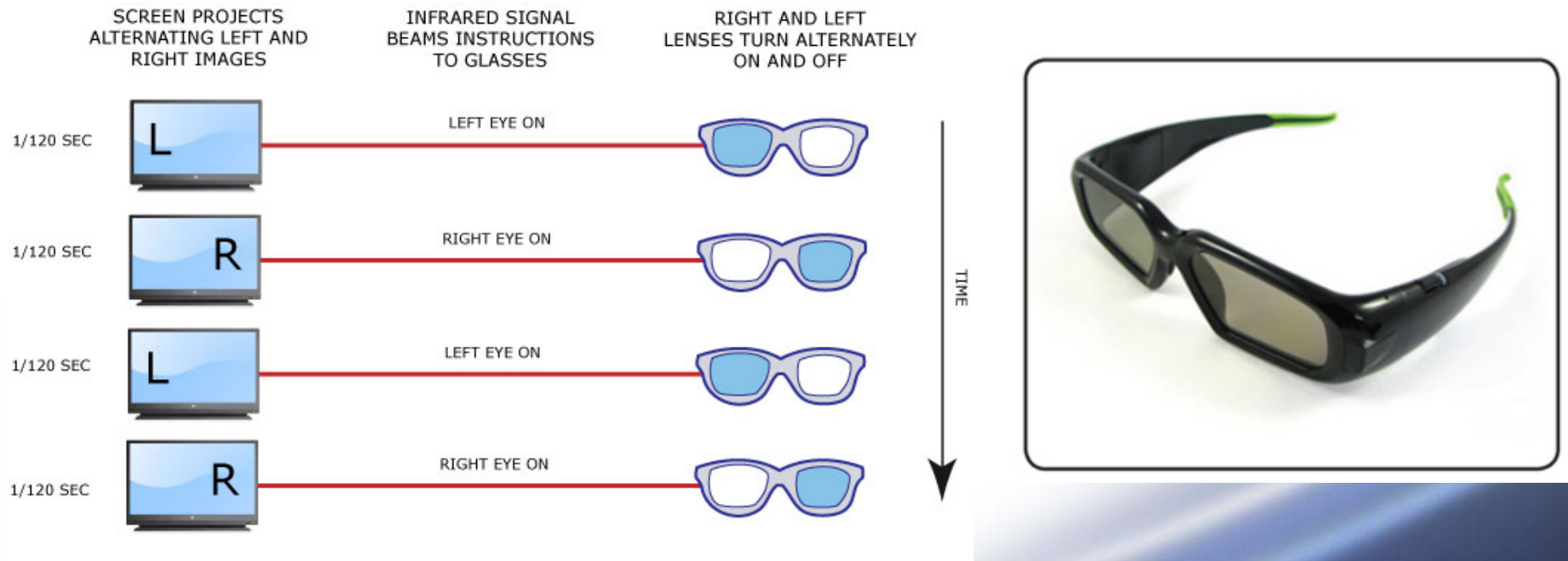
	1	2	3	4	5	6	7	8	9	10	→	1919	1920
1	L	R	L	R	L	R	L	R	L	R		L	R
2	R	L	R	L	R	L	R	L	R	L		R	L
3	L	R	L	R	L	R	L	R	L	R		L	R
4	R	L	R	L	R	L	R	L	R	L		R	L
1079	L	R	L	R	L	R	L	R	L	R		L	R
1080	R	L	R	L	R	L	R	L	R	L		R	L

2D + DEPTH MAP

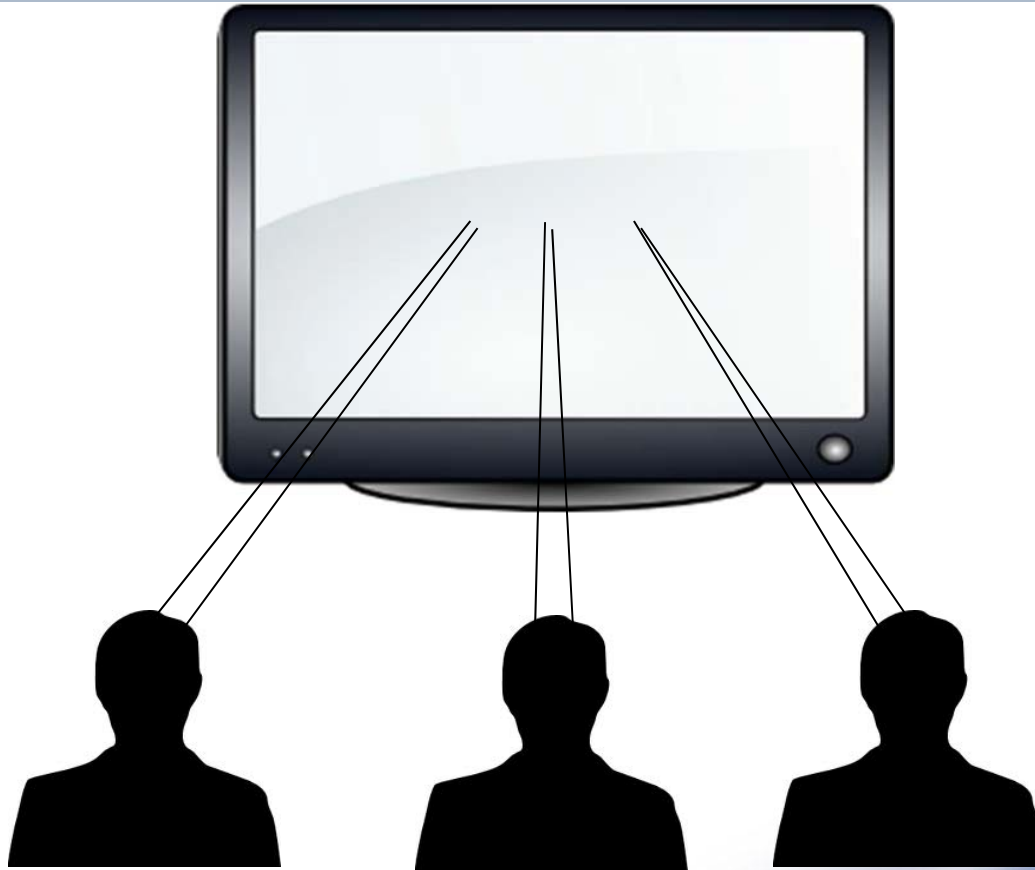


3D Technologies – Full Resolution (BD)

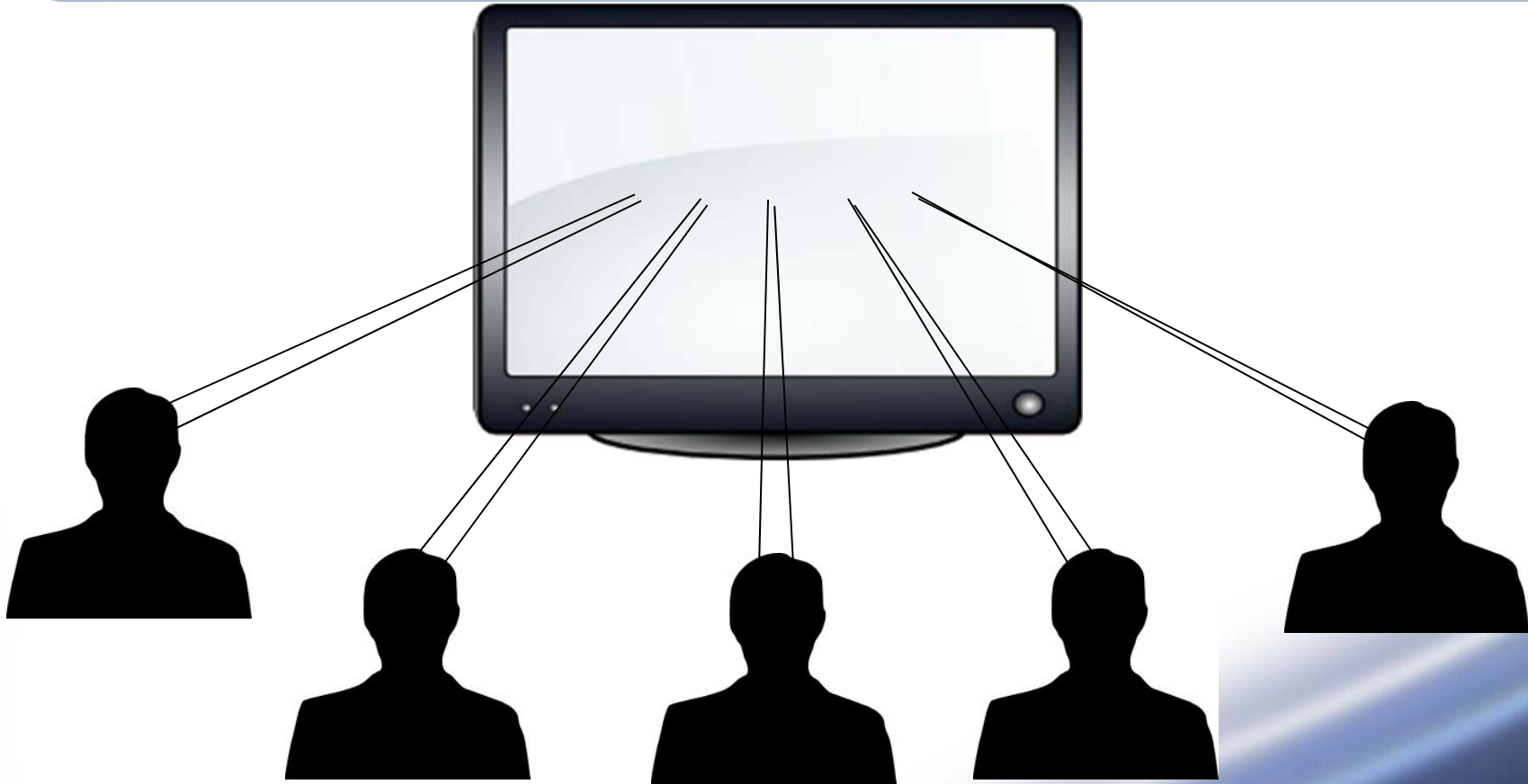
Frame Sequential



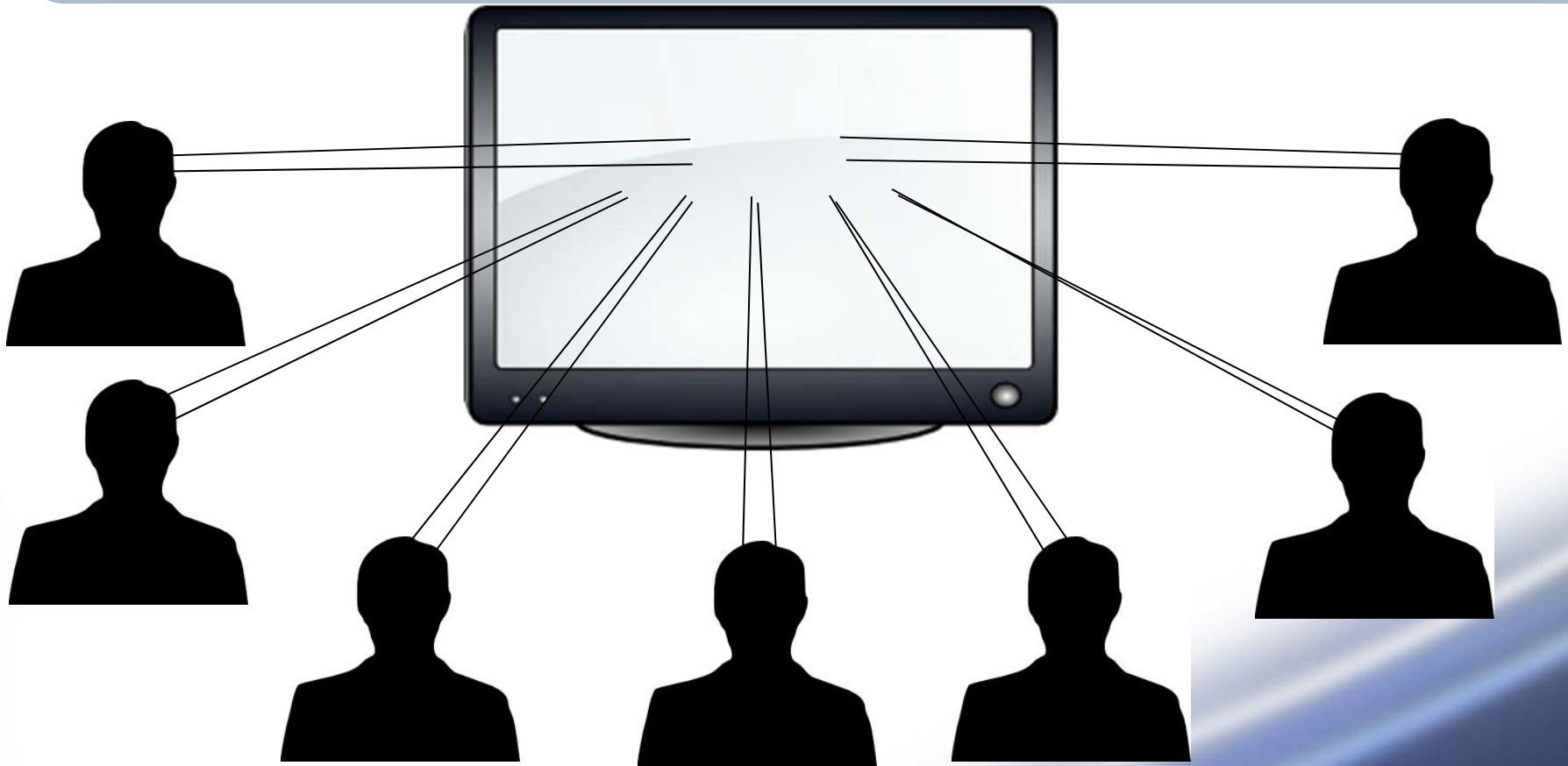
Auto-Stereoscopic



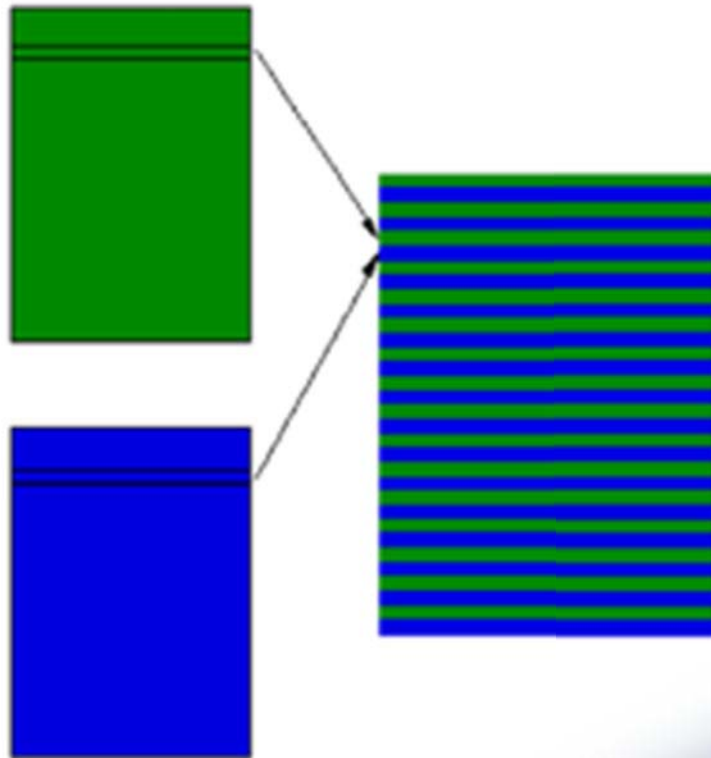
Auto-Stereoscopic



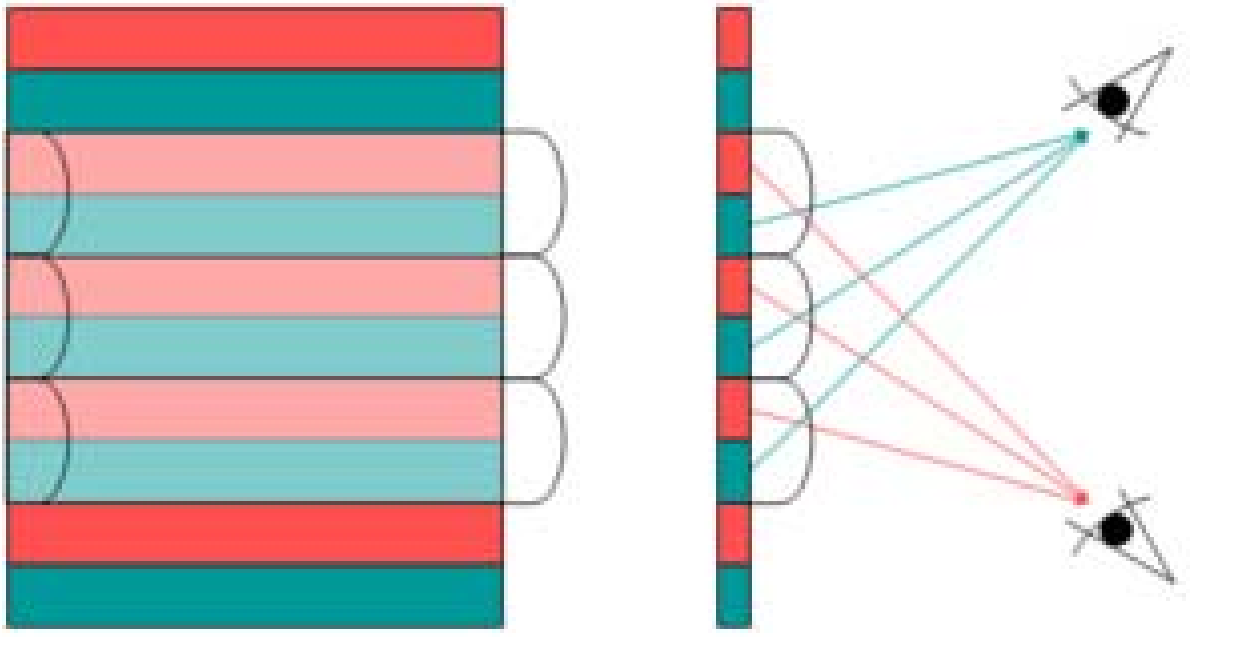
Auto-Stereoscopic



Auto-Stereoscopic

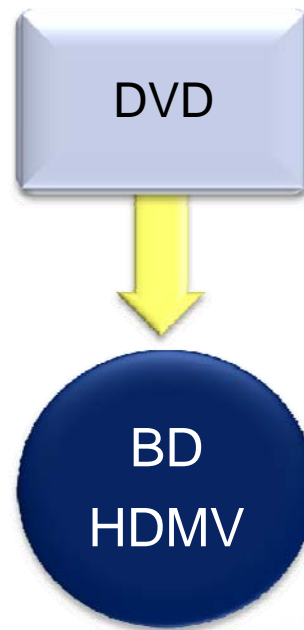


Auto-Stereoscopic



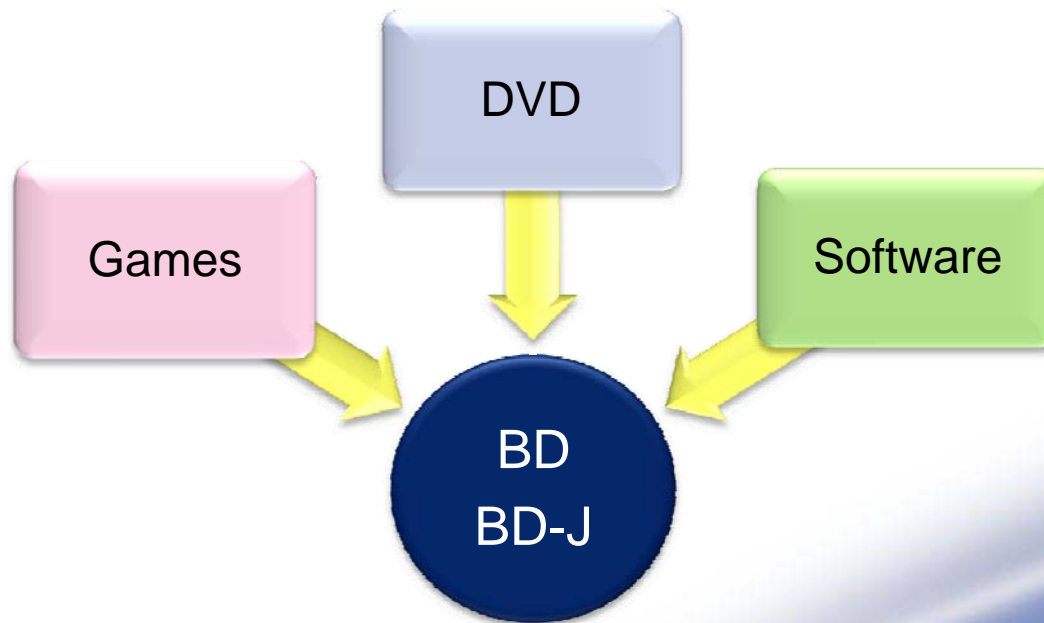
Safeguarding the Consumer Experience

Evolution of BD Authoring/Testing



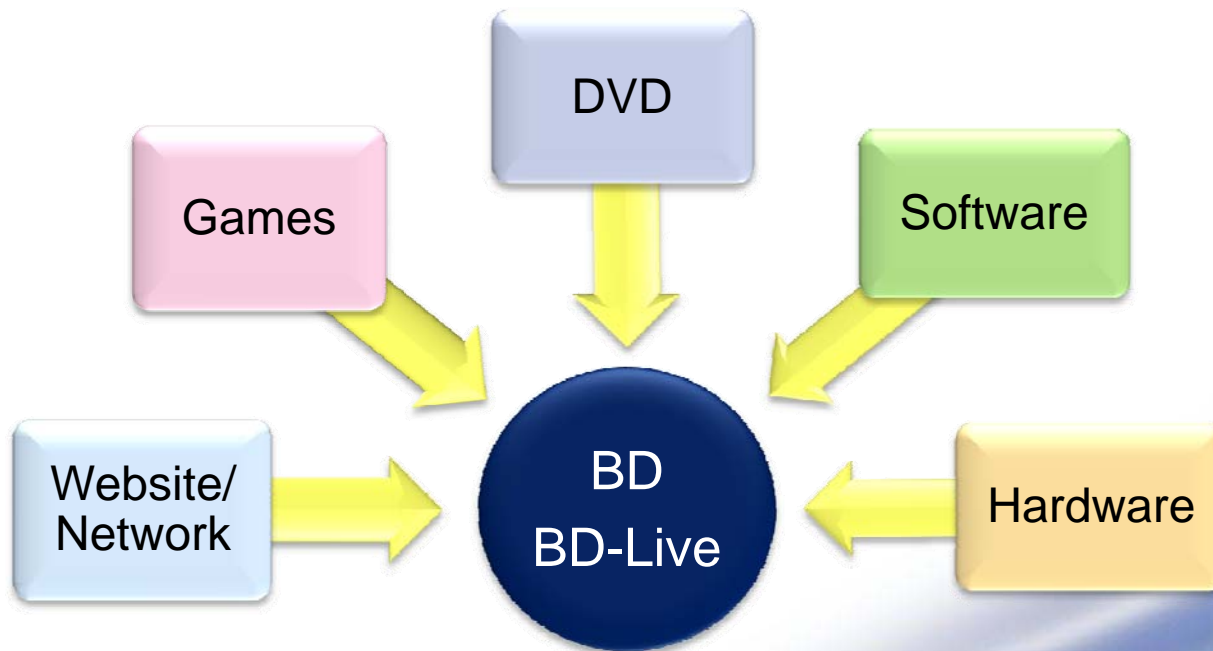
Safeguarding the Consumer Experience

Evolution of BD Authoring/Testing



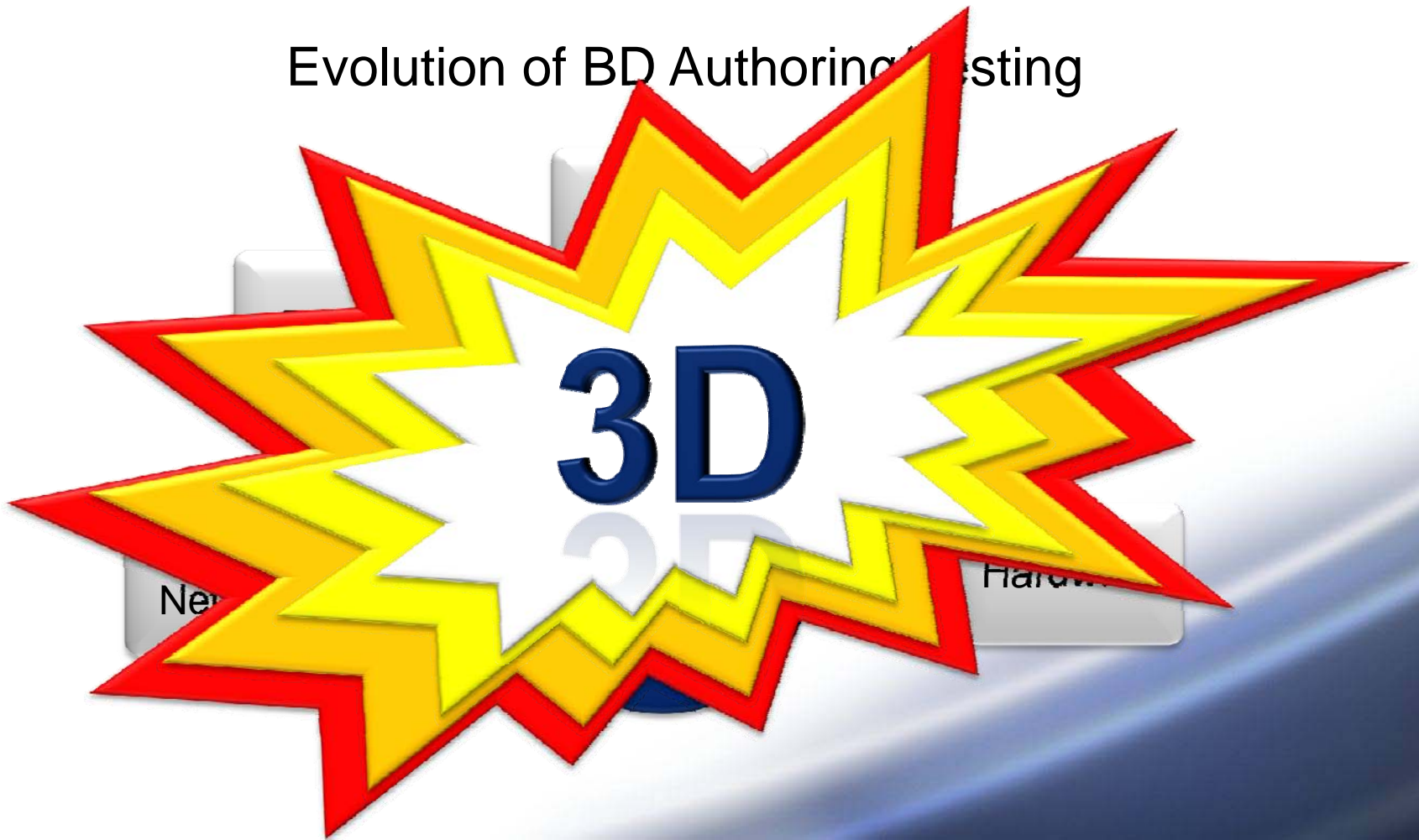
Safeguarding the Consumer Experience

Evolution of BD Authoring/Testing



Safeguarding the Consumer Experience

Evolution of BD Authoring & Testing



3D QC Content Issues

- Ghosting



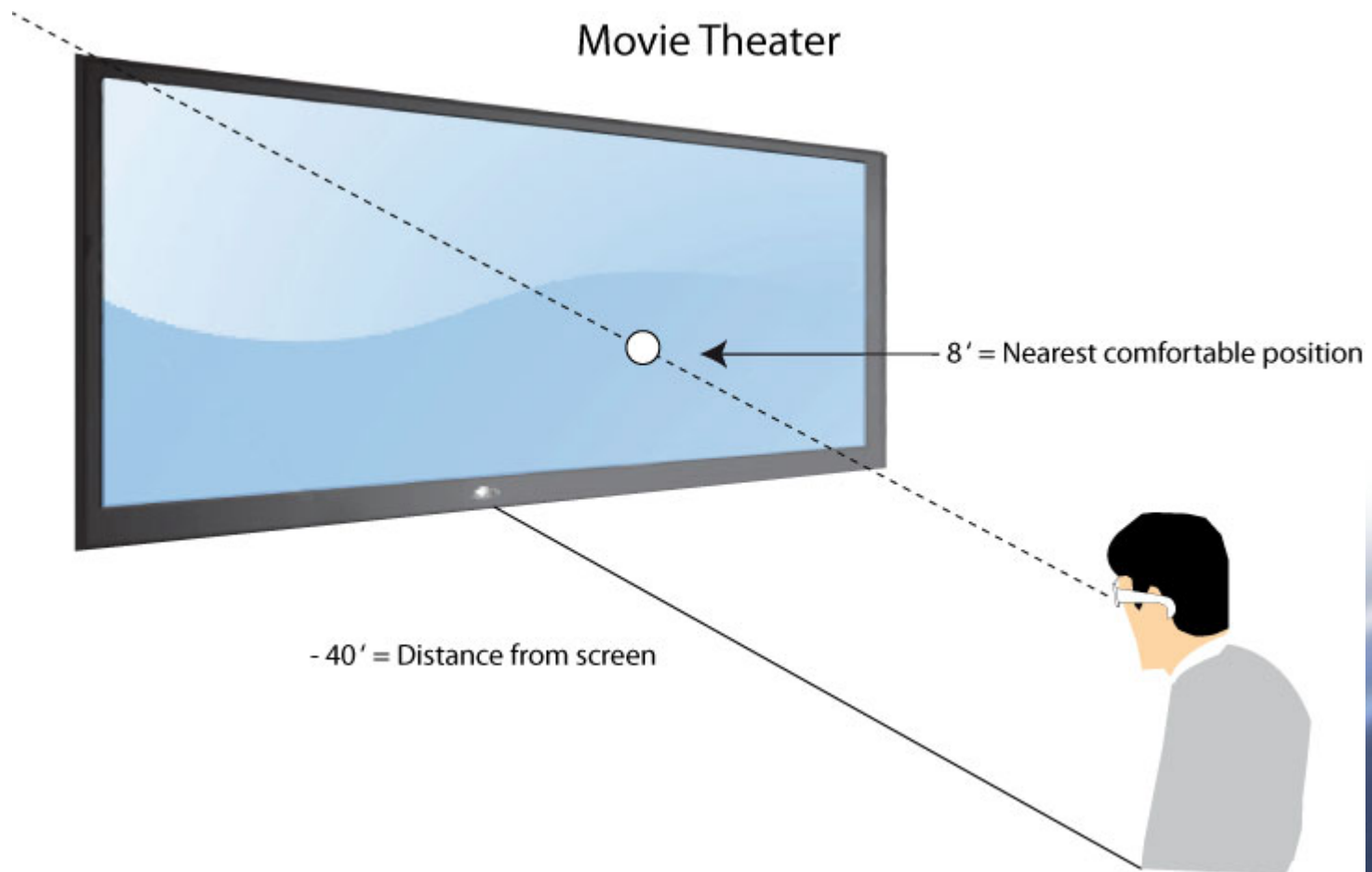
Ghosting



3D QC Content Issues

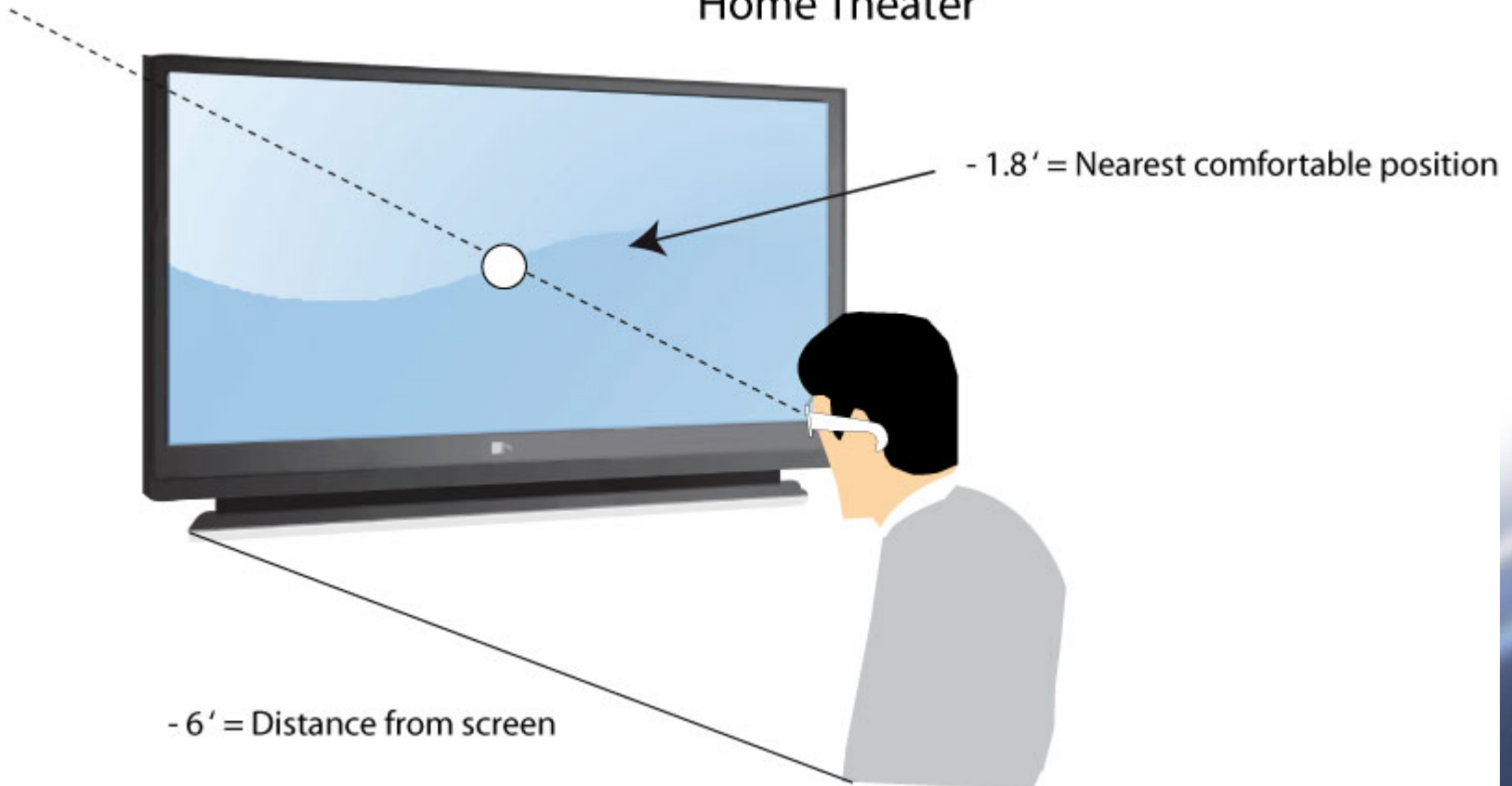
- Ghosting
- Temporal sampling flicker and motion judder
- Maintaining depth across scene cuts
- Window violations
- Vergence-accommodation conflict (focal distance)

Focal Distance - Theatrical



Focal Distance - Home

Home Theater



3D QC Content Issues

- Ghosting
- Temporal sampling flicker and motion judder
- Maintaining depth across scene cuts
- Window violations
- Vergence-accommodation conflict (focal distance)
- Subtitle placement in Z-axis
- Subtitle/content collisions
- Right/left eye sync
- Floating window issues

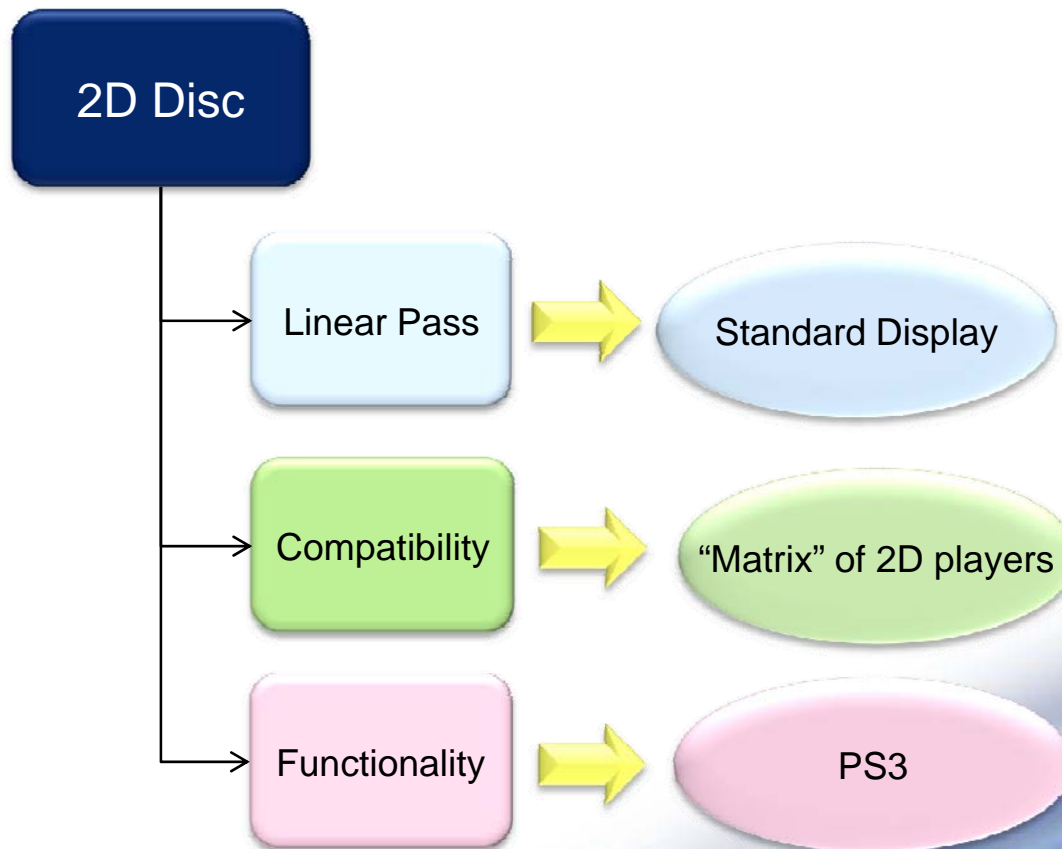
Potential 3D QC Compatibility Issues

- 3D backward compatibility on 2D players
- 3D version showing on 2D display
- Choosing 2D version still shows 3D version
- Right/left eye image inversion
- Subtitle placement in Z-axis
- Decoding artifacts in dependent view

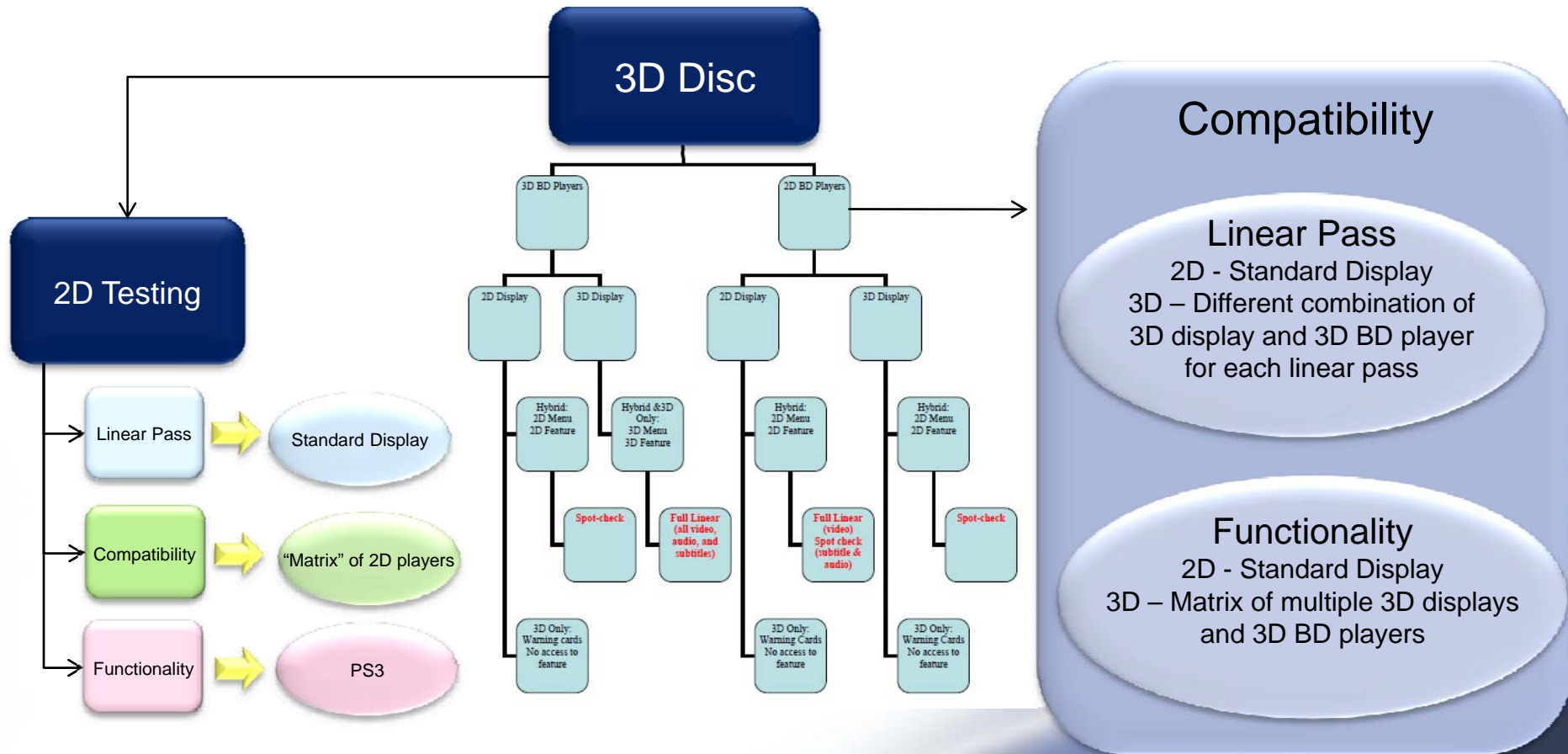
Additional 3D Testing Procedures

- Interoperability
 - All 3D displays
 - One 2D display
 - HDMI 1.4 receivers
- Proper functioning in 2D mode with 2D and 3D display
- Backwards compatibility with 2D Blu-ray players (disc)
- 3D subtitle QC (1 pass per stream)
- 3D Menu QC (HDMV and Java)
- Backwards compatibility with 2D Blu-ray discs (player)

2D Testing Procedures



3D Testing Procedures



Issues Already Found

- 3D authoring/hardware compatibility
 - When new players/chip sets come onto market, often see incompatibility with specific authoring approach
 - Video stuttering, audio stuttering, complete stop
- 2D backward compatibility
 - Almost all 3D authoring approaches have had problems playing back in some 2D BD players
- Interoperability
 - Samsung player would not connect to Panasonic monitor
 - Manufacturer proprietary protocol failing through 3rd party receiver

Issues Already Found

- Software players
 - Plagued with problems
 - Each new fix breaks something else
- Subtitles
 - Switching back and forth from 2D to 3D subtitles (loss of z-axis data) from one subtitle to next

Testing Challenges

- Inability to see 3D
- Eyestrain/Fatigue
- “Flattening”

What's New?

- 3D in the Home Systems
 - May 2010 – 3
 - March 2011 – Over 20
- 3D Portable/Phone – Nintendo 3DS, HTC Evo 3D
- *3D TV Health Benefits -Eye Doctors Discuss the Mechanics and Hidden Benefits of 3D* – today3d.com
- The Hobbit & The Amazing Spider-Man in 3D
- *CEA Begins Standards Process for 3D Glasses* – stereoscopy.com

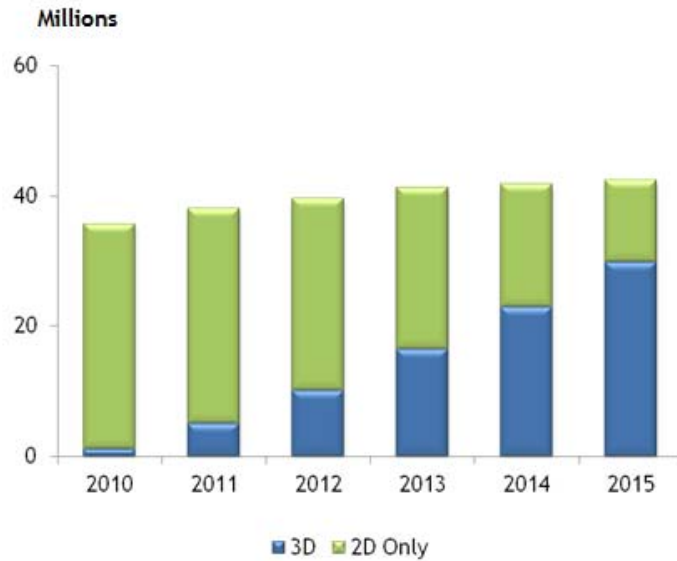
Is 3D A Fad?

- Success in the Theatres – Customer is willing to pay more
- Filmmakers using 3D more effectively
 - Sound
 - Color
 - Cinemascope (and other formats)
 - 3D
- Once a consumer has seen a 3D theatrical version, will they be satisfied with a 2D home version?

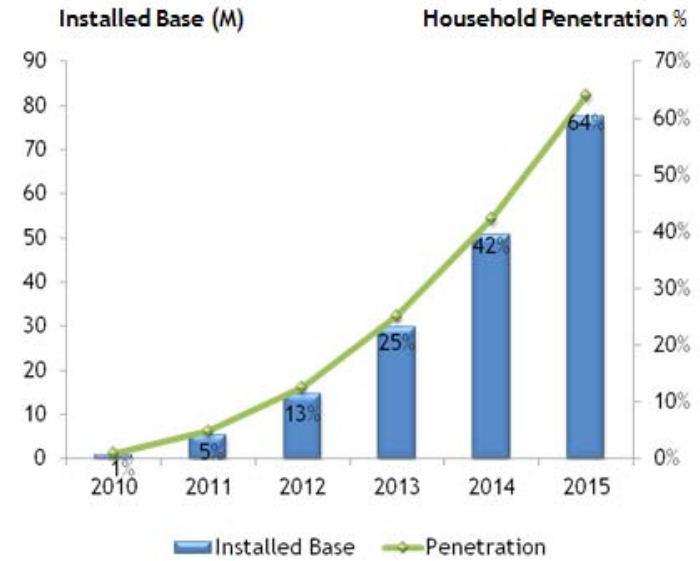
Is 3D A Fad?

3D TV Display Forecast: USA

Annual TV Display Shipments: USA



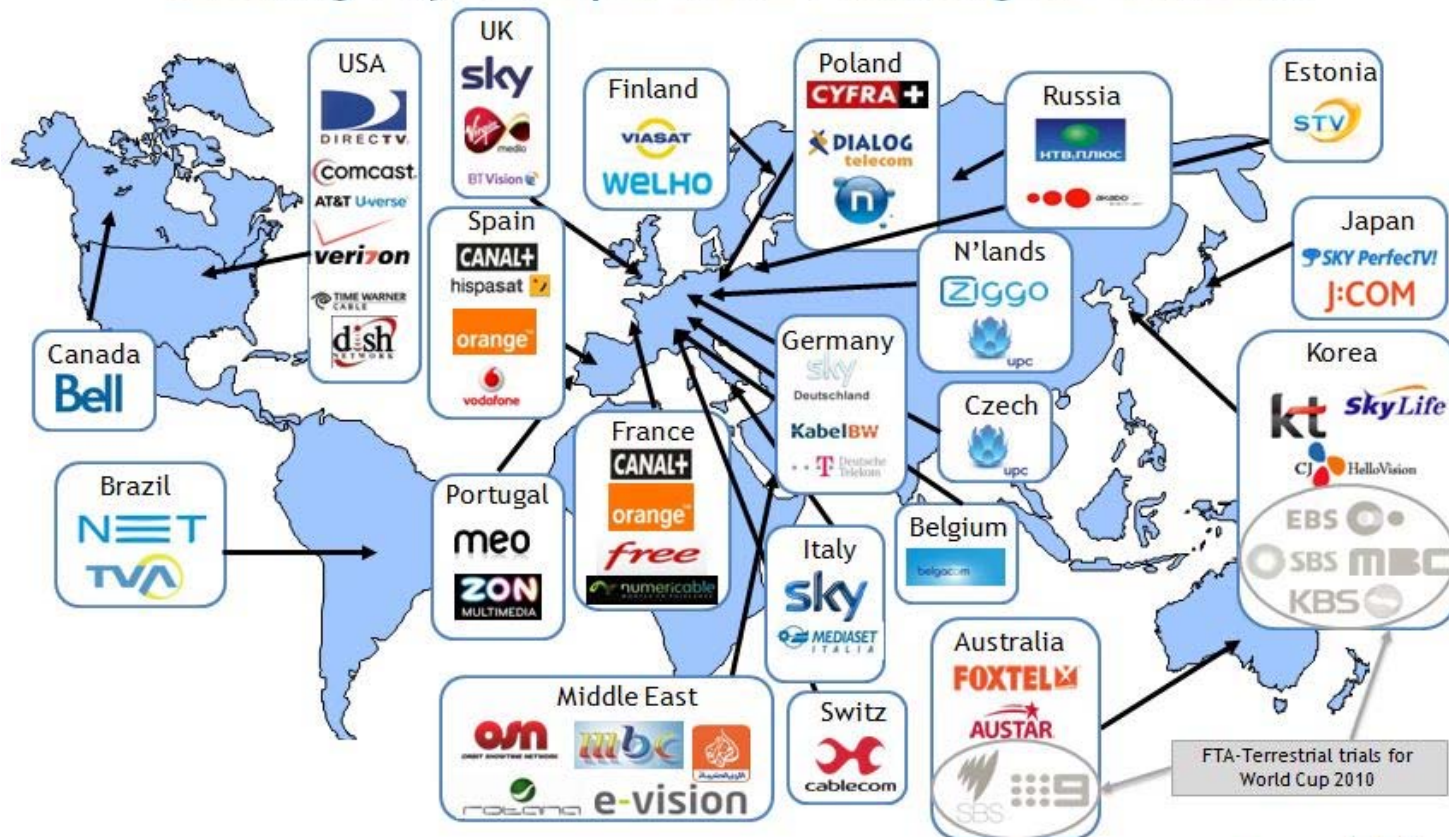
3D TV*



* Excluding non-full HD 3D sets sold prior to 2010

Is 3D A Fad?

Leading Pay-TV Operators Planning 3D Content*



*Includes both 3D broadcast tests and channel/ on-demand service roll-out

THANK YOU

