3D Re-Awakens:
A Review of 2006 and a Look at the Technology

Media Salles Digitraining 2007
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Agenda

- What happened in the last year?
- Plans and Roll-outs for 2007
  - screens
- Planned Movies
- Technology Update
  - Systems
  - Reliability
  - Standards
- Demo

American Focus - Initially

- **Early 3D roll-out is dominated by US theatre chains**
  - **3D deployment on digital screens**
  - **US deployment currently dominates**
- **Test theatres in many International markets**

REAL D

- **REAL D is dominant provider**
  - **>95% of 3D cinema installations worldwide (not including IMAX)**
- **Other systems developing**
- **REAL D system proven track record**
  - **Performance**
  - **Reliability**
  - **Box office results**

Key Dates in 3D

- June 2005
  - Disney, REAL D agree to launch Chicken Little in 3D
- November 2005
  - Chicken Little opens on 89 3D screens in North America
  - Box office average - 3x 2D
  - Movie composed conservatively
  - 3D presentation holds up well,
    - No headaches or eyestrain
  - System pronounced “very good”
  - Audiences liked it, exhibitors liked it, Disney liked it
- December 05 – February 06
  - Chicken Little 3D opens in International territories (UK, Australia, Germany, Japan)
  - International box office holds similar ratios

2006

- **July 2006**
  - **Monster House opens on 178 (REAL D) screens in North America**
  - **Widest digital release (2D or 3D) to date**
  - **Box office 3x**
  - **Composition less conservative**
  - **Viewing experience very comfortable**
- **August**
  - **Monster House opens internationally**
  - **Korea, Germany, Australia etc.**
- **Oct 20, 2006**
  - **Nightmare Before Christmas releases on 168 screens in North America**
  - **Released only in 3D**
  - **Theatres set records – El Capitan grosses >$300,000 opening week-end**
  - **Re-release of old movie**
- **October 23, 2006**
  - **REAL D demonstrates live 3D in theatre at Show East**

End 2006 (REAL D) Footprint

- 220 screens worldwide
- 40 exhibitors
- 9 countries
  - U.S., Canada, U.K., Mexico, Korea, Germany, Australia. Japan, Russia
- Established in less than 9 months

2007

- **Feb 18 – Live simulcast of National Basketball Association All-star game in 3D**
  - **HD resolution, 5 camera played in real time**
- **March 30 – Meet the Robinsons**
  - **Critical event spurs installations**
  - **Installed systems – >700**
  - **All major US theatre chains involved**
  - **30 shutter glasses sites in Europe**
  - **1 Dolby site**
- **Committed – >1000 REAL D systems before end 2007**
- **>20% of all Digital Cinema screens are 3D enabled**

Current REAL D Footprint

Australia	15
Brazil	3
Germany	2
Greece	2
Iceland	1
Japan	3
Korea	17
Mexico	5
Portugal	8
Singapore	1
UK	7
Canada	8
USA	631
Total	703

Exhibitor Experiences

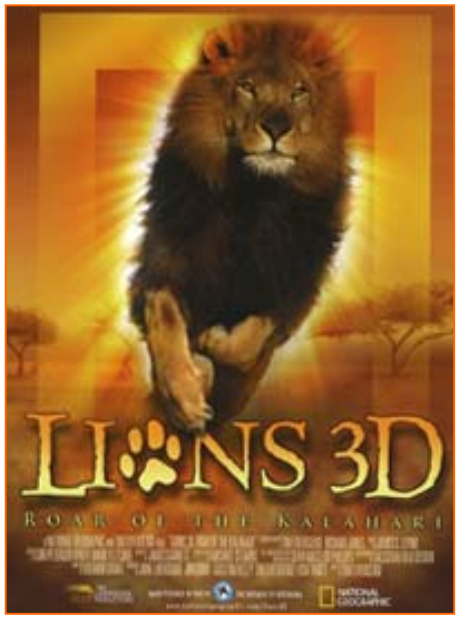
REAL D At The Box Office

- 88 REAL D screens generated over $7 million in 4 weeks
- Nearly 3 times the 2D screen average

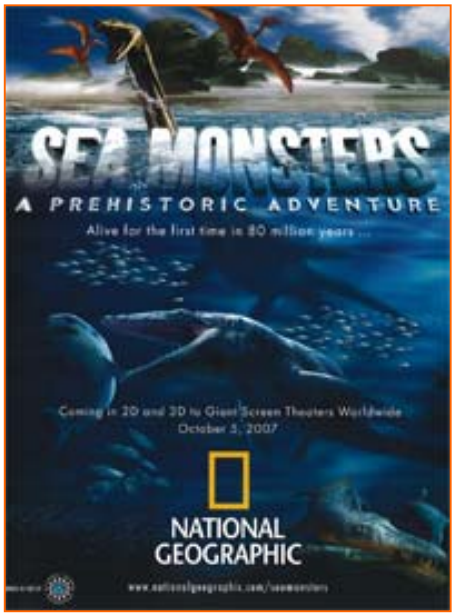
- REAL D screens grossed over $10 million
- 15% of domestic gross was generated by 4% of screens
- Nearly 4 times the 2D screen average

- Grossed $19,500 per screen on opening weekend

The Future… More 3D Releases

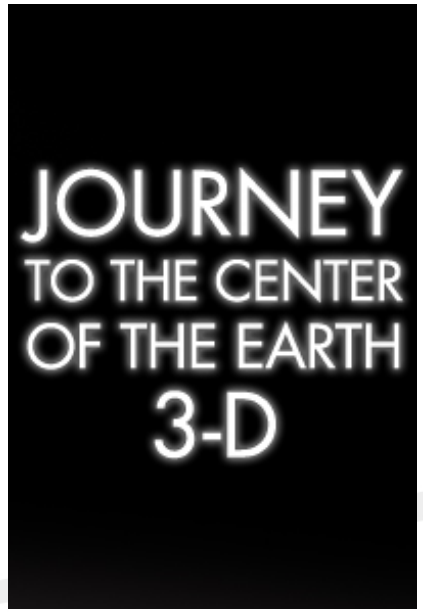


Lions 3D:
Roar Of The Kalahari
Spring 2007



Sea Monsters:
A Prehistoric Adventure
Fall 2007

Beowulf
November 21, 2007

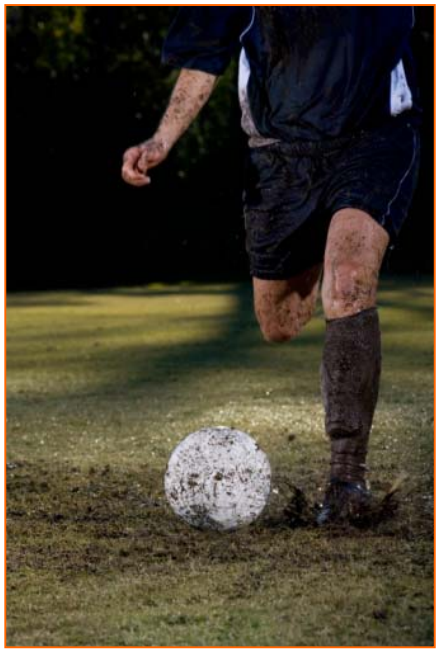


Journey To The Center
Of The Earth 3-D
March 2008

Releases in Discussion

- **Dreamworks commits to release all movies in 3D starting 2009**
- **James Cameron plans Avitar 3D release in 2009**
- **U2 South American concert tour to release later in 2007 only in 3D**
- **Other studies nearing commitment for 3D movie releases**

The Future… Live Events/Alternative Content



- **Concerts, sporting events, and more…**

Technology Update

- **3D theatre system comparison**
- **Description of REAL D System**

What is Involved in 3D System for Theatre?

- **Simple Addition to Digital Cinema projection system**
- **Means to provide separate images to left and right eyes**
  - **2 projector with polarization and passive glasses**
  - **1 projector with shutter glasses**
  - **1 projector with Z screen and passive glasses**
  - **1 projector with spectral division (e.g. Infitec)**

System Requirements for 3D Theatre

- **Provides quality 3D viewing**
- **Easy for theatre to operate**
- **Large screen**
- **Economics are viable**
- **Reliable**

Dominant Systems

- **REAL D Z screen and passive glasses (700 sites)**
  - **Switches polairzation at projector**
- **Shutter glasses (Nuvision) (30 sites)**
  - **Switches eyes off and on in glasses**
- **Spectral Division / Infitec (Dolby) (1 site)**
  - **Uses different colors for each eye**

Comparison of 3D Theatre Systems

	Shutter Glasses	REAL D Circular	Spectral Division (Infitec)
Screen	Conventional matte white	Silver-non depolarizing	Conventional matte white
Switching speed (blanking time)	Slow - >2 milliseconds Supports double flash only	Fast < 600 microseconds Supports triple flash for better motion	Fast
Light efficiency	Low	Low	Low
Cost	Tens of $	Tens of cents	Tens of $
Dynamic Range	Very good	Good	Good
Max screen size: 17 nits image, 20,000 lumens, gain 1.3 matte or gain 2.4 silver	1.3 gain matte - 11 metres 2.4 gain screen - 15 metres	2.2 gain silver 15.5 metres	1.3 gain matte -11 meters 2.4 gain -15 metres

Comparison of 3D Theatre Systems (cont.)

	Shutter Glasses	REAL D Circular	Spectral Division
Eyewear Management	Theatre must collect, clean, QC and re-use (Major issue)	Disposable or souvenir	Theatre must collect, clean, QC and re-use (Major issue)
Theatre management	Requires IR synchronization	Requires Z screen modulator attached to projector	Requires special projector and special server
System deployment	In ~30 theatres	In >700 theatres	In development
System Manufacturers	MacNaughton, REAL D	REAL D	Dolby

Issues

- **Theatre operation**
- **Silver Screen**

Theatre Operation

- **Reused Eyewear – Shutter and Infitec**
  - **Operational costs (personnel) to:**
    - **Collect**
    - **Clean**
    - **Test**
    - **Repair**
  - **theft**
- **Passive eyewear is low cost**
  - **Disposable**
  - **Souvenir – themed with movie**
- **Economics**
  - **Reusing eyewear places significant operational burden on theatre operations**
  - **Inventory needs periodic replacement**

Silver Screens

- **Criticism of Silver Screens**
  - **Based on hot spot, color shift and cosmetic defects**
  - **Newest silver screens are significantly improved in last 2 years**
    - **Broader light distribution**
    - **No color shift**
    - **No cosmetic defects**
  - **Performance tests with studios are very positive**
- **Passive systems require silver screens for polarization**
  - **Silver screen provides gain**
    - **Needed for larger screens**
- **Active and spectral division systems don’t require silver screens**
  - **BUT – are very limited in screen size due to brightness.**

Brightness Considerations

- **Single projector passive glasses system capable of 49’ (15.5m) screen at 17 cd/m^2 (gain 2.2 Silver)**
- **Shutter glasses, spectral division capable of 36’ (11m) screen at 17cd/m^2 (gain 1.3 Matte)**

Reliability

- **700 REAL D systems installed**
- **Cumulative running time >250,000 hours**
- **Failures in theatres - 0**

Standards For 3D - SMPTE

- **SMPTE is working on standards through DC28.40 Working group.**
  - **Mastering**
  - **Distribution**
  - **Exhibition**
- **3D can fit within most of the DCI requirements**
  - **Manage 2 parallel pictures**
  - **Overall darker image due to efficiency**
- **Currently no 3D specific standards**
  - **12 months**

The REAL D System in Operation - Demonstration

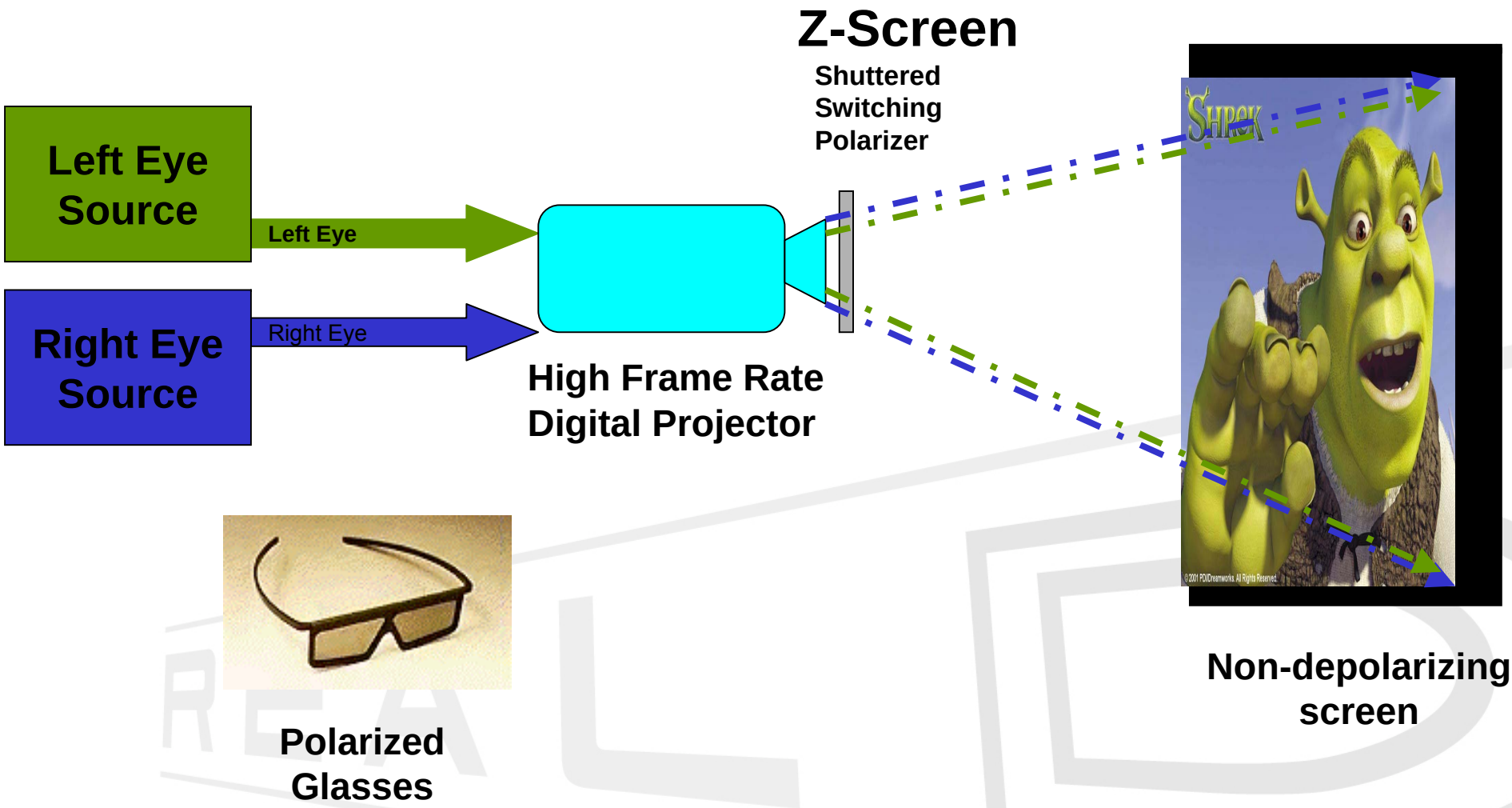
The REAL D System

- **Created for a high quality visual experience**
- **Image quality is driver**
  - **High performance**
  - **Long-term stability**
- **Easy to use**
- **developed over 5 years**

What Makes Good 3D?

- **Quality content**
  - **Conservative use of 3D effects (parallax)**
  - **Careful editing**
  - **No “conflict of cues”**
- **Quality Display system**
  - **Left/right eye symmetry**
  - **Minimized ghosting / crosstalk**
  - **Good motion rendition**
  - **Brightness**
- **The objective is to make the image “feel” like the real world**

Passive 1 Projector Stereo (REAL D System)



System Components

- 3D-enabled server
  - e.g. QuVis Cinema Player and other manufacturers
- Projector
  - DLP Cinema™ digital cinema projector
    - Barco, Christie, Cinemeccanica, NEC
- “Z-Screen” electronic polarization switch
- Silver screen
  - System requires high quality to ensure good performance
- Inexpensive passive glasses
  - Souvenir or disposable

Server

- **Outputs left and right eye streams**
- **Connects to projector over 2 links (dual link)**
- **Manages 3D and 2D content**
- **Multiple manufacturers**
  - **Doremi, Kodak, Dolby, QuVis, GDC**

Projector

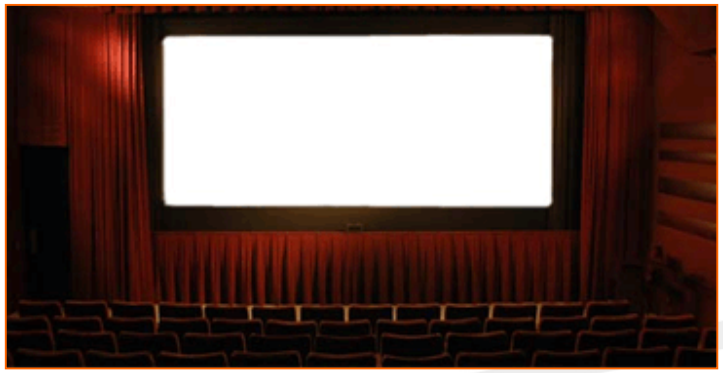
- Standard DLP Cinema projector
  - Barco, Christie, NEC
- Set into 3D mode, and use “triple flash”
- Left and right frames input from server
- Requires brighter lamp than for 2D
- Accurate color through projector’s color calibration

Z-Screen

- **Mounts in front of projector**
- **Synchronized to projector and switches polarization for left and right eyes**
  - **Left circular for left eye**
  - **Right circular for right eye**
- **Simple device**
  - **Long life**
  - **Stable performance**

Projection Screen

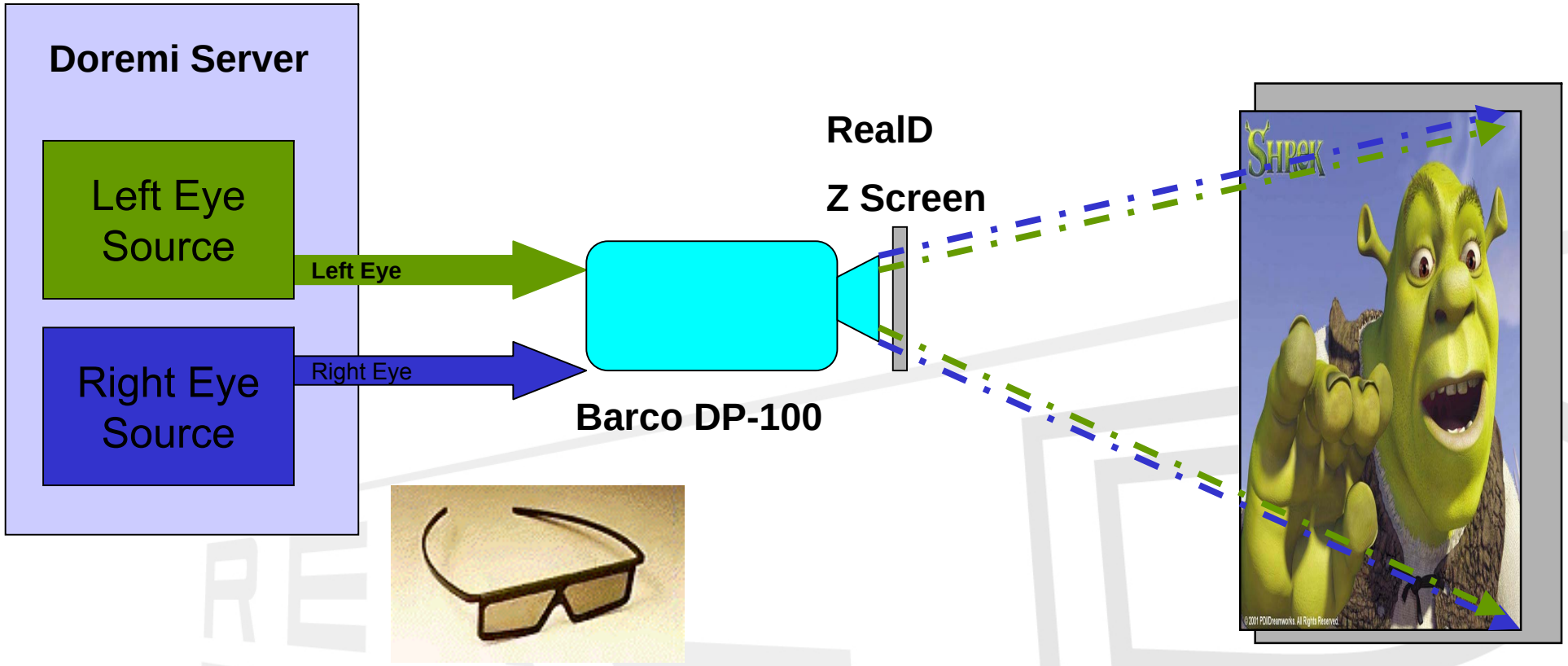
- **High quality**
- **Maintains polarization**
  - **Silver screen**
- **Gain for screen size**
- **Latest screens from MDI (Canada) and Harkness Hall (UK/US/France)**



Eyewear

- **High performance to minimize ghosting**
- **Inexpensive – disposable or souvenir**
- **Glasses may be designed to match theme of movie (e.g. *Chicken Little*)**

System for Demo



RealD Circular Polarized glasses

Content

- ***The Nightmare Before Christmas*** **trailer – courtesy of Disney**
- ***Meet the Robinsons*** **trailer – courtesy of Disney/Buena Vista International**
- ***National Geographic*** **trailers – courtesy of National Geographic**
- ***U2 3D*** **– courtesy 3ality inc.**

Thank You

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REAL D

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