

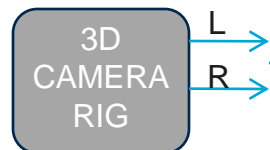


## 3D Customer Summary

Harmonic 3D Team  
April 2010

# 3D Delivery To the Home

- ▶ 3D in the movie theatres has been very successful
- ▶ 3D today means stereoscopic 3D
- ▶ Simultaneously deliver Left eye/ Right eye signal to create depth perception
  
- ▶ Harmonic is active in the primary standards organizations
  - MPEG, DVB, SMPTE, SCTE, and ATSC
  - Standards groups are co-operating towards a unified 3D approach
  - A unified approach will deliver cost benefits to the end user



Home Delivery?

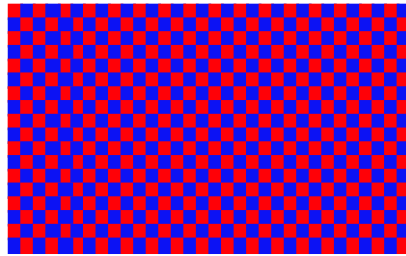


# Deliver 3D To The Home Today

- ▶ With “frame compatible” delivery
  - Use current infrastructure
  - Deliver to 3D ready TV

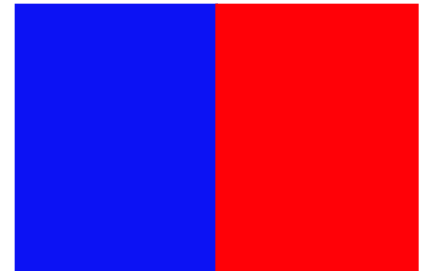
## Checkerboard

$\frac{1}{2}$  Resolution  
- difficult to encode



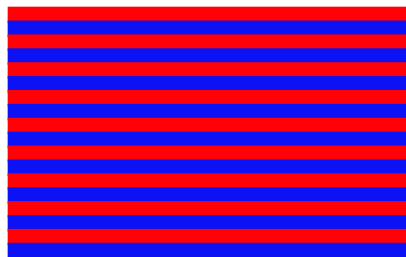
## Side by side

$\frac{1}{2}$  Horizontal resolution  
- easy to encode



## Line interleave

$\frac{1}{2}$  Vertical Resolution  
- difficult to encode



## Above & Below

$\frac{1}{2}$  Vertical resolution  
- easy to encode



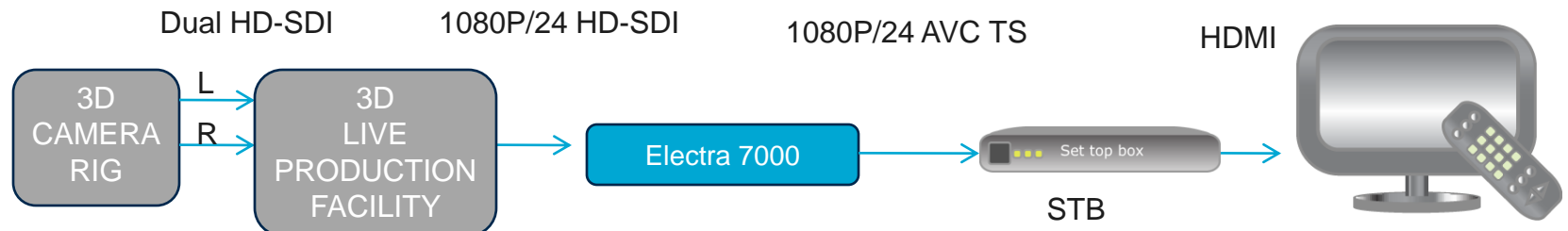
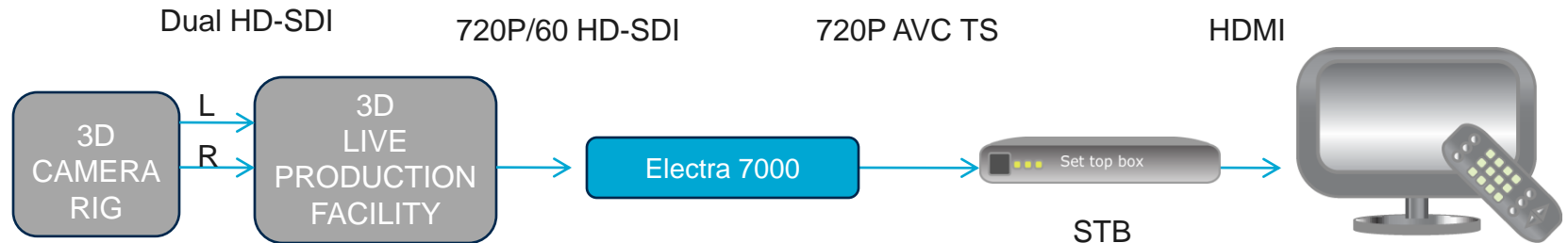
## Time Interleave

$\frac{1}{2}$  Temporal Resolution  
- difficult to encode



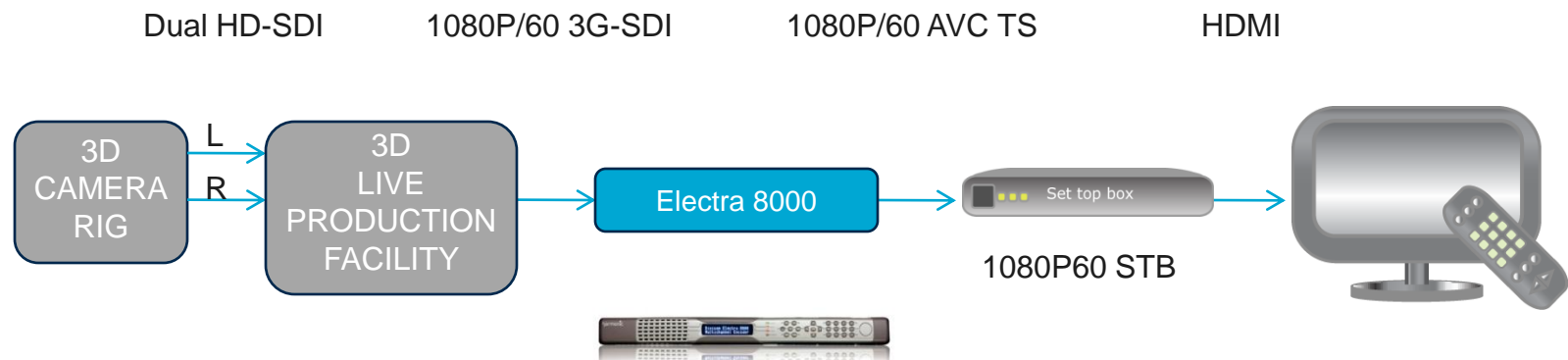
# 3D Delivery Chain Today

- ▶ Deliver 3D today
- ▶ Frame compatible image pair delivered with 1080P/24 or 720P/60
  - Side/side, top bottom, checkerboard, line interleaved
- ▶ Standard STB and standard Encoder
- ▶ Spatial resolution is halved but viewer reaction is still positive



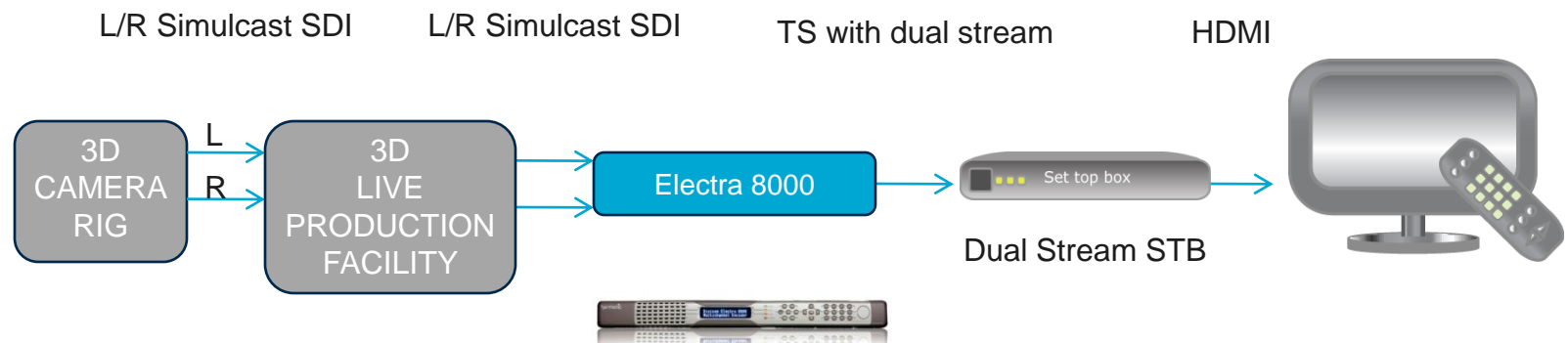
# 3D Delivery Chain 2011

- ▶ Frame compatible image pair delivered using 1080P/60
  - Side/side, top bottom, checkerboard, line interleaved
- ▶ 1080P60 Encoder and STB
- ▶ 1080P60 encoder is planned for 2011
  - Synchronized with anticipated 1080P/60 (HDMI 1.4) STB's



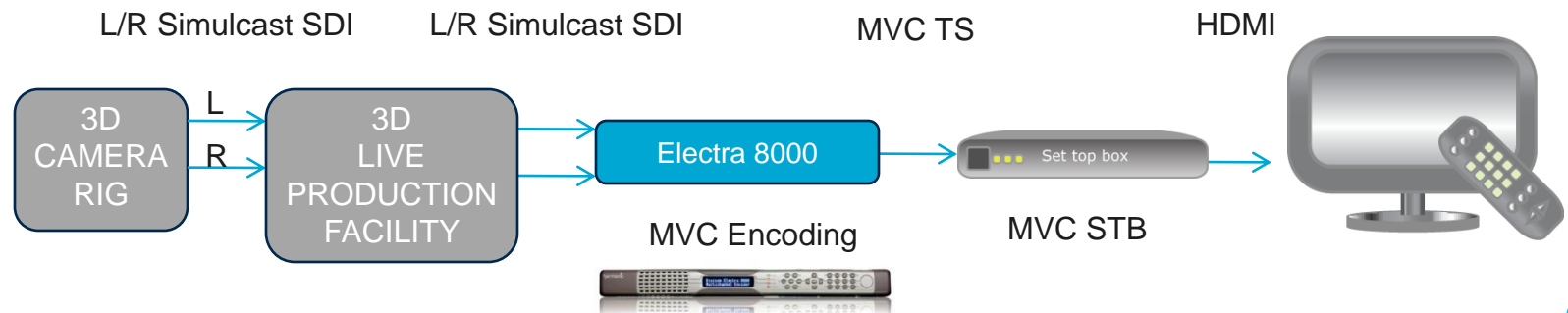
# 3D Delivery Chain Future

- ▶ Deliver 3D with full HD resolution
- ▶ Dual stream L/R Simulcast encoded delivery
  - Need twice the bandwidth
- ▶ 2012 or later
- ▶ Needs simulcast stream encoder /STB and infrastructure
  - Unclear when STB might be available
- ▶ Electra 8000 is hardware capable
  - Unclear if there is demand to justify the dev effort



# 3D Delivery Chain Future

- ▶ MVC encoded delivery
  - 2D Base layer + 3D enhancement
  - 20-30% bandwidth saving compared to dual
- ▶ Needs MVC encoder and STB
- ▶ Complex encoding
- ▶ Standards incomplete - work in progress
  - Unclear when STB might be available
- ▶ Electra 8000 is hardware capable
  - Unclear if there is demand to justify the dev effort



# Products

- ▶ Electra 7000 with 1080P/24 can be used for 3D delivery **today**
  - Harmonic customers are doing this now!
- ▶ Electra 8000 is hardware capable for future needs
  - 3G-SDI inputs for all proposed production formats
  - 1080P/60 in 2011
  - Multiple encoding resource for dual link delivery or MVC
- ▶ Harmonic goal is protect our customer's investments in new encoding technology...



# Operator Economics

- ▶ Live production requirements differ significantly between 2D and 3D
  - Camera angles
  - Production “syntax” (rate of cuts/dissolves/vision mixer effects)
- ▶ This seems likely to translate into a dual-production requirement
  - Operators must recover those costs
  - Pay-per-view or elite tier is required
  - Small audience sizes likely, at least to start
- ▶ Business-cases need to be carefully considered!



Thank You!

