CableLabs®

Cable Ready for Immersive Media with 10G

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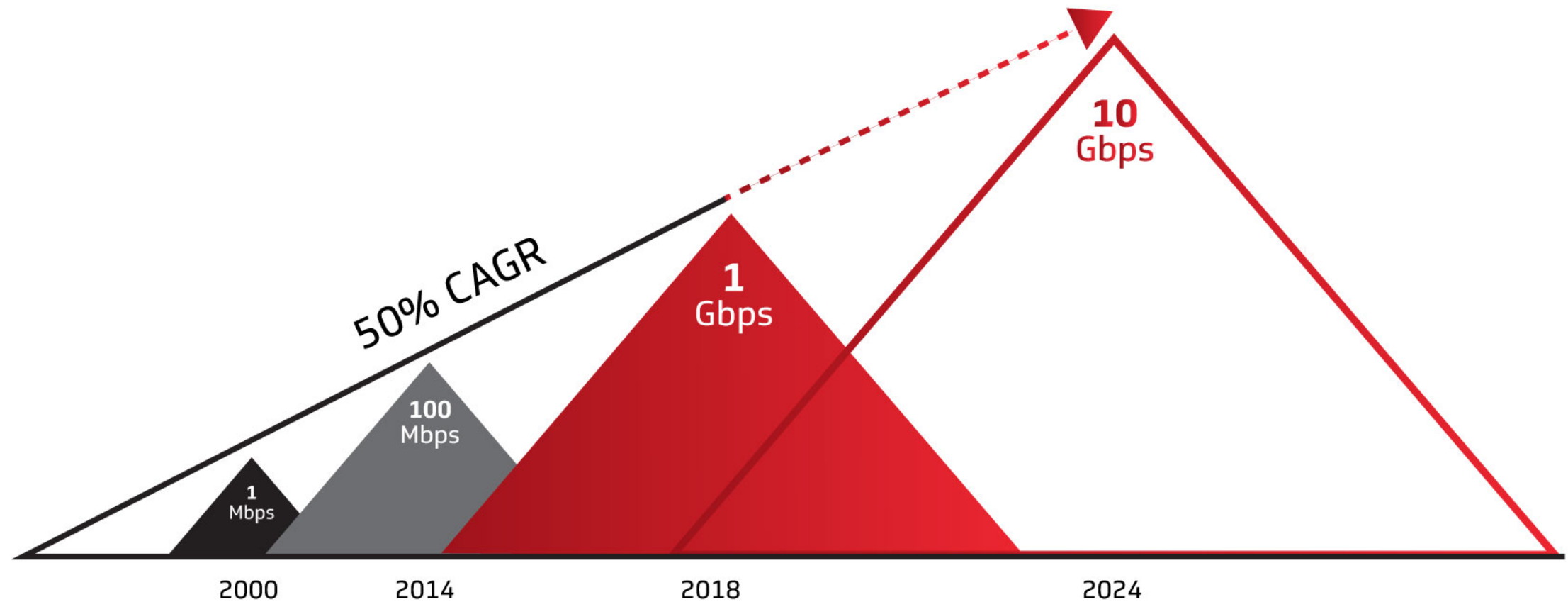
Gigabit Broadband Now A Reality

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DEC 2016
4%

DEC 2018
80%

Availability to US Housing Units

Source: CableLabs

10 Gigs on the Horizon

Source: https://www.nngroup.com/articles/law-of-bandwidth/

100G

Speeds: 10G FDX

Evolving to Full Duplex DOCSIS

	DOCSIS 1.0	**DOCSIS 1.1**	**DOCSIS 2.0**	**DOCSIS 3.0**	**DOCSIS 3.1**	**FULL DUPLEX** **DOCSIS 3.1**
Highlights	Initial cable broadband technology	Added voice over IP service	Higher upstream speed	Greatly enhanced capacity	Capacity and efficiency progression	**Symmetrical streaming and increased upload speeds**
Max Downstream Capacity	40 Mbps	40 Mbps	40 Mbps	1 Gbps	10 Gbps	**10 Gbps**
Max Upstream Capacity	10 Mbps	10 Mbps	30 Mbps	100 Mbps	1-2 Gbps	**10 Gbps**
Initial Specification Date	1997	1999	2001	2006	2013	**2017**
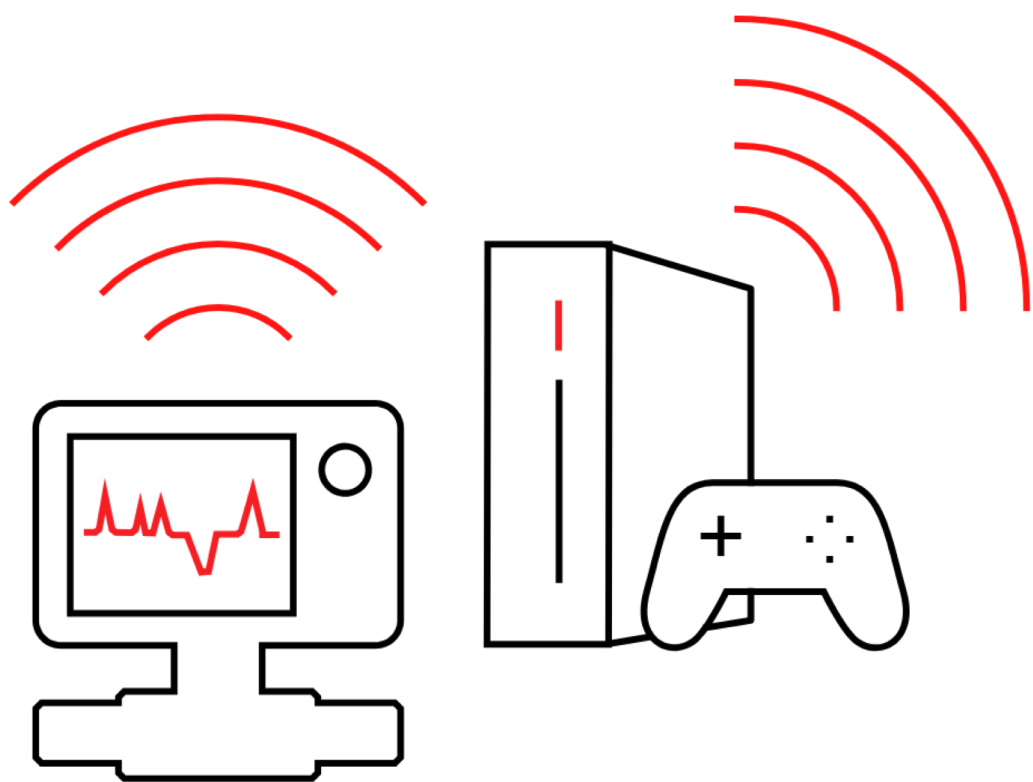
Low Latency

- **Reducing Latency:** 1 millisecond latency for a range of applications

- **Improving UX:** Web page loading, gaming, video calling will all benefit

- **Enabling New Apps:** Medical, vehicular, & other apps require low latency

Security: CableLabs® Micronets

- **Ease of Use:** leveraging SDN, AI, and machine learning to minimize the burden on the consumer

- **Mitigating Insecure IoT:** Quarantining compromised devices

- **Providing Enhanced Security:** Isolating and securing high-value or sensitive devices

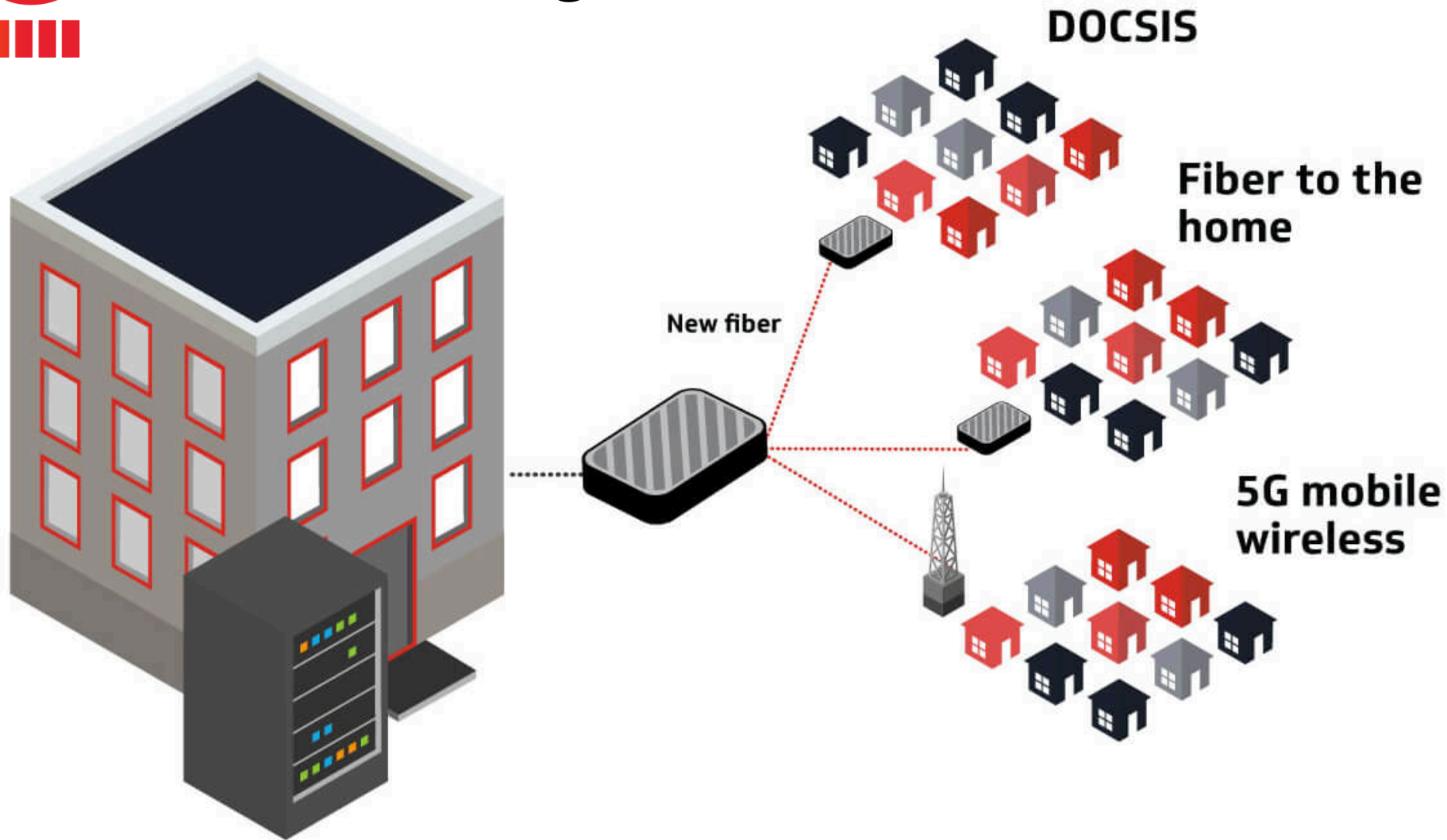- **Transparency:** Visibility and auditability of network events

Wi-Fi

- **Faster Wi-Fi:** Keeping pace with network performance

- **Whole-Home Coverage:** Connectivity everywhere

- **Seamless:** Easy, secure, high-performing wireless

Convergence

10G

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DOCSIS

New fiber

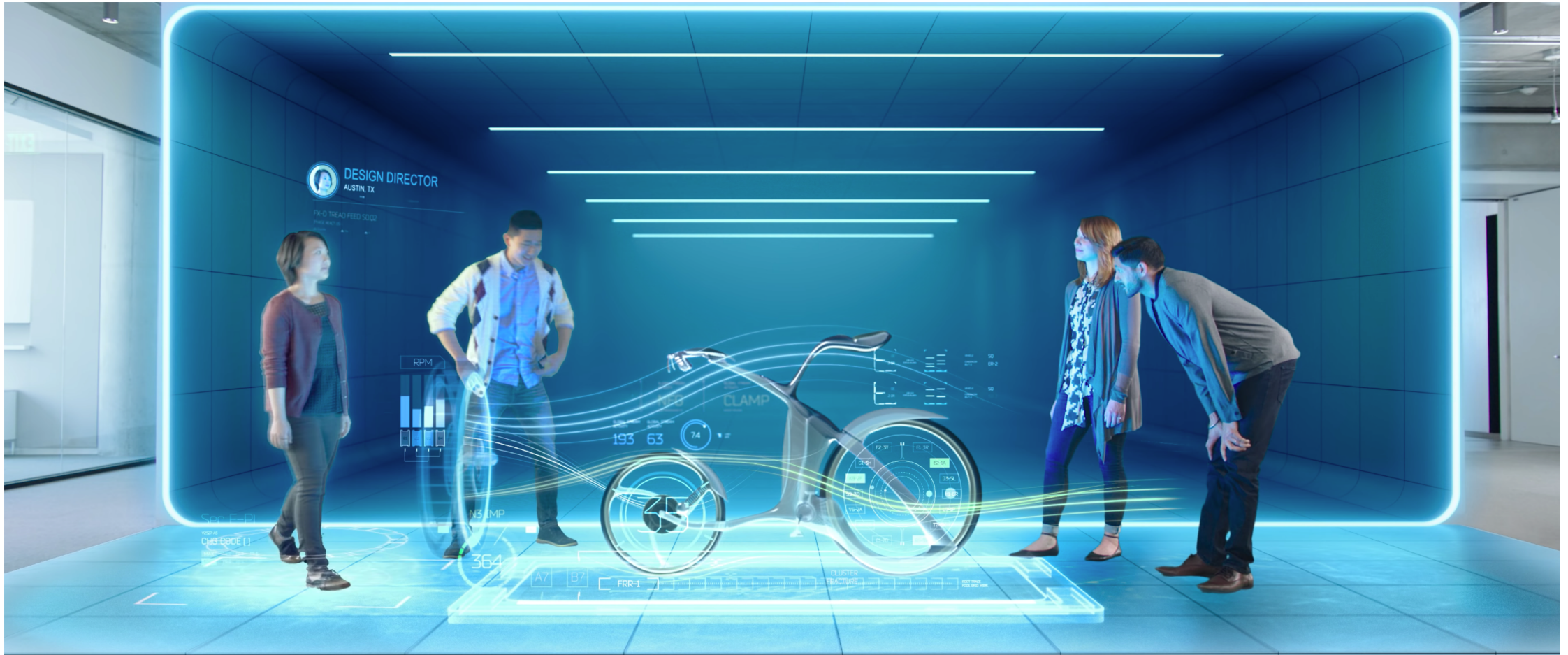Fiber to the home

5G mobile wireless

Immersive: Entertainment and Gaming

Immersive: Education and Work

What is a Light Field?

- Modeled by plenoptic function: $P(x,y,z,\theta,\rho,\lambda,t)$

- Volume of light rays

- Flow of light: every direction, wavelength, across time

- Requires source of light (sun, light bulb)

- Rays interact with surface of object
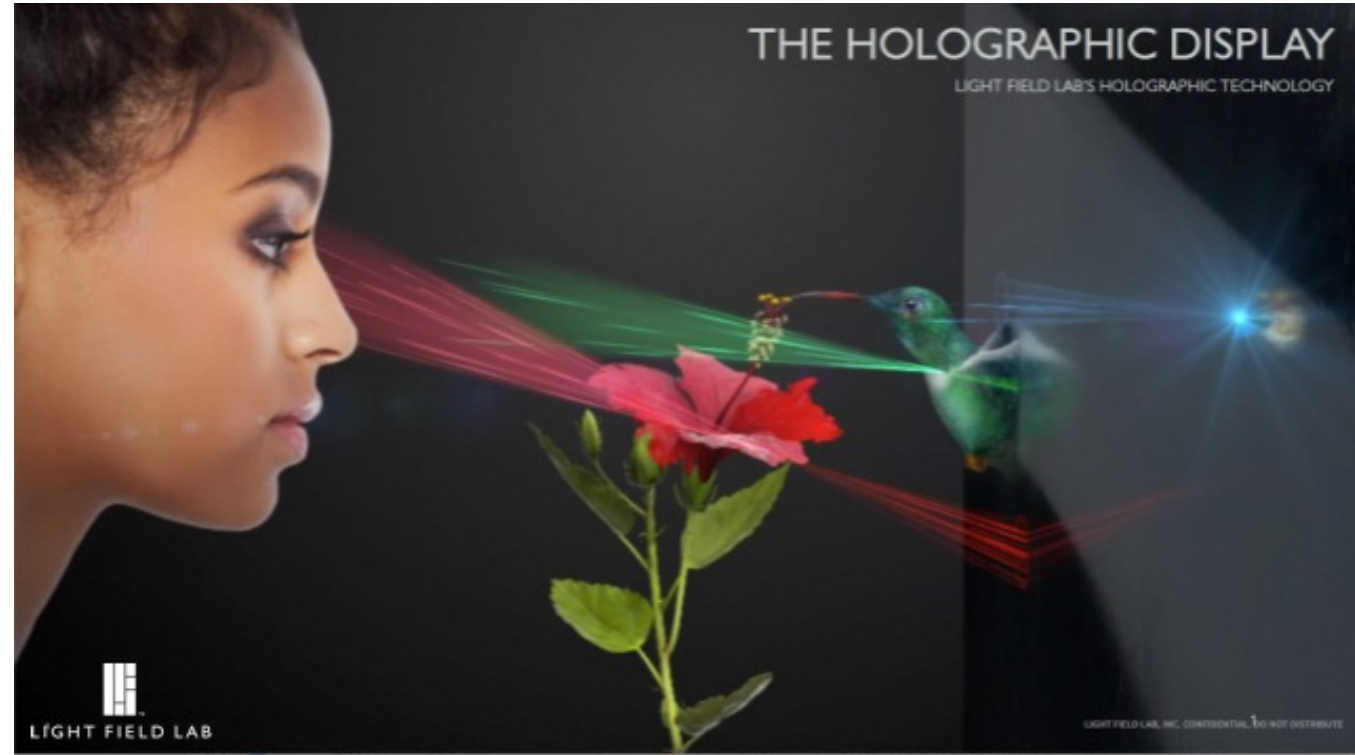
- Surface properties determine what happens to those rays

THE HOLOGRAPHIC DISPLAY
LIGHT FIELD LAB'S HOLOGRAPHIC TECHNOLOGY

LIGHT FIELD LAB

Image credit: Light Field Lab, Inc. © 2019. All rights reserved.

Essentials for Success

- Capture
- Network
- Display
- Content
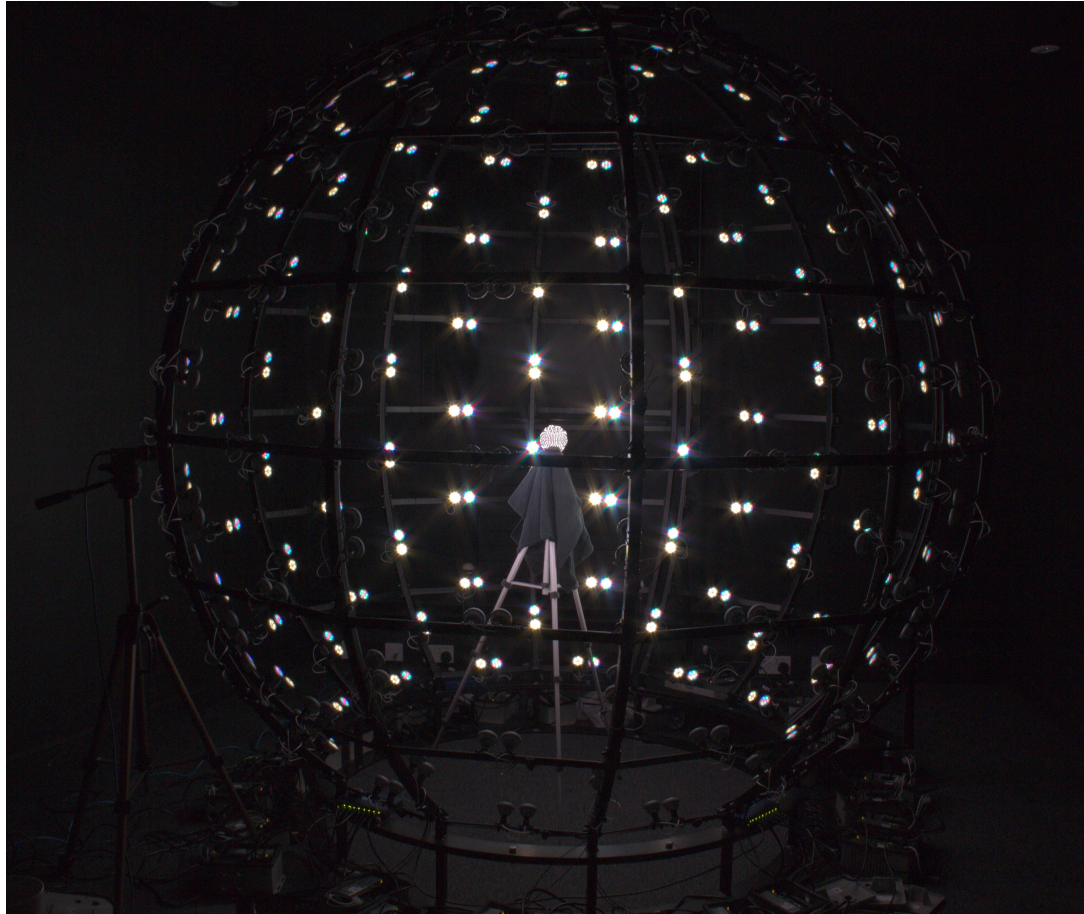- Standards

Anything missing from the above => FAILURE

State of the Art Capture Tech

Light Field Cameras and Light Stages
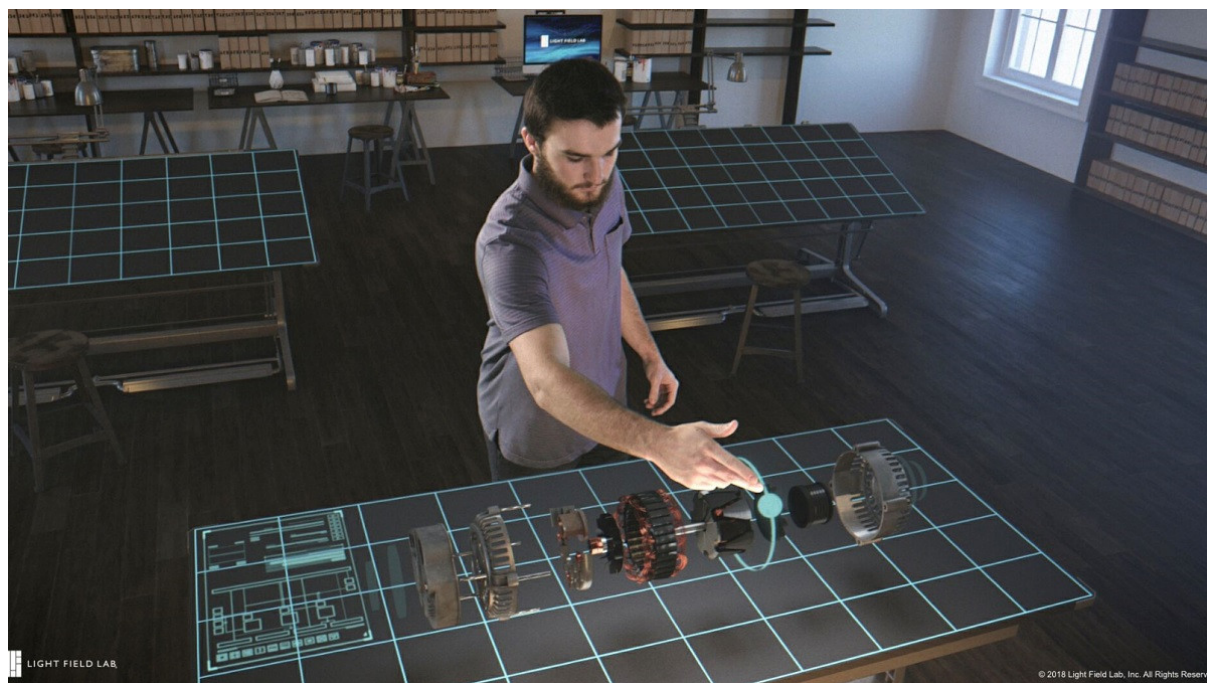
Light Field Lab:
State of the Art Display

Image credit: Light Field Lab, Inc. © 2019. All rights reserved. Future vision concept art of holographic industrial table top display from Light Field Lab, Inc.
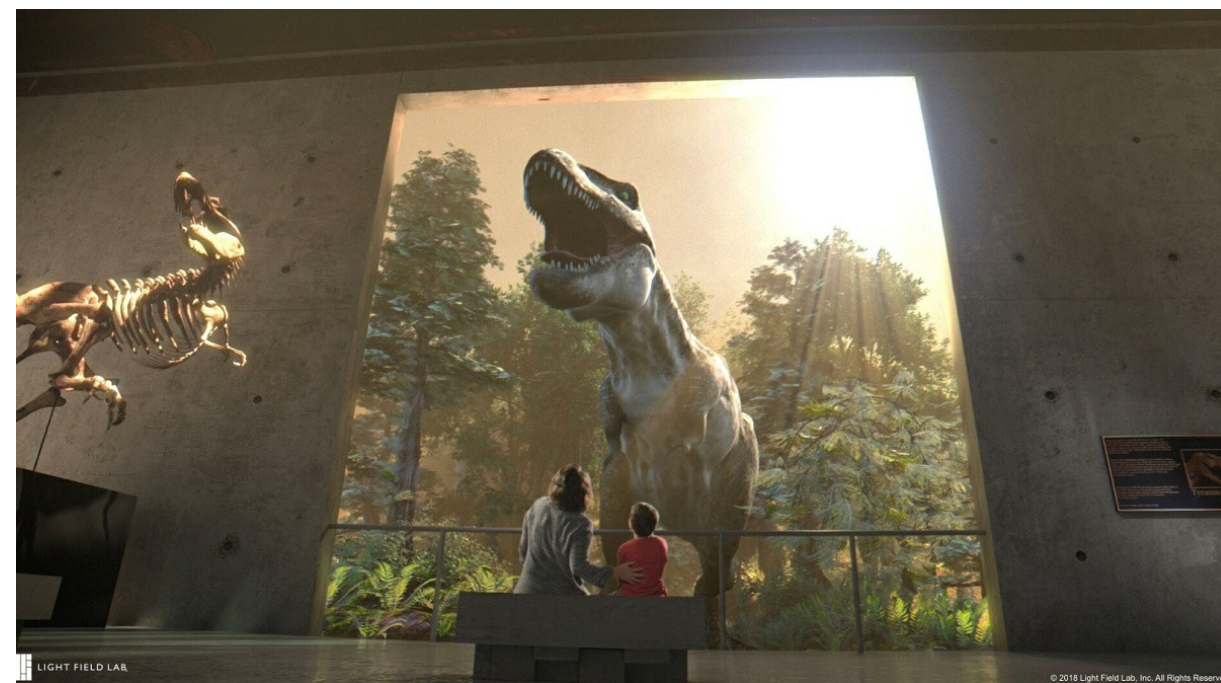

Image credit: Light Field Lab, Inc. © 2019. All rights reserved. Future vision concept art of special venue holographic display from Light Field Lab, Inc.
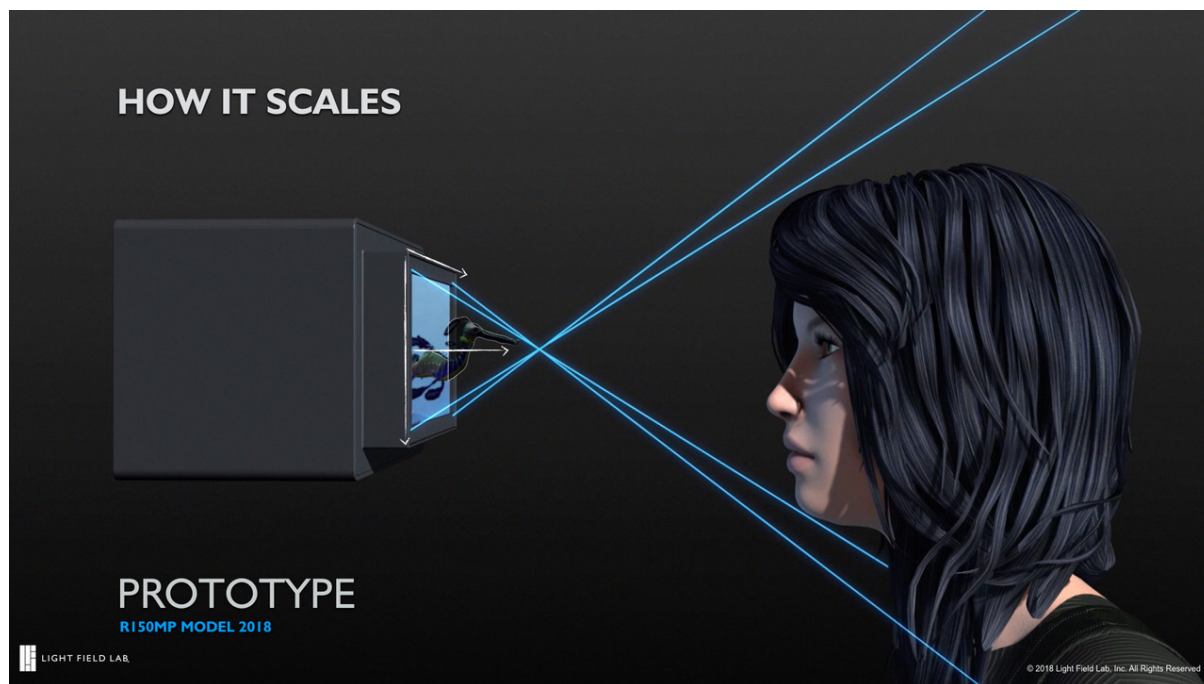
Light Field Lab Display: Prototype to Panel

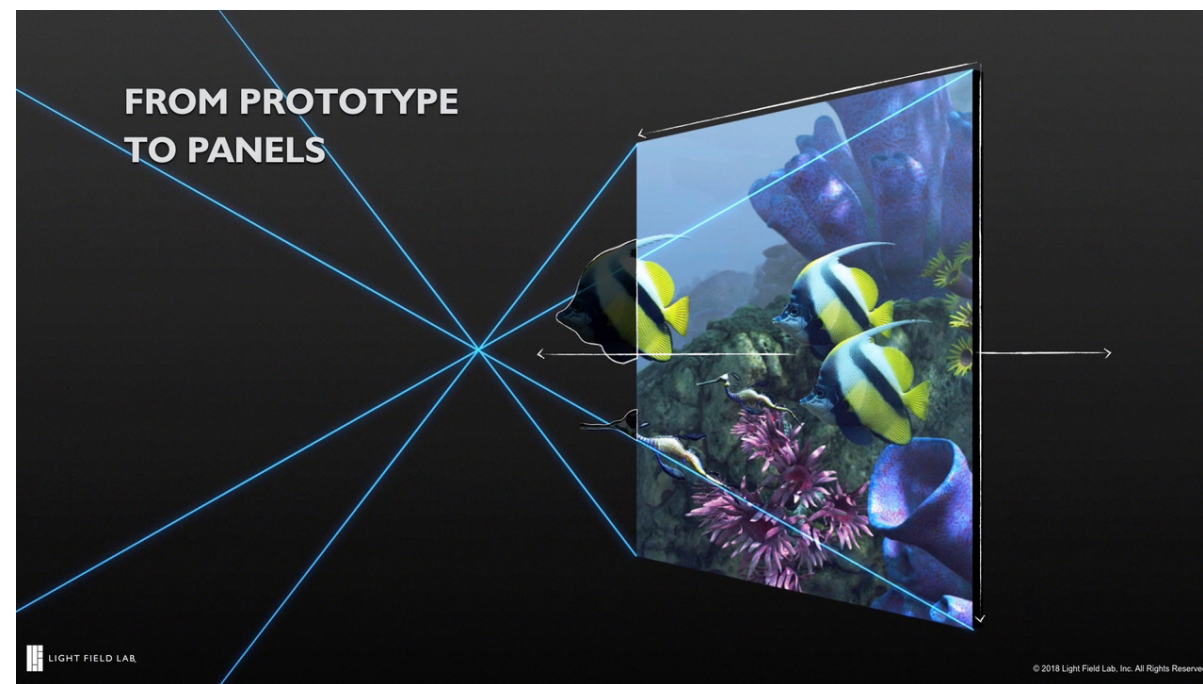Image credit: Light Field Lab, Inc. © 2019. All rights reserved.
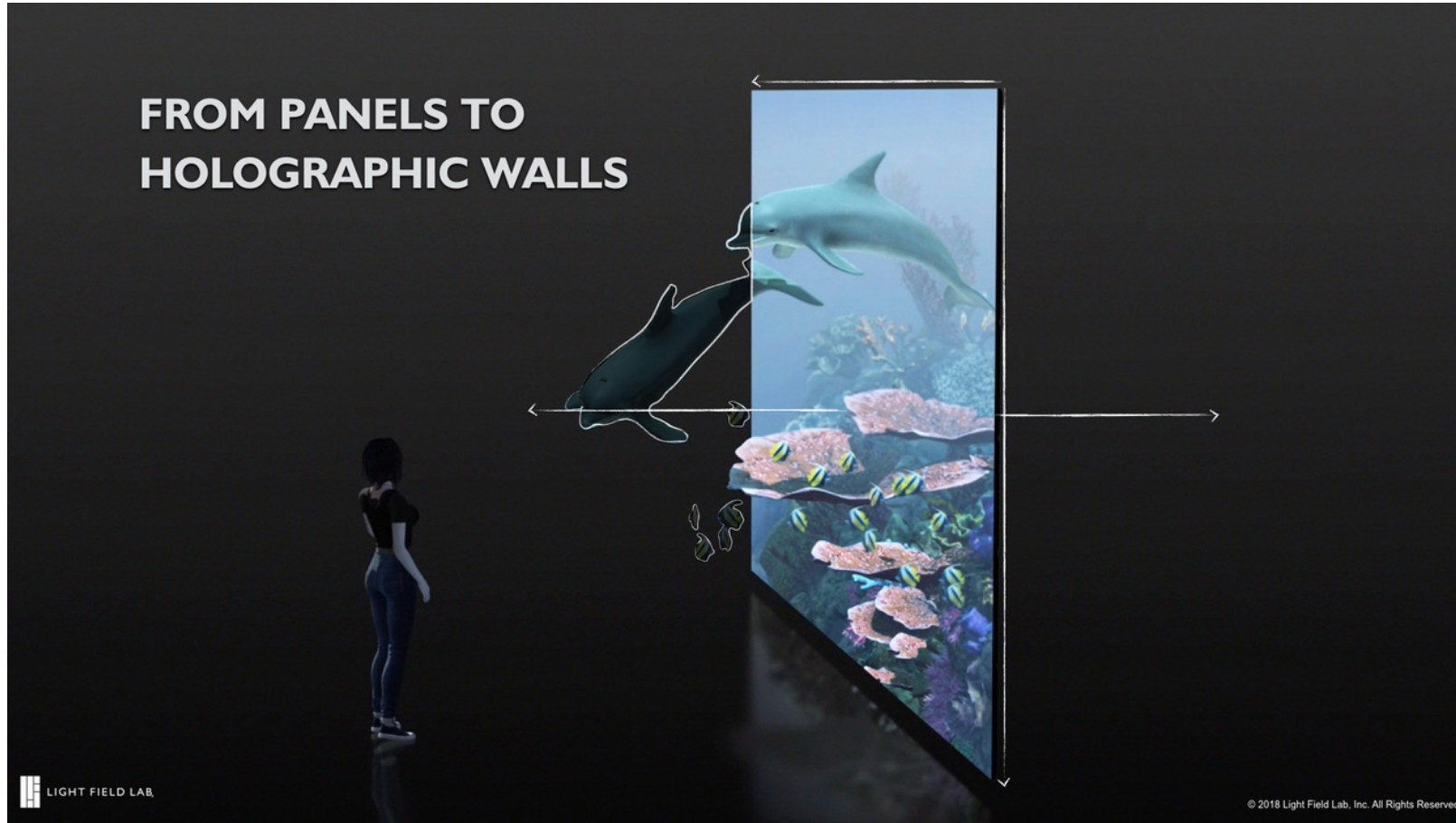
Image credit: Light Field Lab, Inc. © 2019. All rights reserved.

Light Field Lab Display: Panel to Wall

Image credit: Light Field Lab, Inc. © 2019. All rights reserved.

Light Field Lab Display: Wall to Holodeck

Image credit: Light Field Lab, Inc. © 2019. All rights reserved. Future vision concept art of room scale holographic display from Light Field Lab, Inc.

Media Format and Network Considerations

- **Future proof**
- Wireline and wireless IP distribution
  - 10G, FTTH, 5G, WiFi6
- Enable distribution of media beyond 2D video
  - Leverage content creation tools already used by Hollywood
  - Display agnostic, ability to support different levels of interactivity
  - Based on ORBX (OTOY) scene graph and container
- Create flexible, media-aware, robust network APIs
  - Distributed compute/rendering for variety of applications
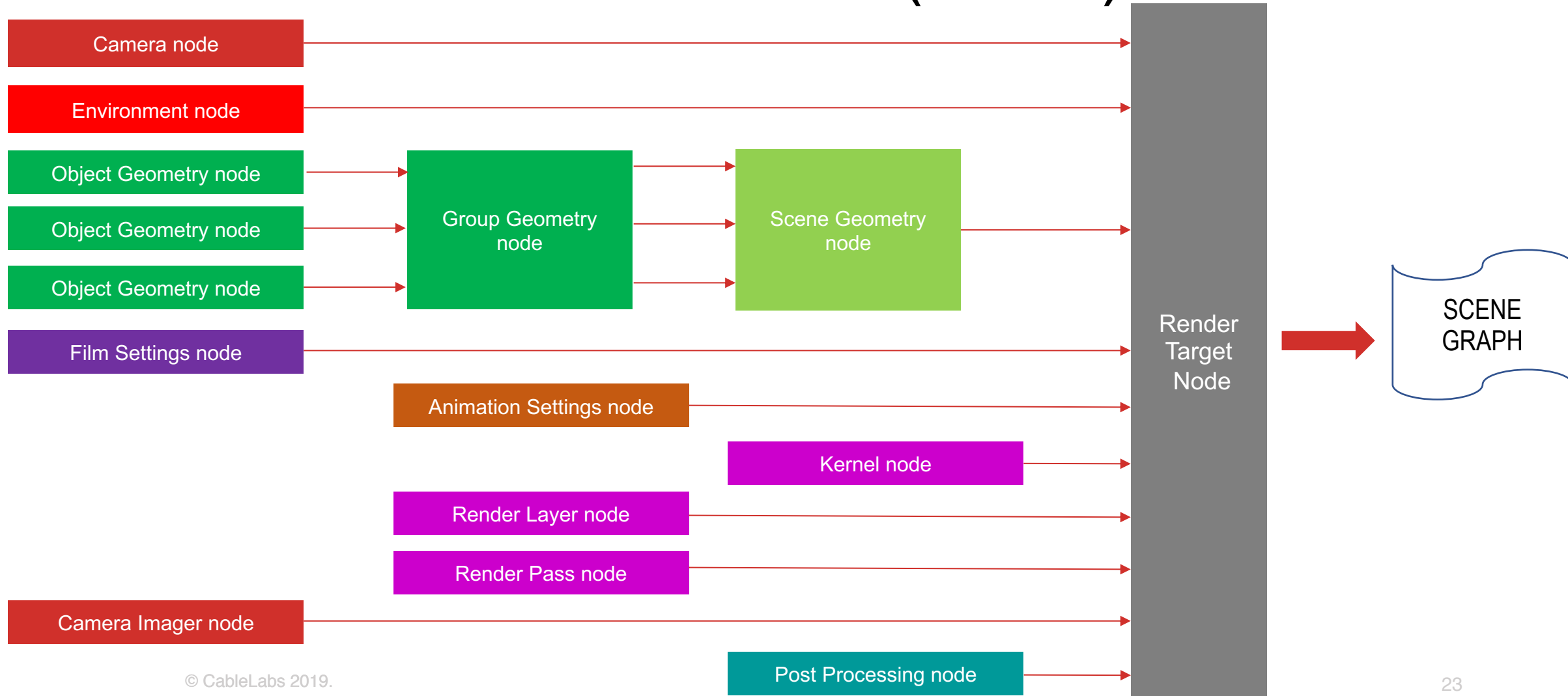 - Rendering at the head-end, edge or at the terminal

Standards

IMMERSIVE DIGITAL EXPERIENCES
ALLIANCE

IDEA Purpose

- Develop a family of royalty-free specifications
- Gather marketplace and technical requirements
- Facilitate interoperability testing and demonstrations
- Produce educational events and materials
- Provide a forum for information and idea exchange

Immersive Technology Media Format (ITMF)

Camera node

Environment node

Object Geometry node

Object Geometry node

Object Geometry node

Group Geometry node

Scene Geometry node

Film Settings node

Animation Settings node

Kernel node

Render Layer node

Render Pass node

Camera Imager node

Post Processing node

Render Target Node

SCENE GRAPH

IDEA Initial Members

New Members Now Welcome To Join:

Content Producers

Movie Studios

Sports Network

Technology Suppliers

Consumer Electronics

Cable and Broadband

www.ImmersiveAlliance.org

Cable Ready for Immersive Media with 10G

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