



2017 ANNUAL TECHNICAL
CONFERENCE & EXHIBITION
HOLLYWOOD, CA.
23-26 October 2017



Engineering a live UHD program from the International Space Station

Rodney Grubbs, NASA MSFC
Sandy George, SAIC



The Challenge

- What happens when you say “wouldn’t it be cool” to Red Digital Cinema’s Jarred Land?
 - NASA has had a Red Epic Dragon on-board the ISS since 2015
 - With the REDCAST module we could use the camera as a source for a live UHD downlink, but...
 - We needed an encoder!
- AWS/Elemental built a custom encoder that would accept 4 HD-SDI outputs of 1080P @ 29.97 fps
- All flight hardware arrived at NASA’s Johnson Space Center in late October 2016
 - Certification
 - Launch
 - Testing



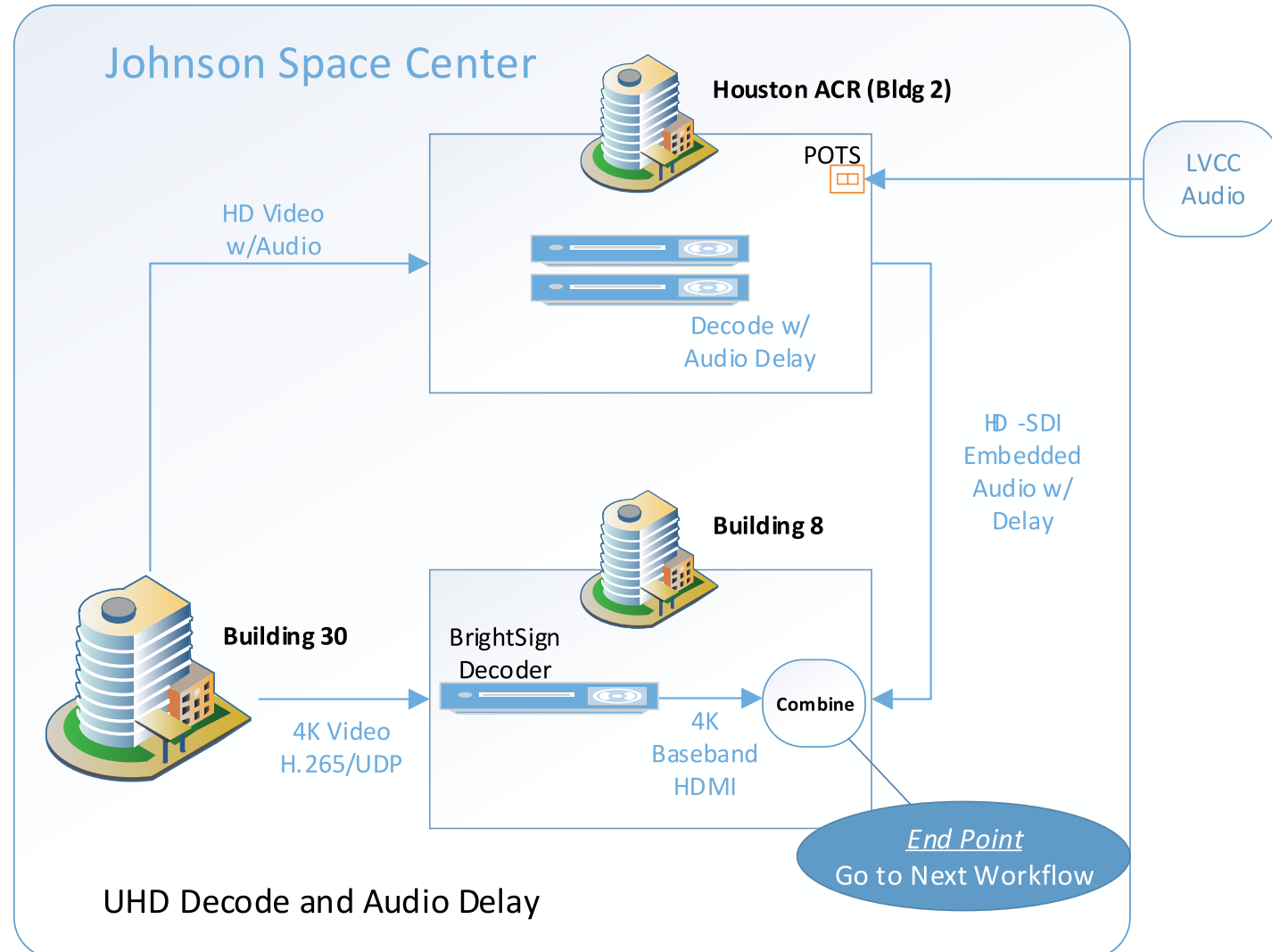
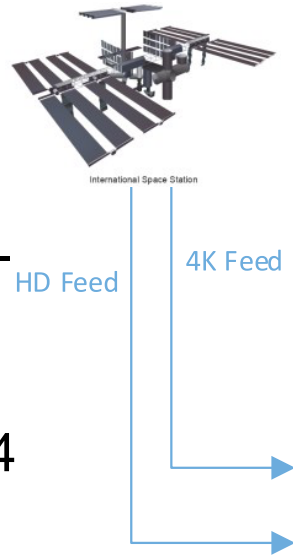
The Hardware

- New Red Epic Dragon Camera
- REDCAST Module
- Custom Encoder with AWS/Elemental h.265 encoder
- HD-SDI cables and interface dongle for encoder



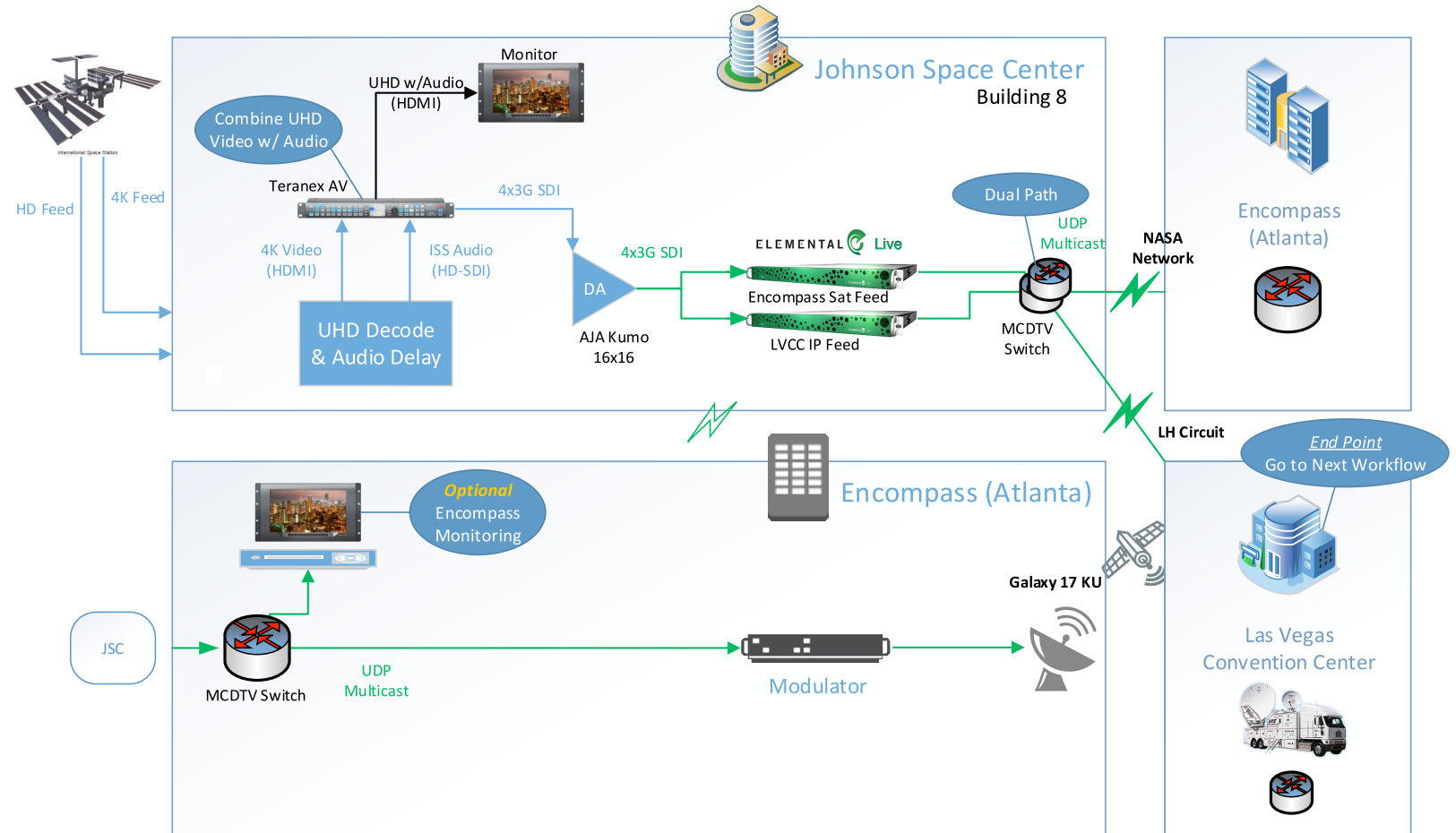
System Testing 1/2

- Red/REDCAST was unable to output embedded sync audio
- Existing HD camera on-board the ISS would provide the audio
- Latency difference of ~4 seconds
- UHD video would be decoded in order to provide a synchronized UHD h.265 stream



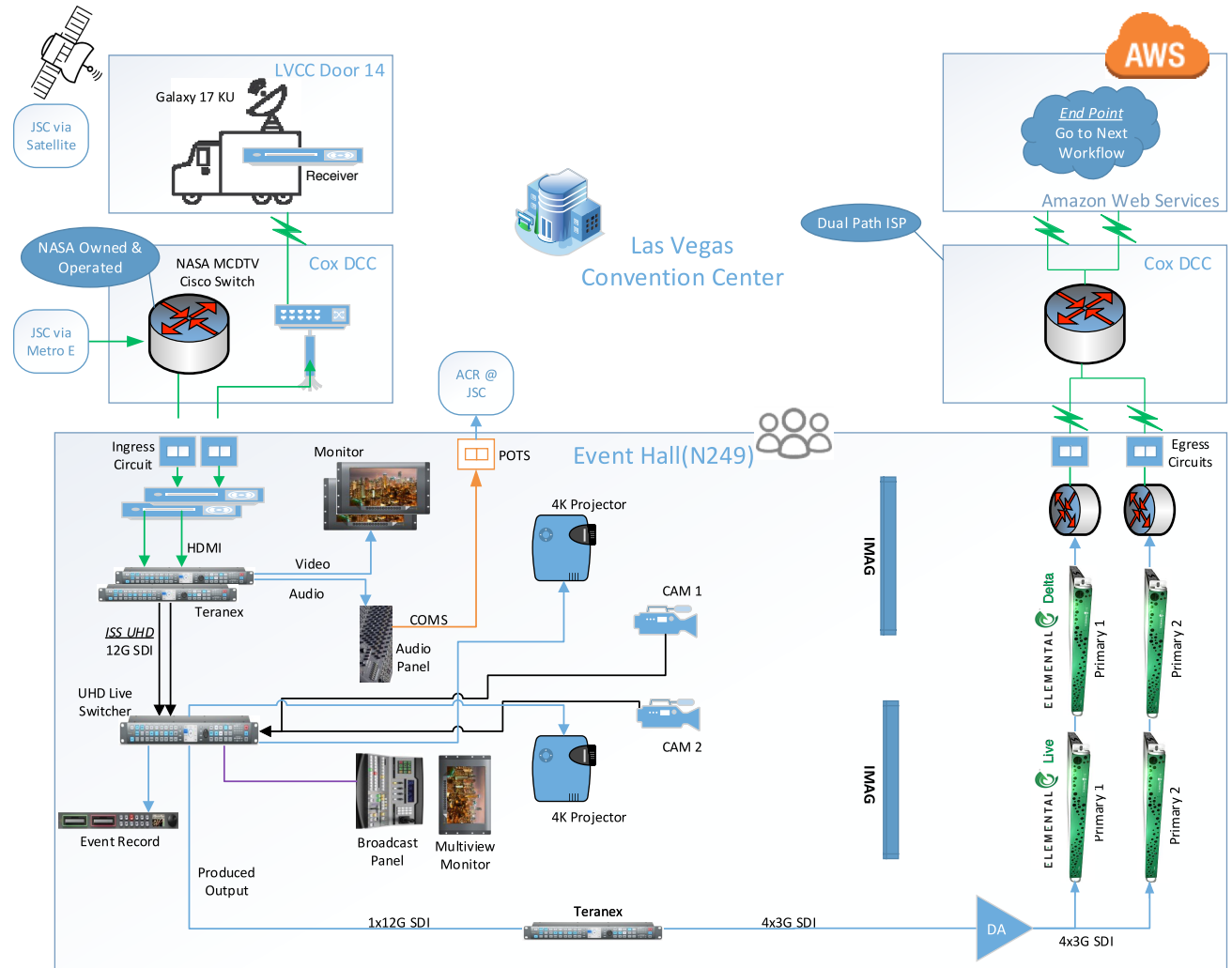
System Testing 2/2

- A series of tests were conducted adding sections of the distribution architecture
- The primary path to the Las Vegas Convention Center utilized the existing NASA TV architecture through our hub @ Encompass in Atlanta
- A redundant path utilized a circuit instead of satellite
- Total latency would be 10 seconds!



The Live Show Architecture

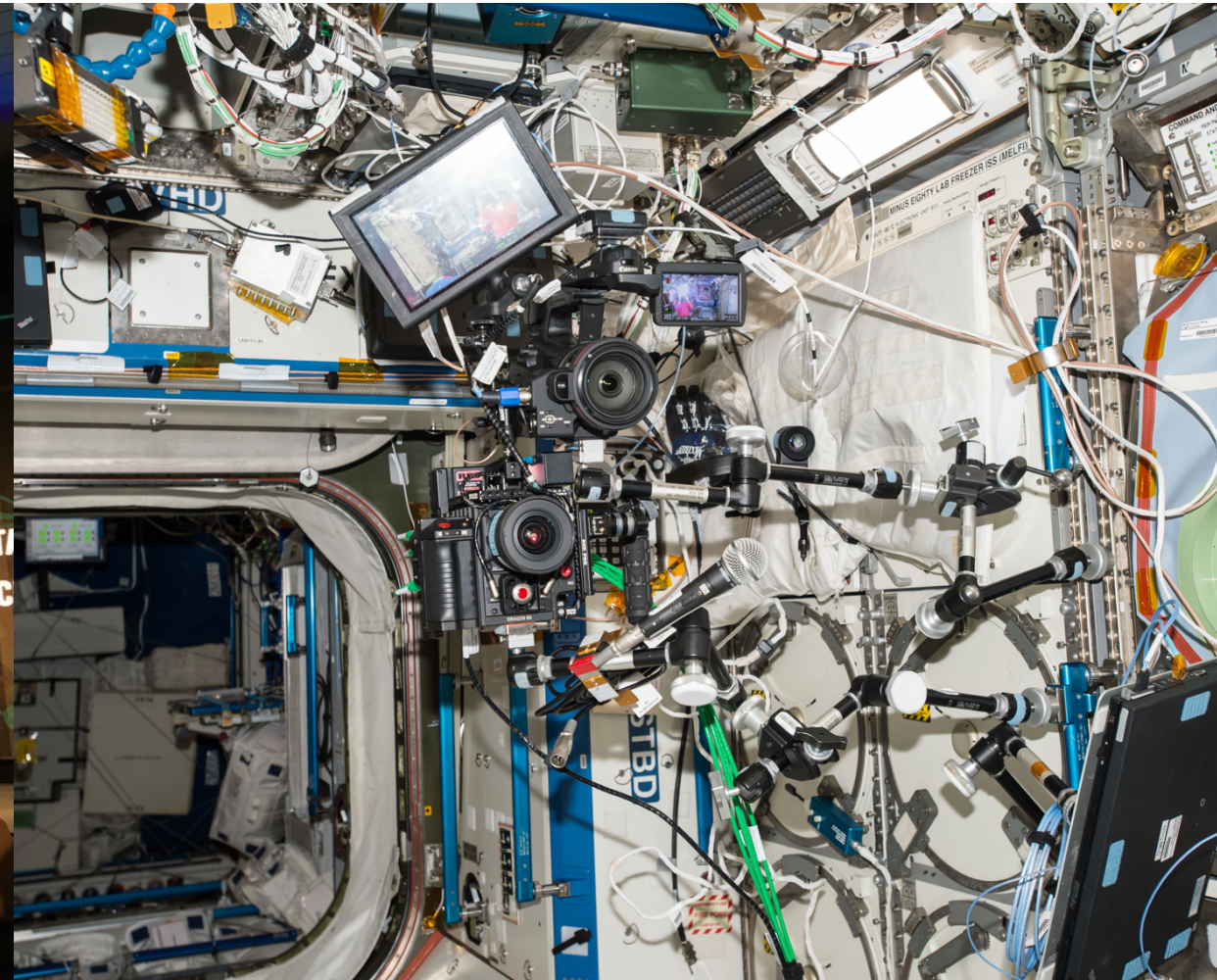
- AWS/Elemental produced a live UHD show of the entire NAB Super Session including the live ISS downlink
- NASA provided communications for queuing between Mission Control Houston and the ISS
- AWS/Elemental's Sam Blackman handled the latency well
- No technical glitches!





2017 ANNUAL TECHNICAL CONFERENCE & EXHIBITION **HOLLYWOOD, CA.**

The Program





What's Next?

