

IMAGINE COMMUNICATIONS
& NC STATE UNIVERSITY DELTA

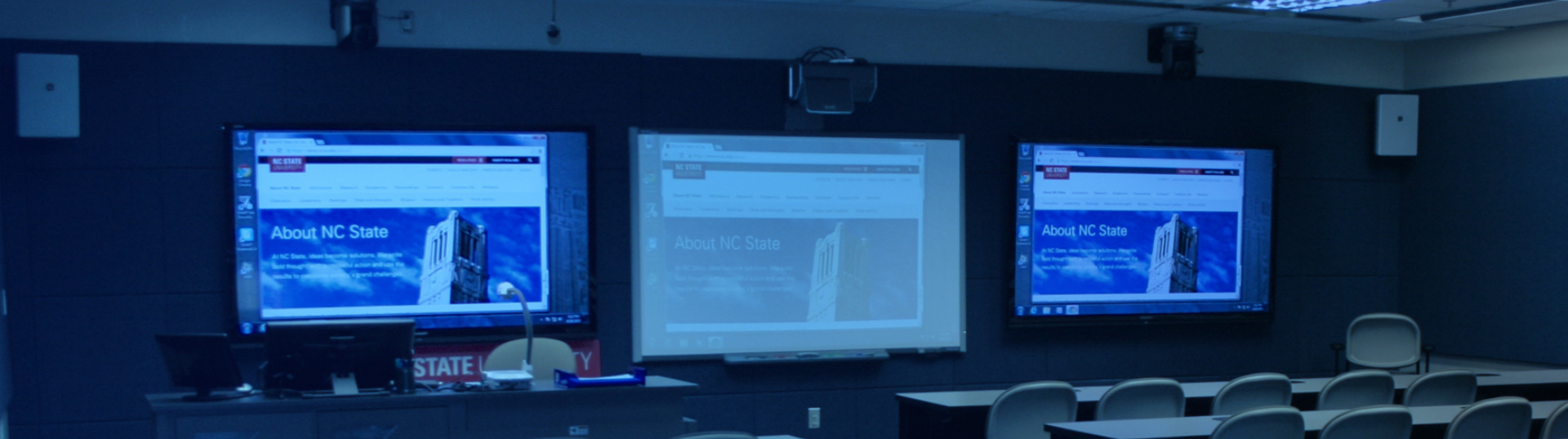
ST-2110 for Distributed Campus AV systems

OCTOBER, 2019



NC STATE

DELTA



North Carolina State University DELTA Classroom System

Multi-Vendor, COTS-based, ST-2110 Live Production system

Distance Education and Learning Technology Applications (DELTA)

DELTA's role within the Office of the Provost is to foster the integration and support of learning technologies in NC State's academic programs, both on the campus and at a distance. We coordinate the funding and production of all distance-based credit programs and courses for the university. We promote high-quality education by extending the reach of the faculty and collaboratively applying expertise in technology and pedagogy in an efficient, effective and service-oriented environment.

Vision

We seek to improve the quality of education by harnessing technology to provide ready access for all learners. In this way we hope to meet the challenges of a changing society.

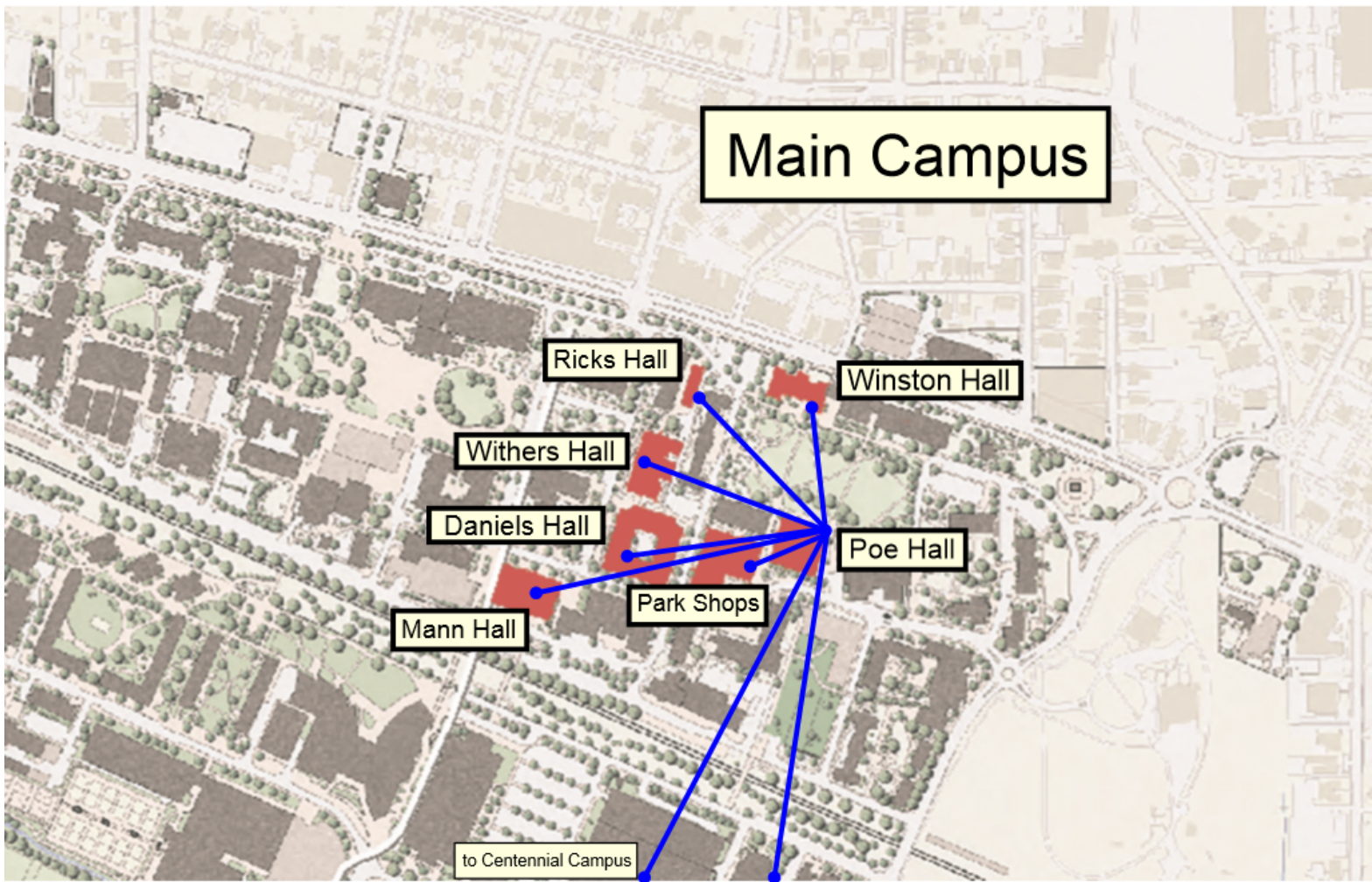
Mission

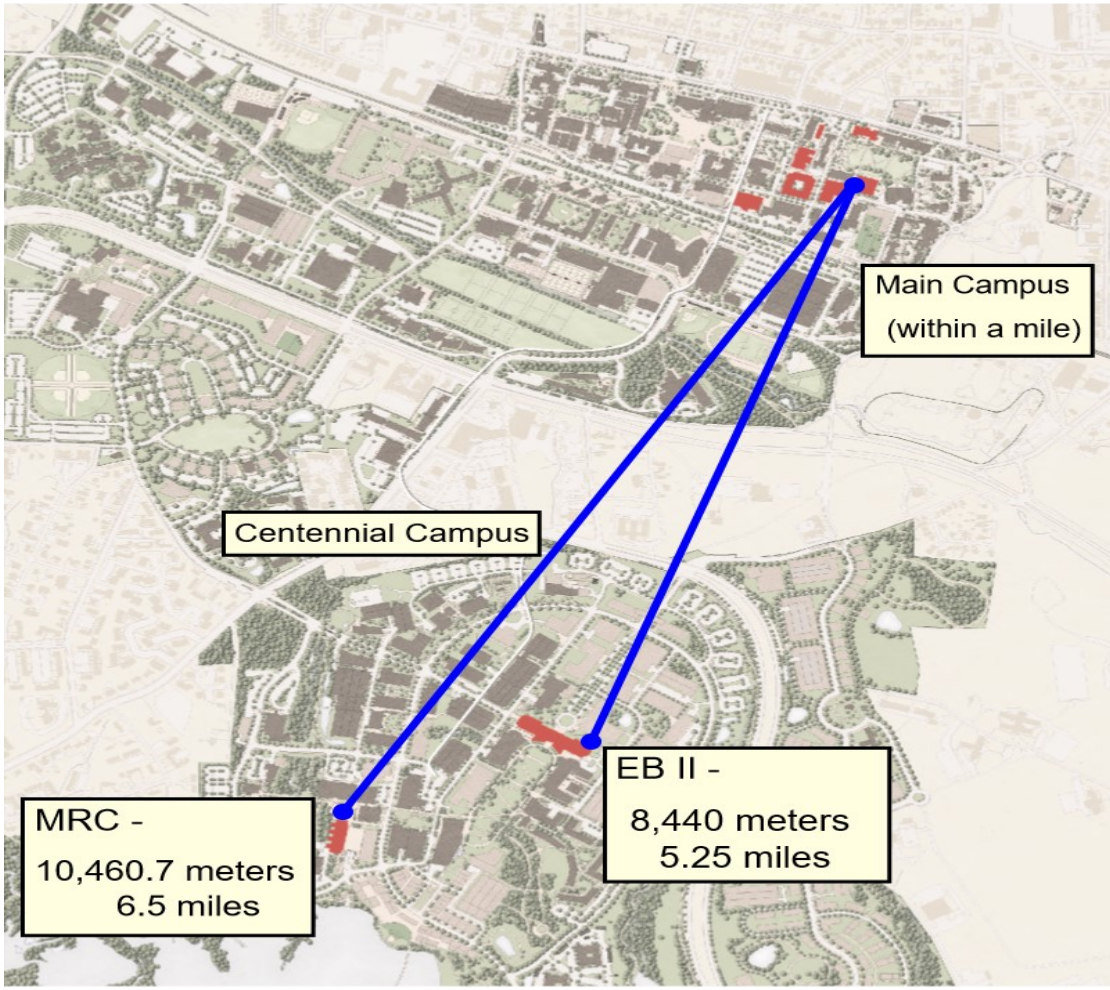
Transformative educational experiences benefit a complex, global society and are key to a quality future. DELTA collaboratively applies expertise in innovative technologies and pedagogies to solve instructional challenges in an efficient, effective and service-oriented environment, with the overarching goal of helping faculty build student success.

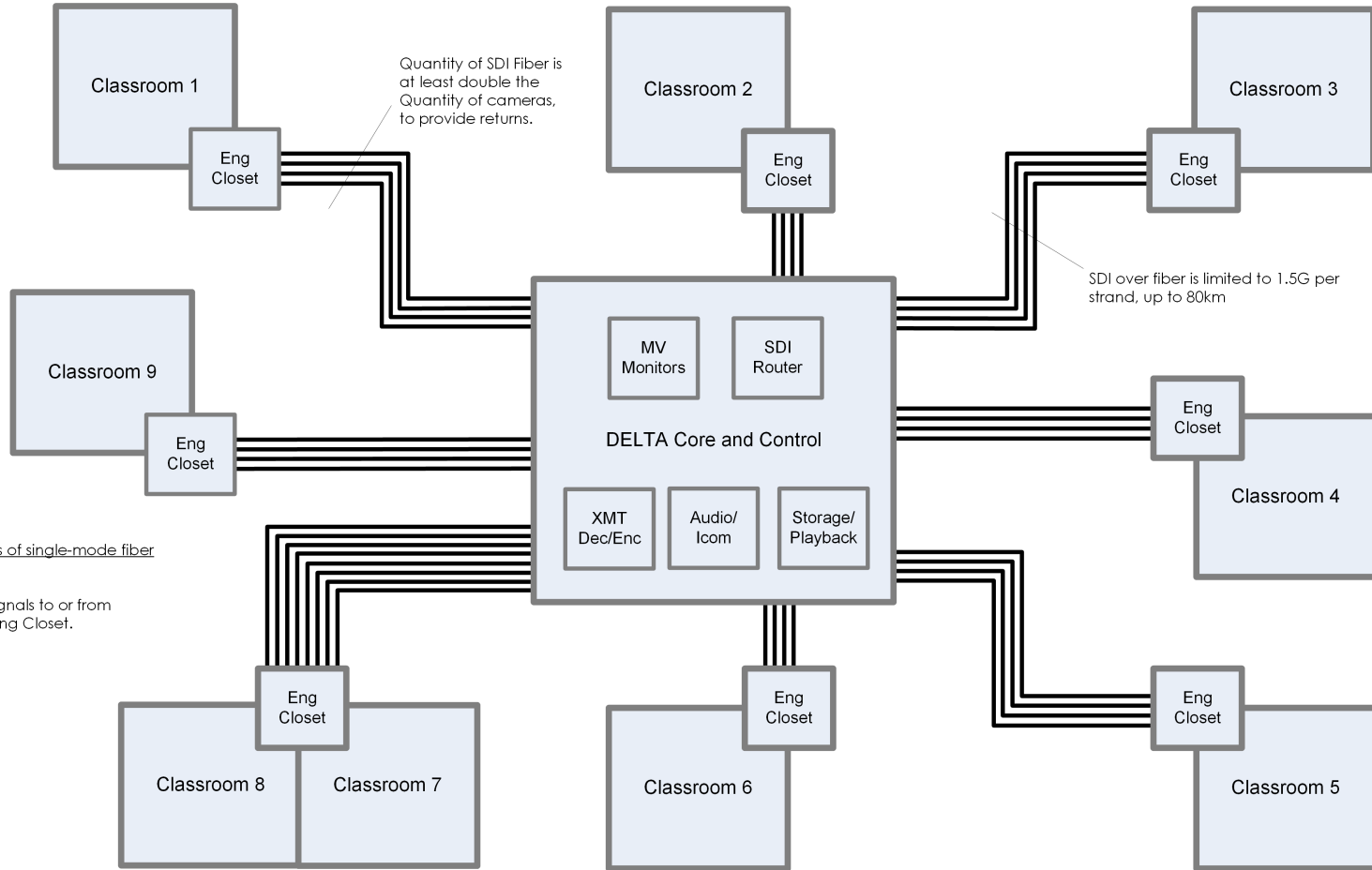
DELTA's Stats

FY 2018/2019

- **131 Live Courses, Captured, Supported, and Monitored**
- **1,708,017 Live Stream and Recording Views**
- **7,055 Hours of Classroom Recordings**
- **46,484 Enrollments in Online and DE Courses**





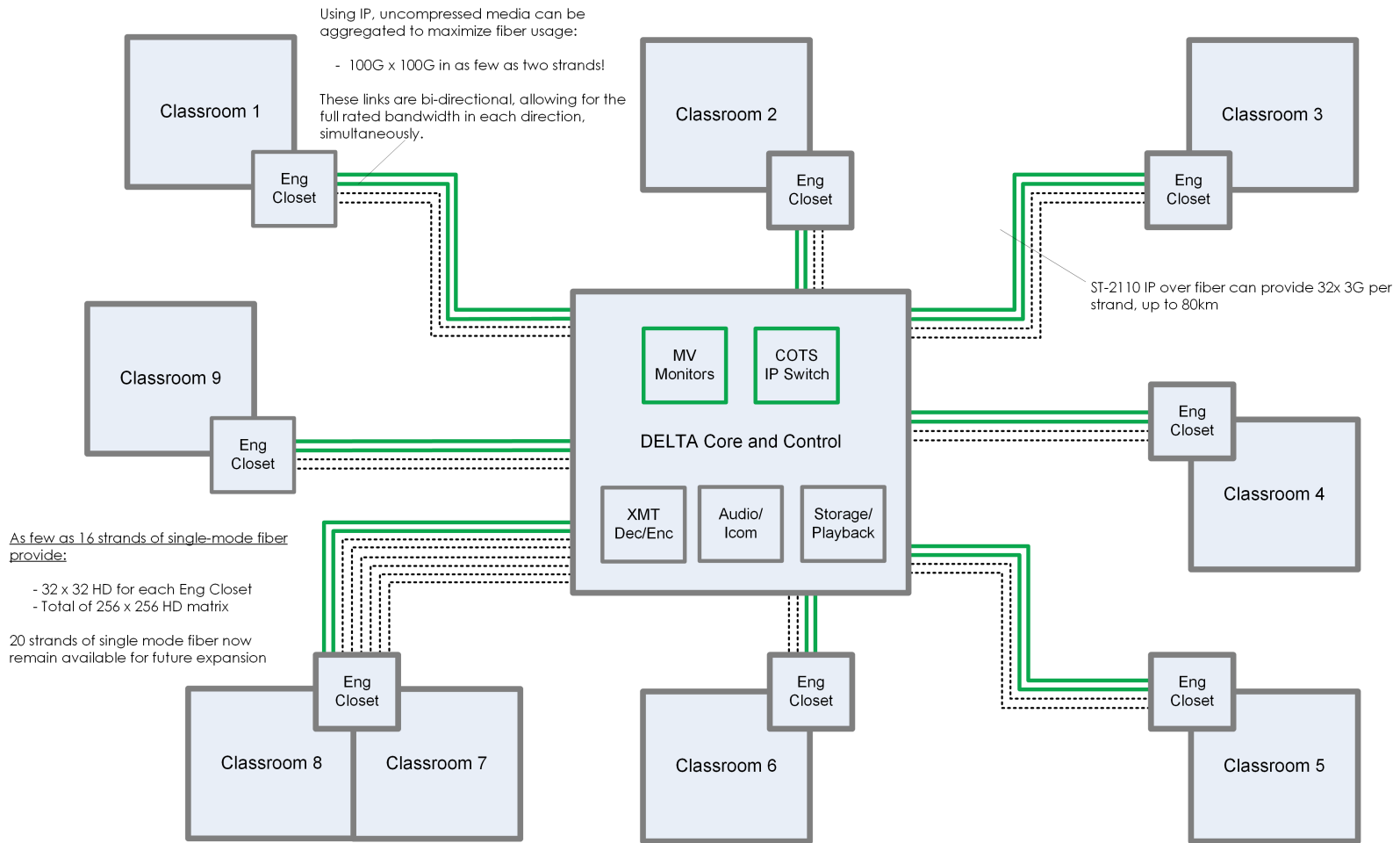


Quantity of SDI Fiber is at least double the Quantity of cameras, to provide returns.

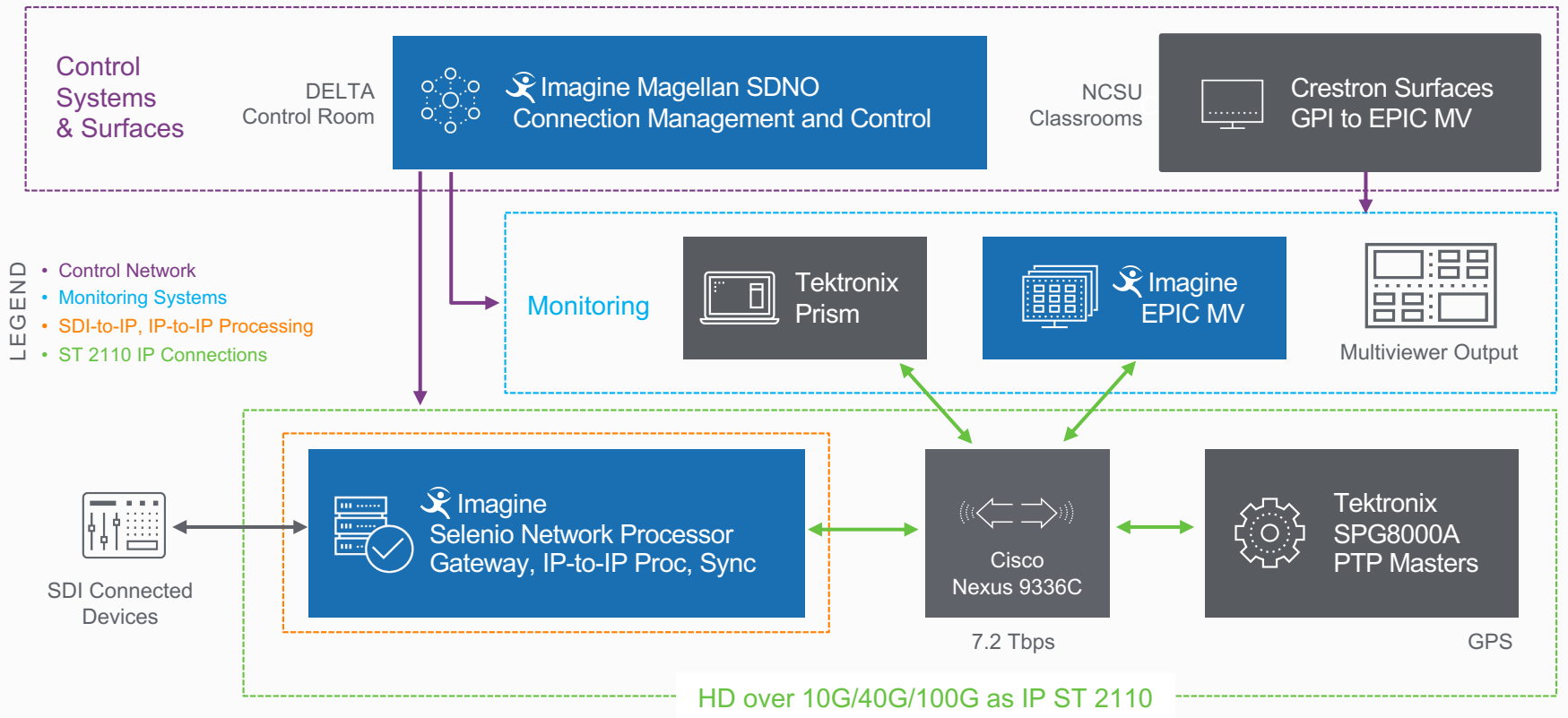
SDI over fiber is limited to 1.5G per strand, up to 80km

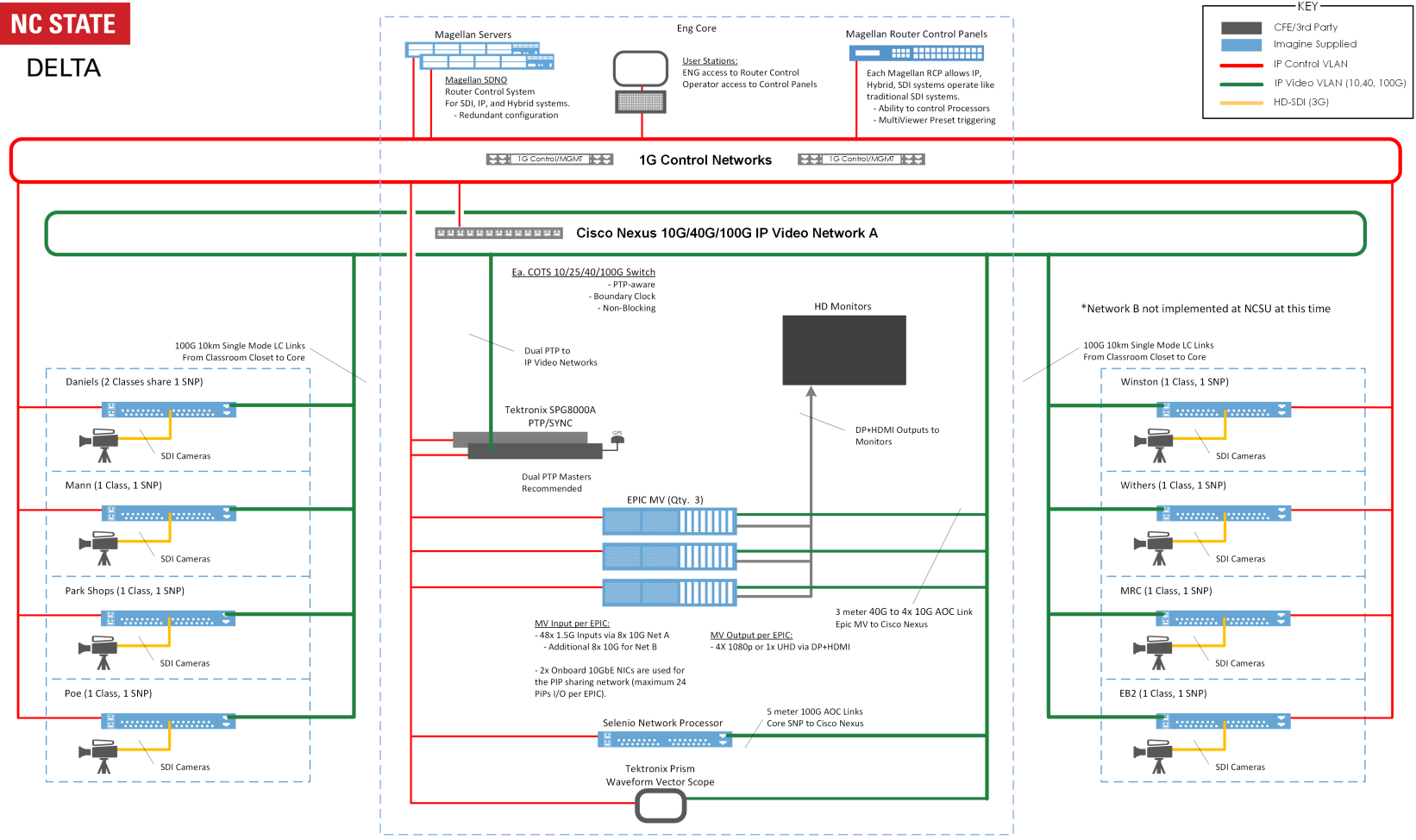
36 strands of single-mode fiber provide:

- 4 SDI signals to or from each Eng Closet.



DELTA Solution Diagram





Project Timeline

- **December 2015** – NC State DELTA begins researching next gen technologies to replace aging equipment
- **February 2016** – DELTA engages vendors in talks for SDI MultiViewer
- **October 2018** – ST-2110 + SDI demonstration at NC State DELTA
- **January 2019** – DELTA requests SDI, Hybrid, and ST-2110 designs
- **April 2019** – ST-2110 design, leveraging legacy SDI and existing fiber, is finalized.
- **May 2019** – Wiring and deployment begins
- **August 2019** – First classes are supported by new ST-2110 system

Why was ST-2110 interesting for NC State DELTA?

- Flexibility to expand the system with additional cameras, equipment
 - The existing SDI classroom cameras remain in use
- The NC State DELTA system is distributed across great distances
 - Fiber runs can be >10 kilometers
- The existing AES67 Audio system can interoperate with ST-2110
- Integration across the campus
- The ST-2110 standards are designed with future-proofing, to support horizontal and vertical changes in media requirements
 - FPGA and COTS technology afford room to change and grow

Benefits of IP/2110: Physical-Scale

- 10G/25G/40G/100G fiber infrastructure
 - Up to 32x 1080p HD (3G) signals per Single Mode fiber
 - Where we were doing 4 HD signals, we can now do 32x32 HD signals!
 - Can mix AOC-direct-attach, OM4, and Single-Mode for optimized economics
- Uses less space and a lot fewer cables
- Redundancy can be easily added using ST-2022-7 model
- Going IP means never having to say that you can't make it bigger
 - UHD-capability can be built into the infrastructure
 - Network Switches can be as big as you want

Benefits of IP/2110: Audio

- SDI is limited to 16ch of audio per video
 - Requires embedding and de-embedding at every touch-point
- In ST2110, the audio is sent on separate IP streams
 - Audio console can subscribe to every stream it needs
 - Audio console generates new streams for its outputs
- Separate Audio = Total Flexibility
- The Control System ties it all together
 - Every user gets the audio and video (and ANC data) they need for their job
 - Every production can be easily configured

Benefits of IP/2110: Timing

- PTP Timing on the Media Network
 - Uses the same cables and switches as the Media
 - No Black-Burst DA tree to Design, Build & Maintain
 - No Timecode DA tree to Design, Build, & Maintain
 - No Crazy Mix of Black-Burst, Tri-Level, Word Clock, DARS, ...
- PTP is Format-flexible across SD, HD, 3G, UHD
- PTP == timestamps on every packet of video and audio
 - The tools are there in the standards to help with sync
 - Allows equipment to synchronize audio and video anyplace in the system

Benefits of IP/2110: Choices

- Every Major Vendor is building ST-2110 interfaces now
- NC State DELTA can choose their Cameras, Switchers, Replay, Multiviewers, and other equipment based on operational criteria – not technical limitations
- 2110 provides the level playing field for best-of-breed systems

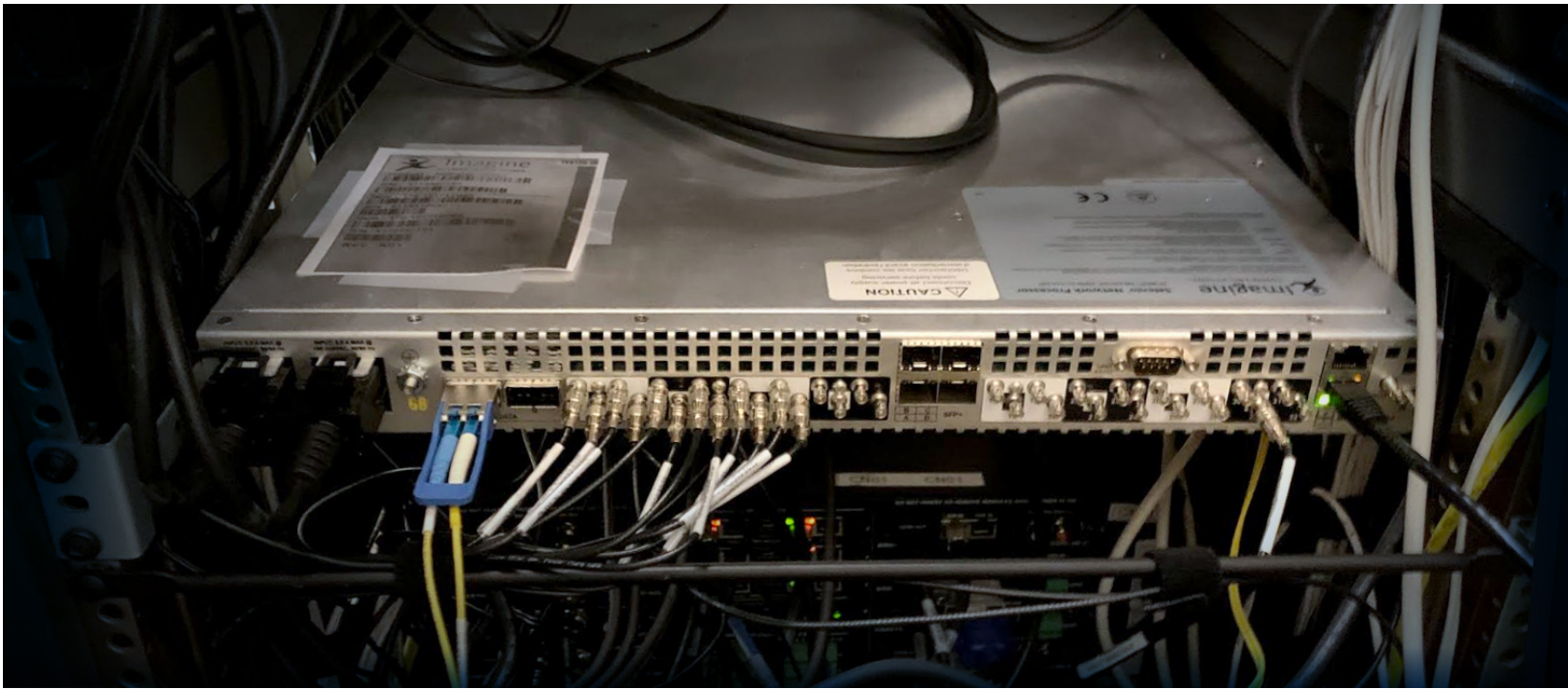
COTS-Based IP Core

- Cisco Nexus 9K 9336 Switch
 - 7 Terabytes per second
- Could support a 1,200 x 1,200 1080p HD matrix today
 - Each COTS IP Core is 1 rack unit
 - The same system would require full racks of additional equipment in pure SDI
- AES67 can be introduced into the switch and ST-2110 Media Network
 - Allowing mix-and-match of any Audio and Video streams in the network.

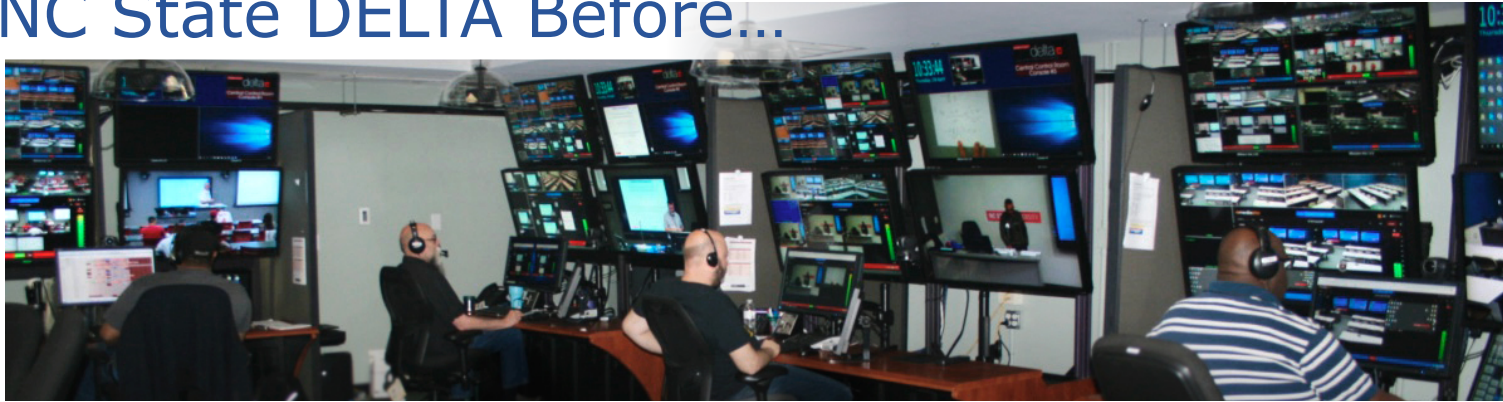
Multi-Viewer system leverages COTS Servers



SDI to IP... IP to IP... IP to SDI



NC State DELTA Before...



And After...



IP/2110 and Distributed Campus: Perfect Together

- The right gateways can extend the life of functioning SDI devices for years to come
- ST-2110 provides a level playing field for best-of-breed systems
- Fiber optimization like never before
 - Up to 32x uncompressed HD per strand
- Flexibility to move everything
 - From audio, ancillary data and HD video to UHD and beyond
- No more tie-lines! –distributed system can perform as “one big router”