John McCoskey

Chief Technology Officer
PBS

WELCOME!

to the

36th Annual PBS Technology Conference

Stats:

- 404 attendees
- 100 stations
- 25 sponsors and exhibitors

- Distant attendees:
  - Guam
  - Tokyo
  - Hong Kong
  - Munich
  - San Juan

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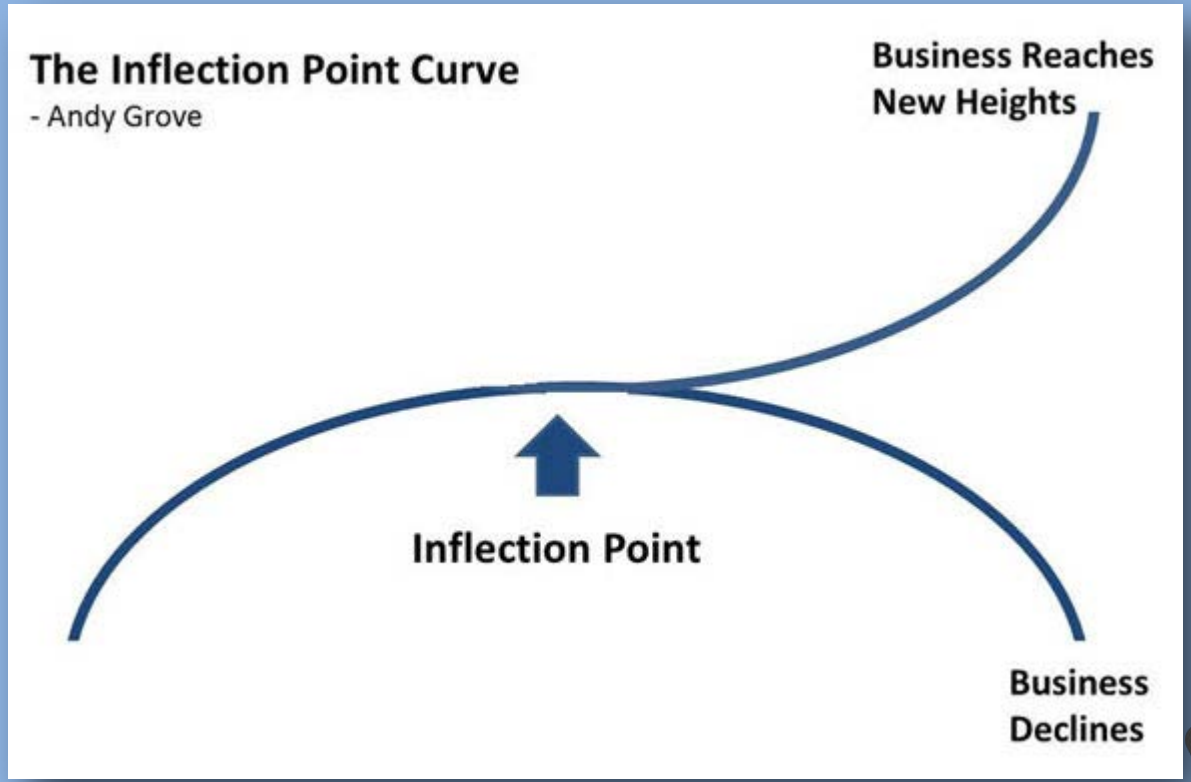
SPOILER ALERT!

Inflection Point

“a point on a curve at which the curvature or concavity changes sign”

Strategic Inflection Point

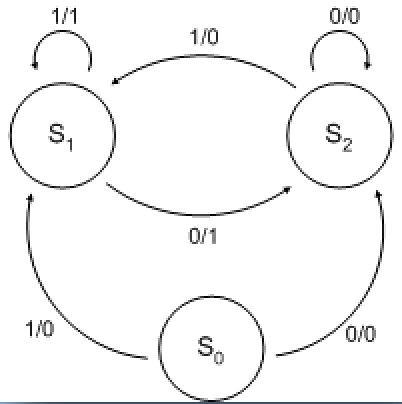


Public Media Inflection Points

- Overall Business
- Technology & Infrastructure
- Distribution options & needs:
  - Disruptive technologies
  - Changing consumption behaviors

PTV Landscape

- Capital Needs
- Interconnection
- Infrastructure



Capital Needs

Current State

PTV Capital Needs Assessment

- Comprehensive survey of stations in 1Q2013

- Landscape:
  - Reduction & elimination of PTFP, CPB Digital and RUS capital funding
  - Aging infrastructure
  - Deferred maintenance
  - Shortening equipment lifespan
  - 10 year-old DTV infrastructure

Capital Needs Today

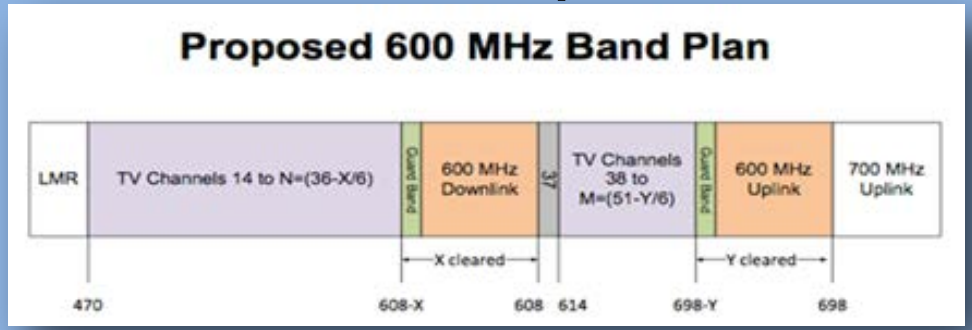
- > **$600 million** in backlogged projects
  - **$200 million** in towers, many > 40 years old
  - **$200 million** in studio & production gear
  - **$200 million** in other infrastructure

5-year Capital Needs

- Essentially every station is facing at least $1 million need in next 5 years
- 50% of stations are facing at least $3 million in next 5 years
- 42 rural analog translators need conversion

And the spectrum repack?

- Lots of unknowns
- Will the repack funding be sufficient?
- Will we do this with ATSC 1.0?
- What are the tower implications?



Interconnection

Current State

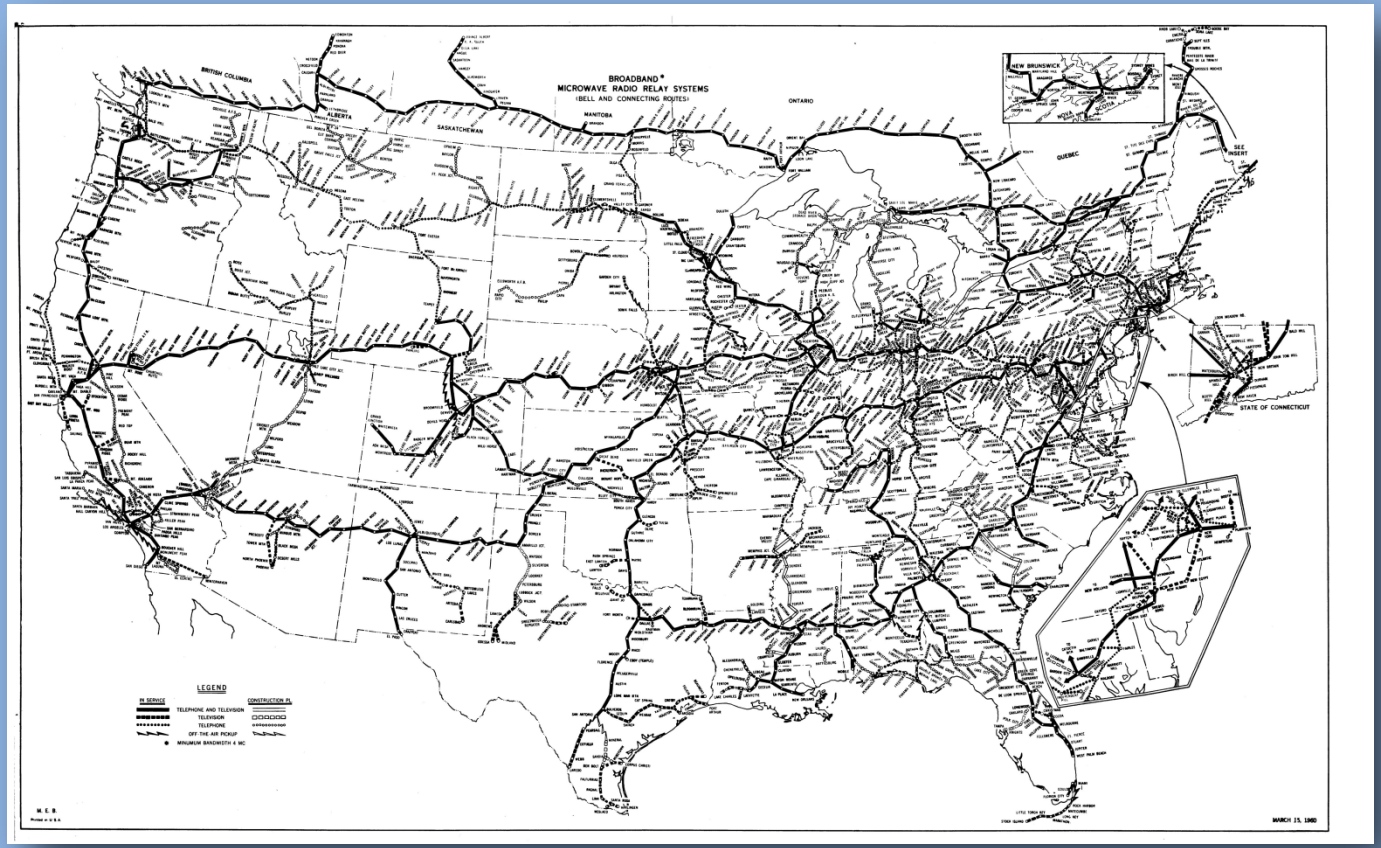
Public Television Interconnection

- Always transformational
- Always cost-effective, but funded
- Always industry leading


We are currently in the 5th incarnation of PTV interconnection

IXCv1 c1952+ “bicycling” tapes

IXCv2 c1969 Analog terrestrial



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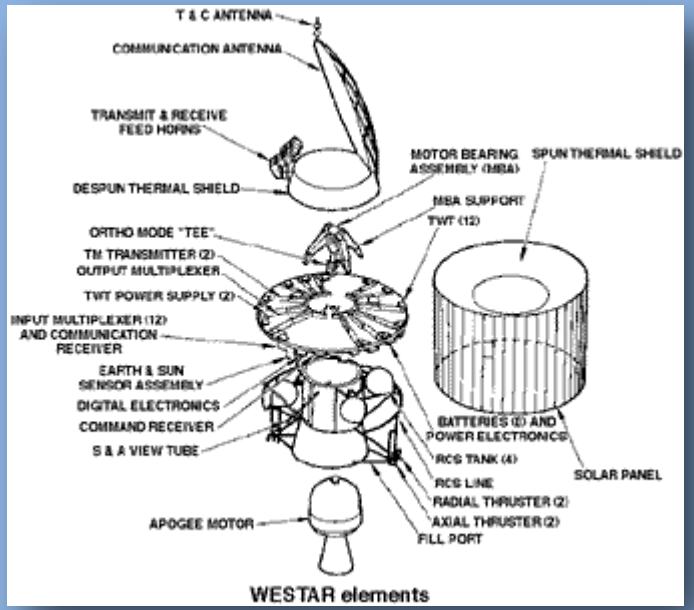
IXCv3 c1978 Analog satellite



IXCv4 c1994 Digital Satellite

IXCv5 c2005 digital sat + NRT

NGIS powered by PBS
Next Generation Interconnection System

DVB S2

H.264
MPEG-4/AVC

Infrastructure

Current State

Infrastructure - Historical

- Hardware-centric:
  - “Rack and stack”
  - Highly specialized / customized
  - Tightly coupled
  - Narrow standards
  - Relatively long life cycles

Infrastructure - Today

- Becoming software-centric
  - Rapid blending of IT and Internet technology
  - Shifting toward commodity, multi-vendor, virtualized and software-based systems
- Shortening life cycles
- Mostly separate broadcast, IT and non-broadcast systems

PTV Future State

Future Challenges

- Interconnection funding appropriation
- Holistic approach to media & operations
- Broadcast standard obsolescence
- Forecasting Ultra-HD adoption & timing
- SW licensing & maintenance models
- Shift from CapEx to OpEx model

Technology Enablers

- Internet and IT technologies
- Commoditized IT infrastructure
  - Processing
  - Networking
  - Storage
  - Software
- Automation
- Cloud architectures
- Broad standards

Journey to the Future

- Standardize
- Commoditize
- Virtualize
- Automate
- Consolidate
- “Pull” content model
- Cloud


A new era of
Interconnection:
IXCv6

IXCv6

- Starts October 1, 2016

- Following PTV history and legacy it should be:
  - Transformative
  - Innovative
  - Industry Leading
  - Efficient

IXCv6 Plan

- Approach validation FY13
- Technology validation / lab FY13/14
- Station validation FY14
- Capitol Hill FY14/15/16

IXCv6 initial analysis / lab work

- Assumptions:
  - Serve all stations
  - Terrestrial MPLS networking
  - 100 Mbps objective, 45Mbps in hardest cases
  - Linear “Push” feeds
  - NRT and soft-feed “Pull” content
  - RT linear satellite feed for DR and reach

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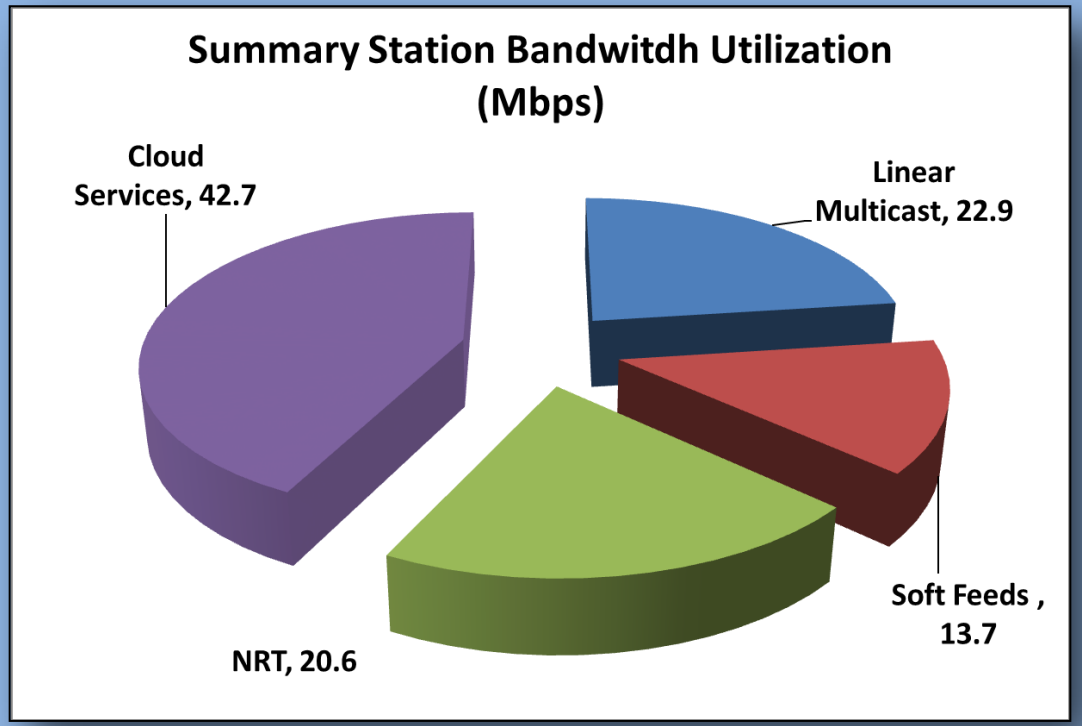
What size pipes are required?

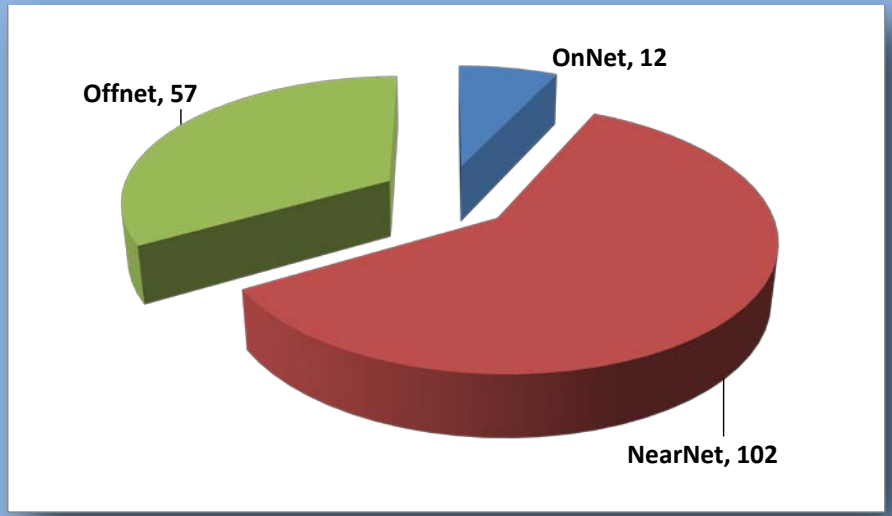


➔ **100 Mbps**

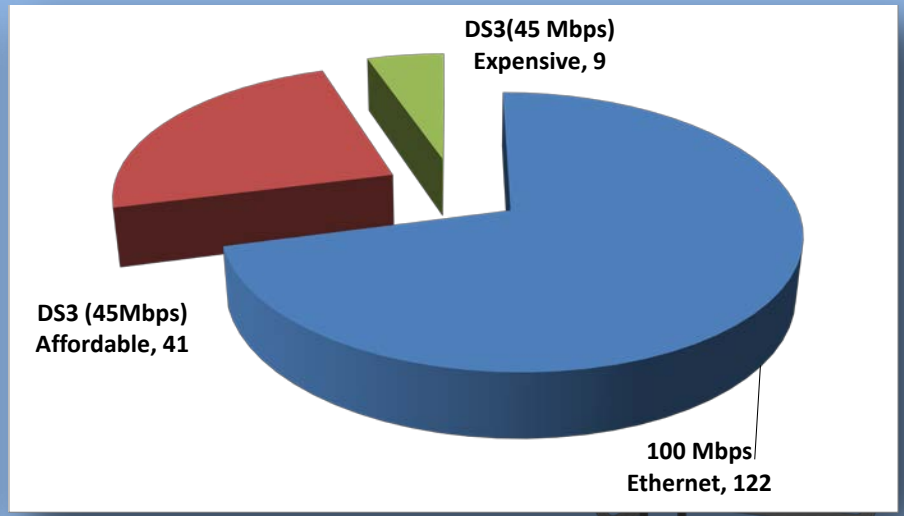
What is the reach to stations?

- Fiber connectivity today:

Station Connectivity



Connectivity Type



Is it affordable?

- **VERY Preliminary**, but:
  - Initial answer is **YES**
  - Lower cost than a straight NGIS replacement
  - Joint master controls also reduce cost (but shift some connectivity costs to stations)
  - Offers significant station opportunities for cost reduction through opt-in cloud services

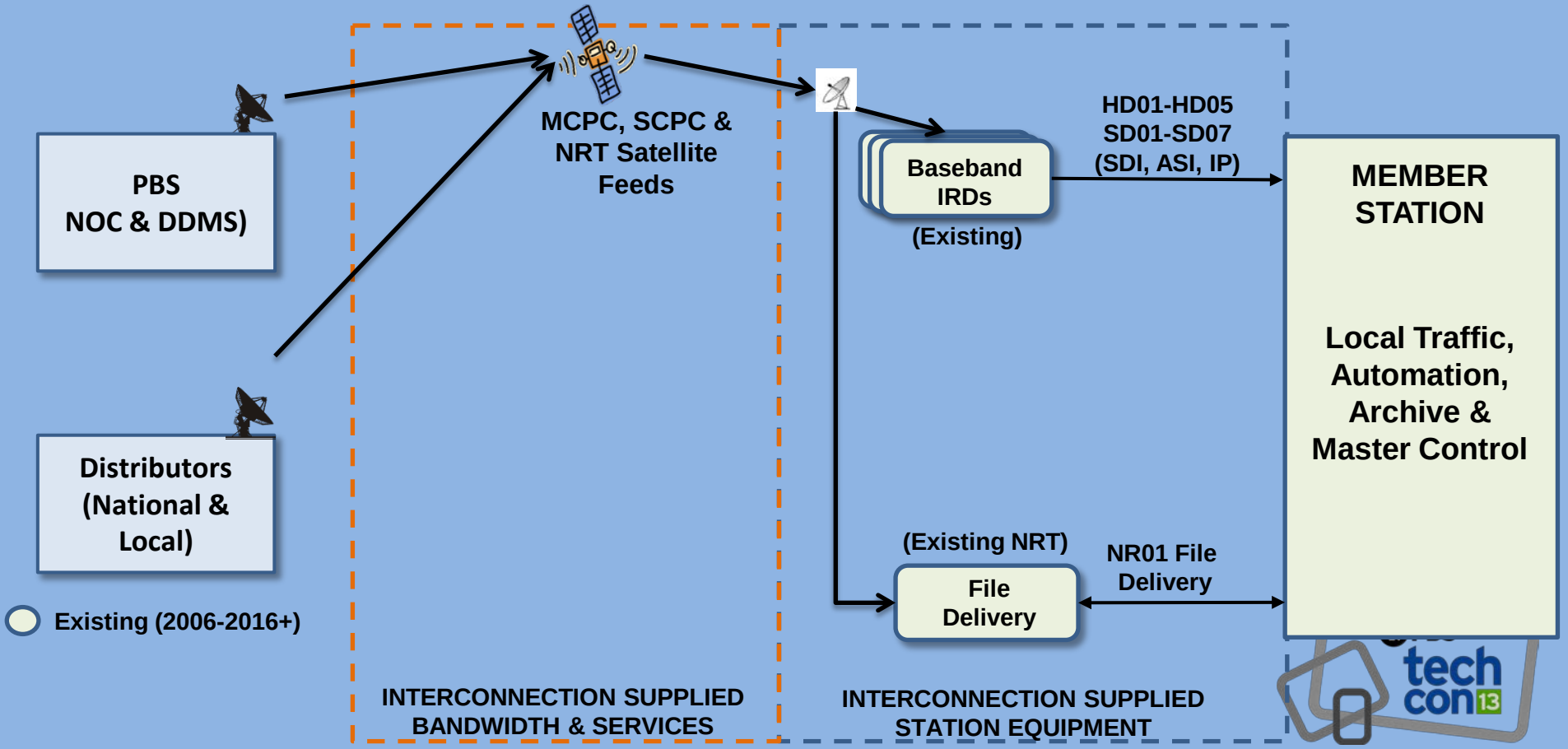
What about Ultra-HD?

- We assume the likelihood of Ultra-HD / 4K in a ten year window for IXCv6
- Also assume 2x compression technology advances, HD and SD will still exist

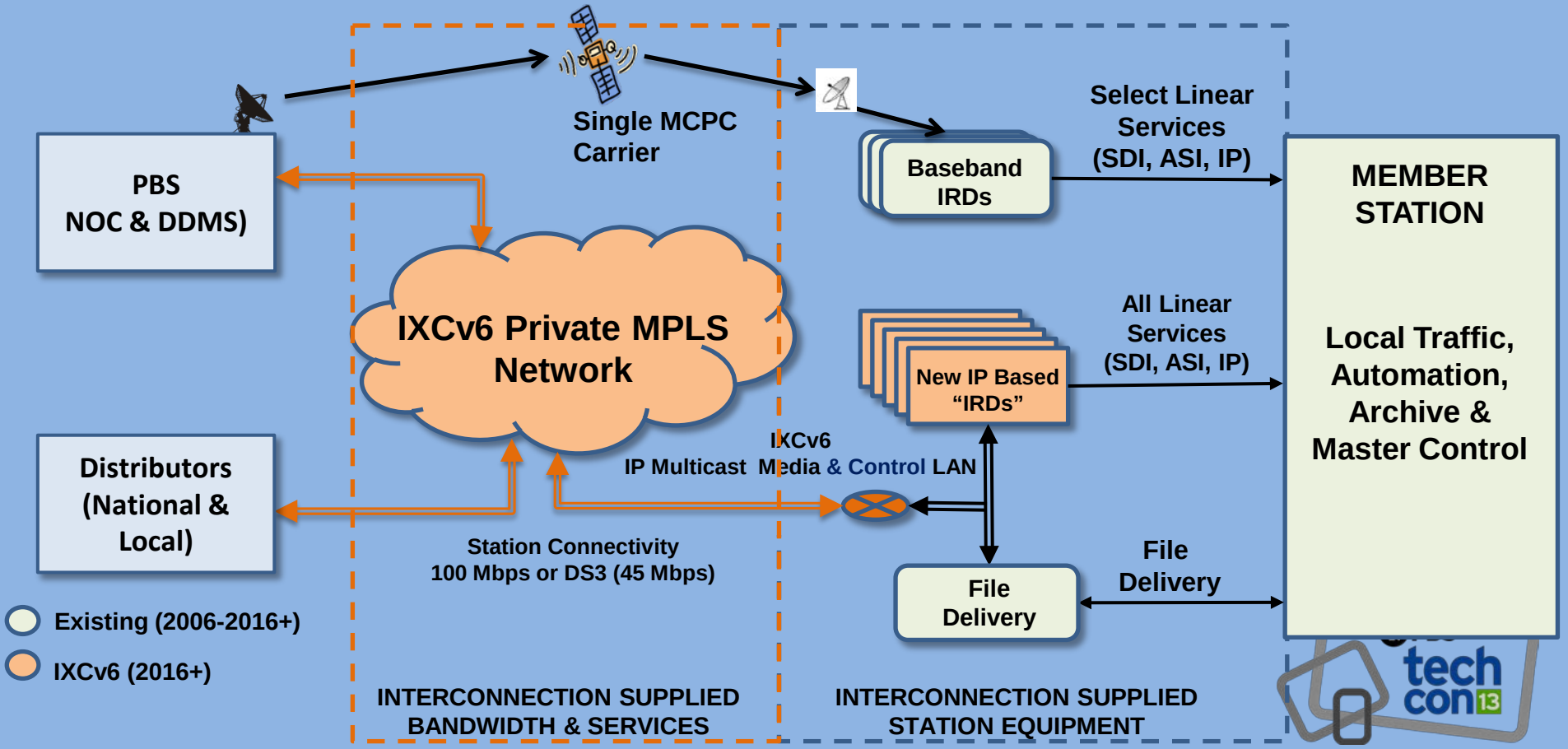
Potential IXCv6 Architecture

(preview of Cloud 102 session
and Kiosk demonstration)

Current Interconnection System Configuration

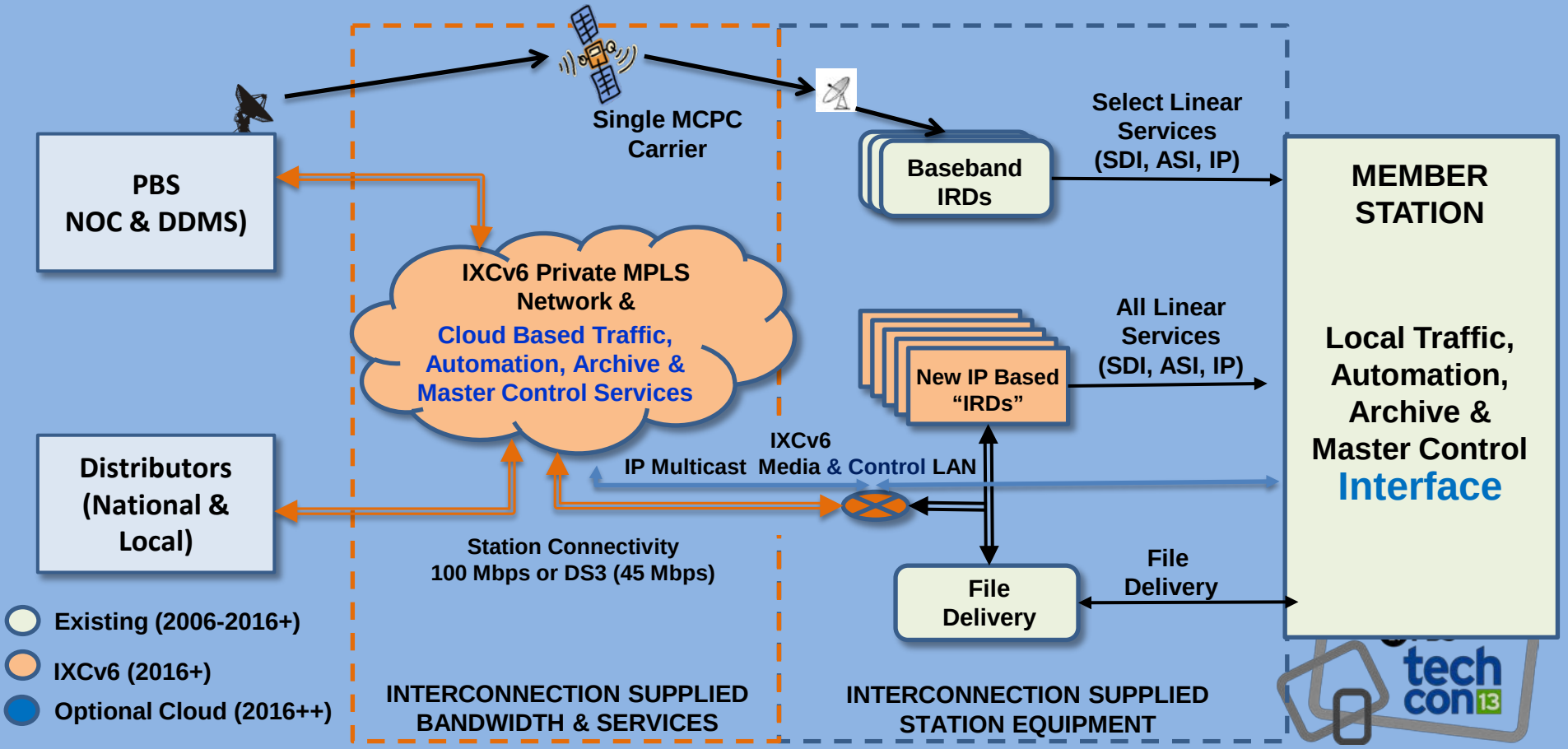


Concept: Transition Interconnection Configuration



Potential for a New Approach to Station Architecture

Concept: Long Term Interconnection Configuration



System Implications

- Leverage economies of scale for service procurement
- Potential to reduce the 170X cost factor
- Reduce dependence on owned capital equipment
- Flexibility for disruptive changes

Station Implications

- Ability to evaluate functions strictly from a business perspective
- Common approach & infrastructure for broadcast and non-broadcast content
- Ability to move content TO the cloud
  - P2P sharing
  - Archive, transcode, media management

IXCv6 Concept Demonstration

- Visit the Kiosk
- Background
  - 2 months from concept to implementation
  - 4 parties, new team
- Consider the implications & opportunities

IXCv6 Kiosk Demo Partners:

Cinegy

ERICSSON

MYERS
Intelligent Broadcast Workflow

Sequencia
TECHNOLOGIES
Cloud Solutions - Engineered and Executed

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