

Implications of New RF PHYs and Supporting Architectures for HFC Equipment Suppliers

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Topics

- Viewpoint
- HFC Architecture Considerations
- Frequency Planning Considerations
- Related Product Development Activity
- Consideration for Field Actives
- Summary



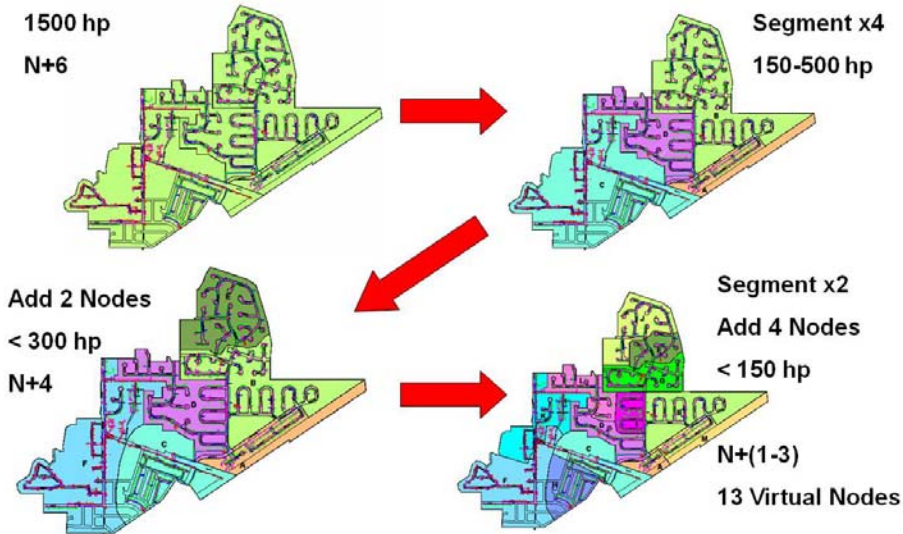
Viewpoint

- HFC is capable of a very long lifespan
 - Powerful available tools to manage service growth
 - Existence of significant latent capacity
- More capacity becomes accessible with shrinking RF cascades
 - The network continues to migrate to deeper fiber
 - Fully exploited FTLA / N+0 / Passive Coax as an “End State” for cable residential services
- Today’s PHY is effective; new tools have since evolved
 - Legacy bandwidth use could be made more efficient
 - There is unused coaxial bandwidth available with investment
- Architecture, PHY definition, and ease and cost of implementation are all tied closely to Frequency Planning
- Edge, Access and CPE “next gen” product development is underway, and would immediately benefit from the understanding of unique new service needs and system guidelines



HFC Architecture Considerations

“Business-As-Usual” Brownfield Migration (NA)



- Single Family Unit (SFU) based vs. MDU-based (N+0) systems
 - New PHY Support: Nodes and Amplifiers?
 - FTLA “overlay” model (major amplifier upgrade)

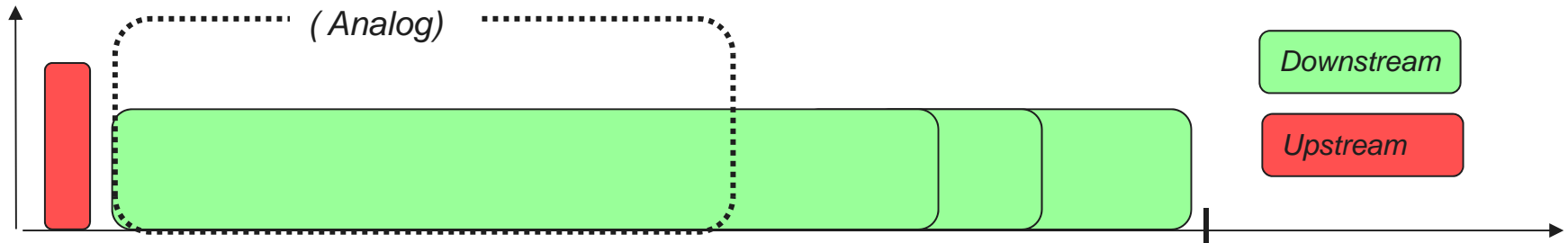
- Economics of plant migration
 - N+Small vs. N+0
 - Amp-to-Node kits simplify process but drive “legacy” nodes deep
 - Linear optical transport model (transparent)

BW-Cost “Sweet Spot” Favors Short Cascades

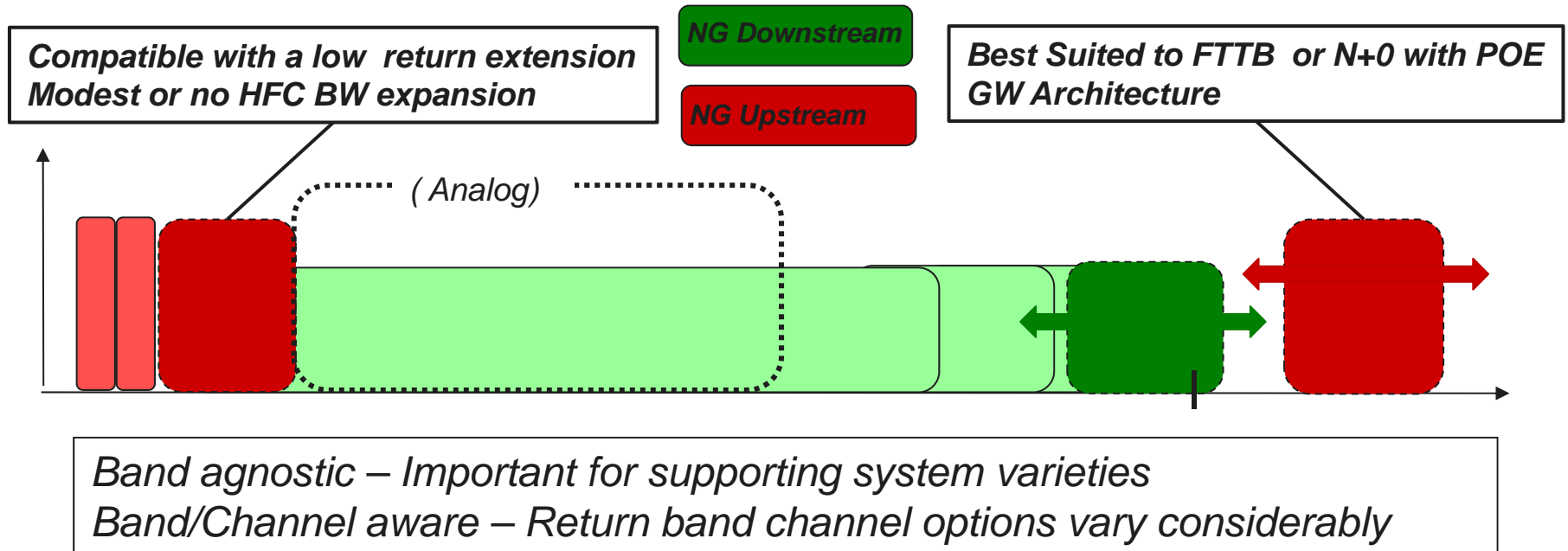


Frequency Plan Considerations

Cable Spectrum Today

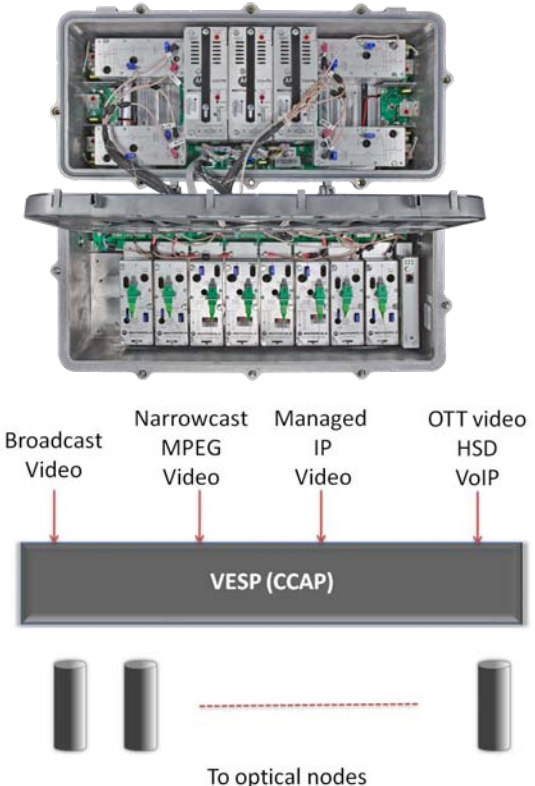
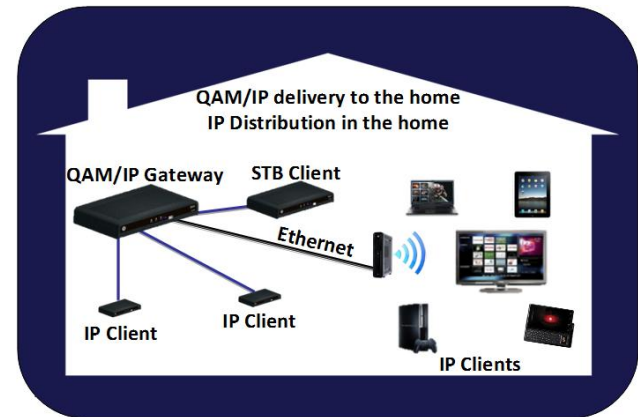


Possible Spectrum Evolution



Related Product Development Activity

- CPE: Significant development in home gateways and IP accessories
 - Historically long lifespan, indoors
 - Extremely cost sensitive
- New Access Modules & Types
 - Std D/S & U/S Segmentation (transmitters and receivers)
 - Fiber-Based Commercial Services (PTP Ethernet, EPON)
 - Optics (Mux/Demux, EDFAs, Switches)
- Amp-to-Node Conversion Kits
- Major investment in next generation edge platforms (CCAP, high density EQAMs)



Extensive Assortment of Fielded Actives



- Regional dependencies
 - Form factor, cost, dominant architectures
- Many originated as 550 MHz and were incrementally upgraded to 1 GHz
- Modular “hub” nodes have increased the flexibility of new technology deployment
- Amplifier-to-node conversion has made fiber deep easier but target legacy services
- Nodes: New modules?
- Amplifiers (Outdoor): Avoiding, bypassing, upgrading, developing?
- Taps: Replacement?

Varying Amounts of Modularity, Flexibility, and Unoccupied Space



Summary

- Suppliers are eager to help the industry optimize and further extend the lifespan of the HFC network and enable new services
- Investment decisions on upgrades, new products, and the scale hinges on the range of architectures, frequency plans, and technologies
- Next generation solutions for Edge, Access, and CPE are already in development and/or being productized today
- Near-term clarity will best help suppliers make timely consideration for possible hooks, upgradeability, and evaluate development ROI

