FTTP
(Fiber-to-the-Premises)
Next Generation Broadband Access Network

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Why FTTP? Why Now? What's Different than before?

Technology Improvements

- Superior Full Service Network
  - POTS, Data, Video
- Standards Based {G.983.x}

Cost Improvements

- Reduced Costs (Actives & Passives)
- Low Cost compared with PMO
- Reduced Maintenance Costs {Passive Plant}

Increasing Data Services Requirements

- Continued Increasing Data Bandwidth Demand
  - Demand for Video
- DSL Unlikely to Meet Longer Term Needs

Competition

- Entertainment Video

Regulatory

- Changing Regulatory Environment

What does FTTP mean to Verizon ?

New Network

New Products/Services

New Processes

New Regulatory Framework

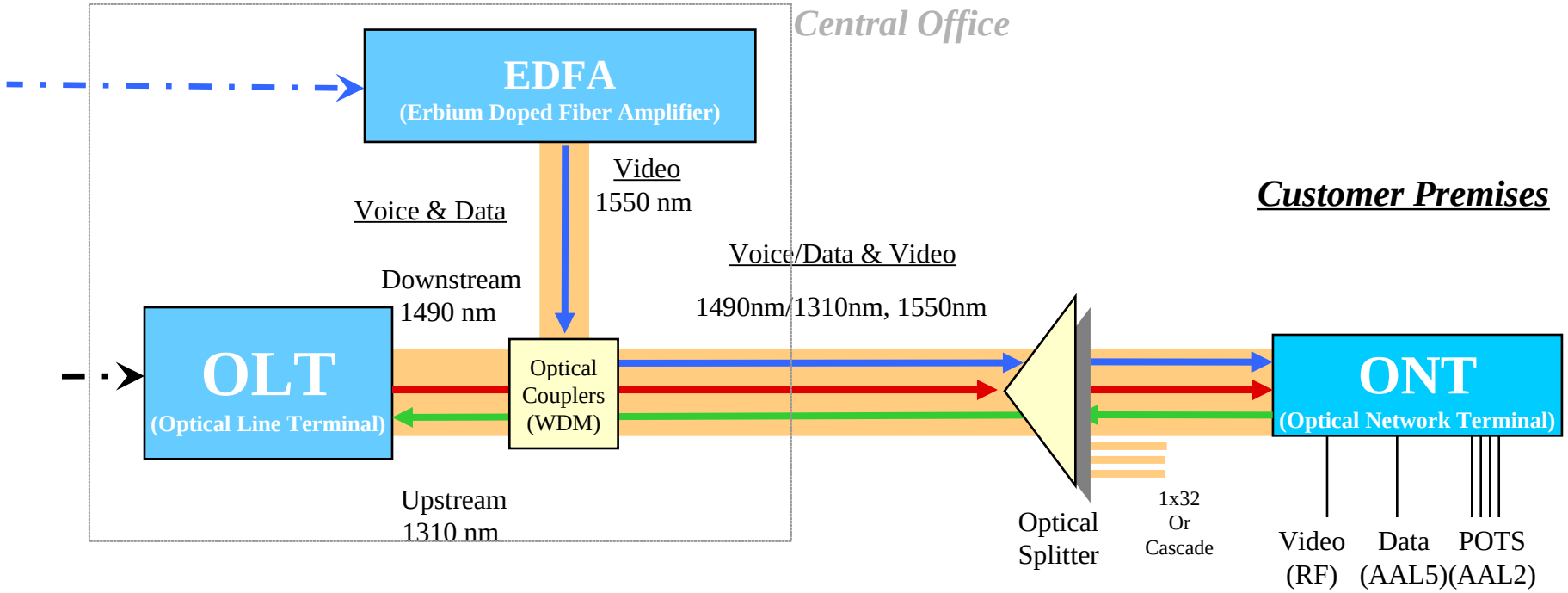
Re-inventing the Network

Increased Revenue Opportunity

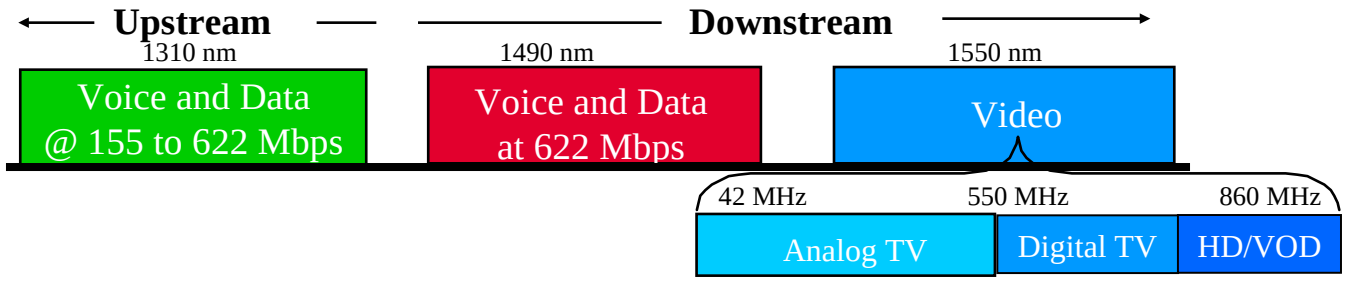
and

Lower Cost

PON Architecture (ITU-T G.983): A New Network



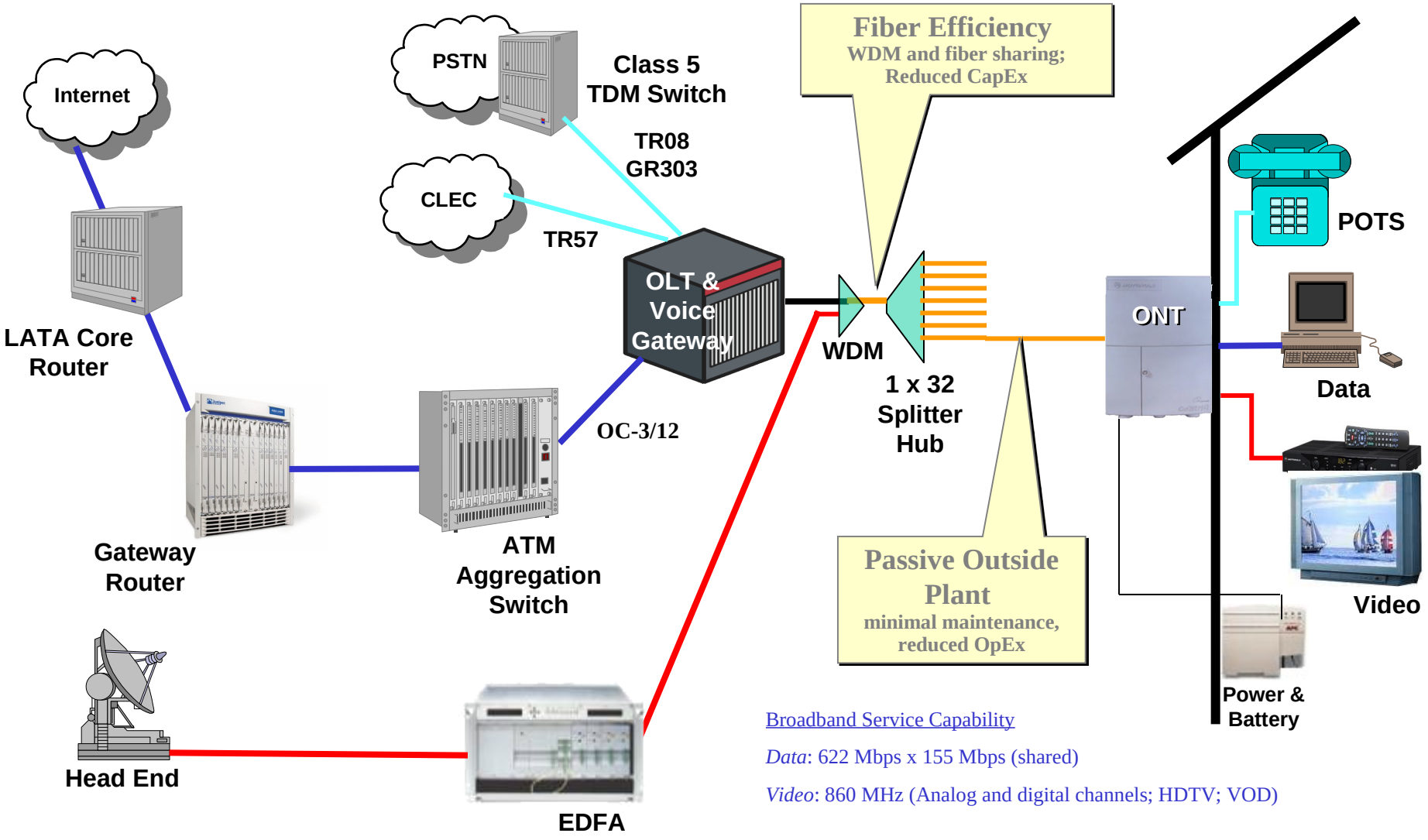
Bandwidths & Services



- Range defined by:
  - 20 Km range defined by ranging protocol.
    - Used to align ONTs' upstream data into timeslots
  - Optical Budget (See below)

B-PON ODN Class	Maximum Attenuation (dB)	Minimum Attenuation (dB)	Differential ODN Loss (dB)
A	20	5	15
B	25	10	15
C	30	15	15
Enhancement Band system specific. Conventional RF video will require altered ODN	Alignment w/ B-PON Max Attenuation allows common design max budget over 0-20 km range	Enhancement Band system specific	Can be reduced by video Receiver dynamic range. Analog video Receivers have dynamic range of 4-7 dB

FTTP: A New Network

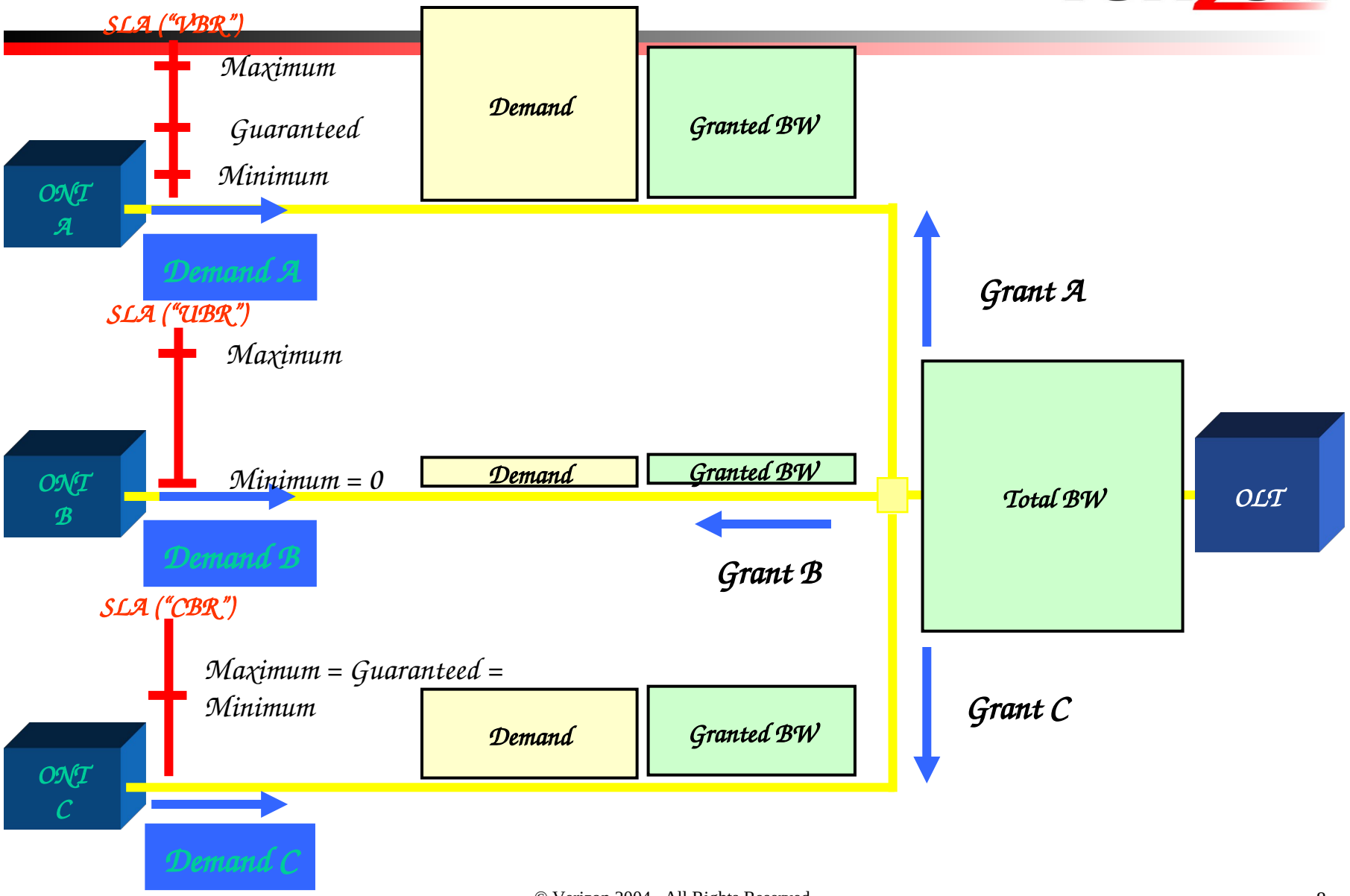


Broadband Service Capability

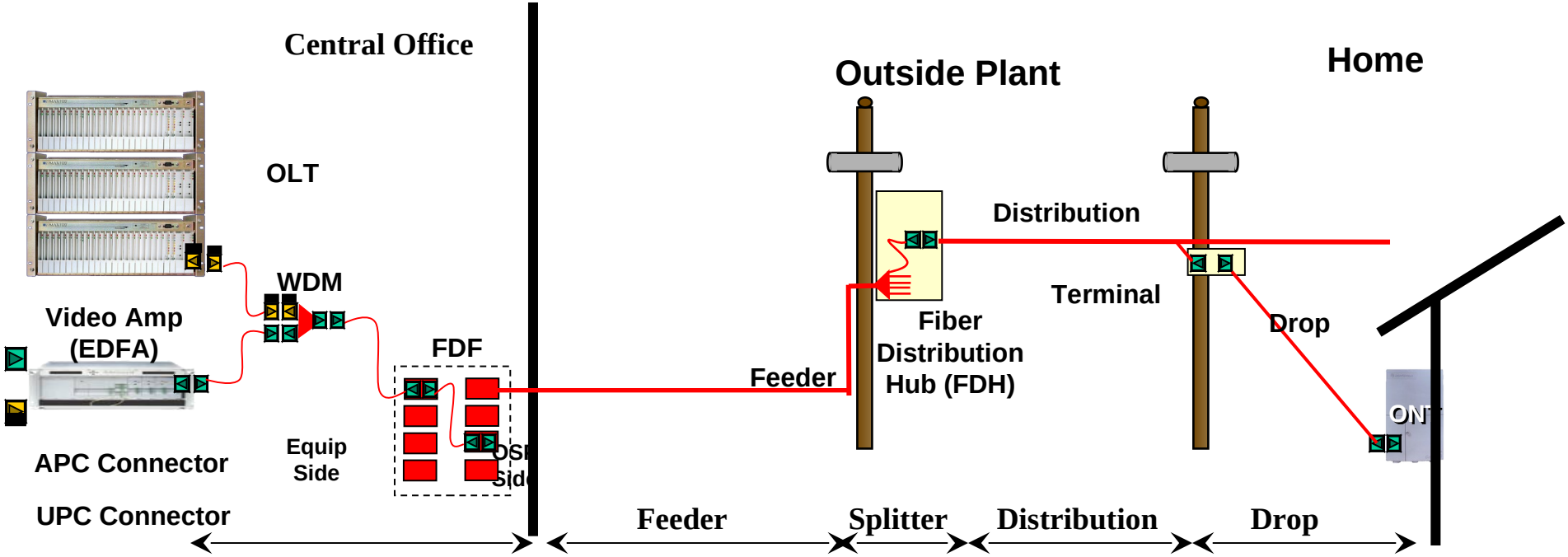
Data: 622 Mbps x 155 Mbps (shared)

Video: 860 MHz (Analog and digital channels; HDTV; VOD)

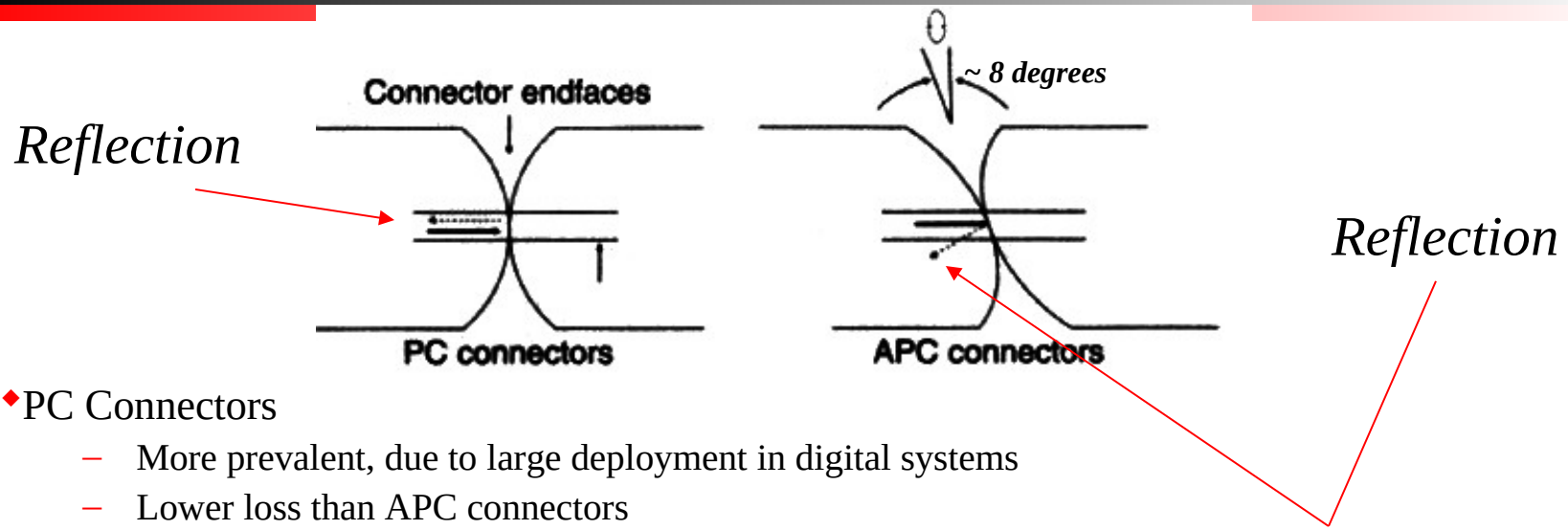
Dynamic Bandwidth Assignment (DBA)



FTTP Architecture

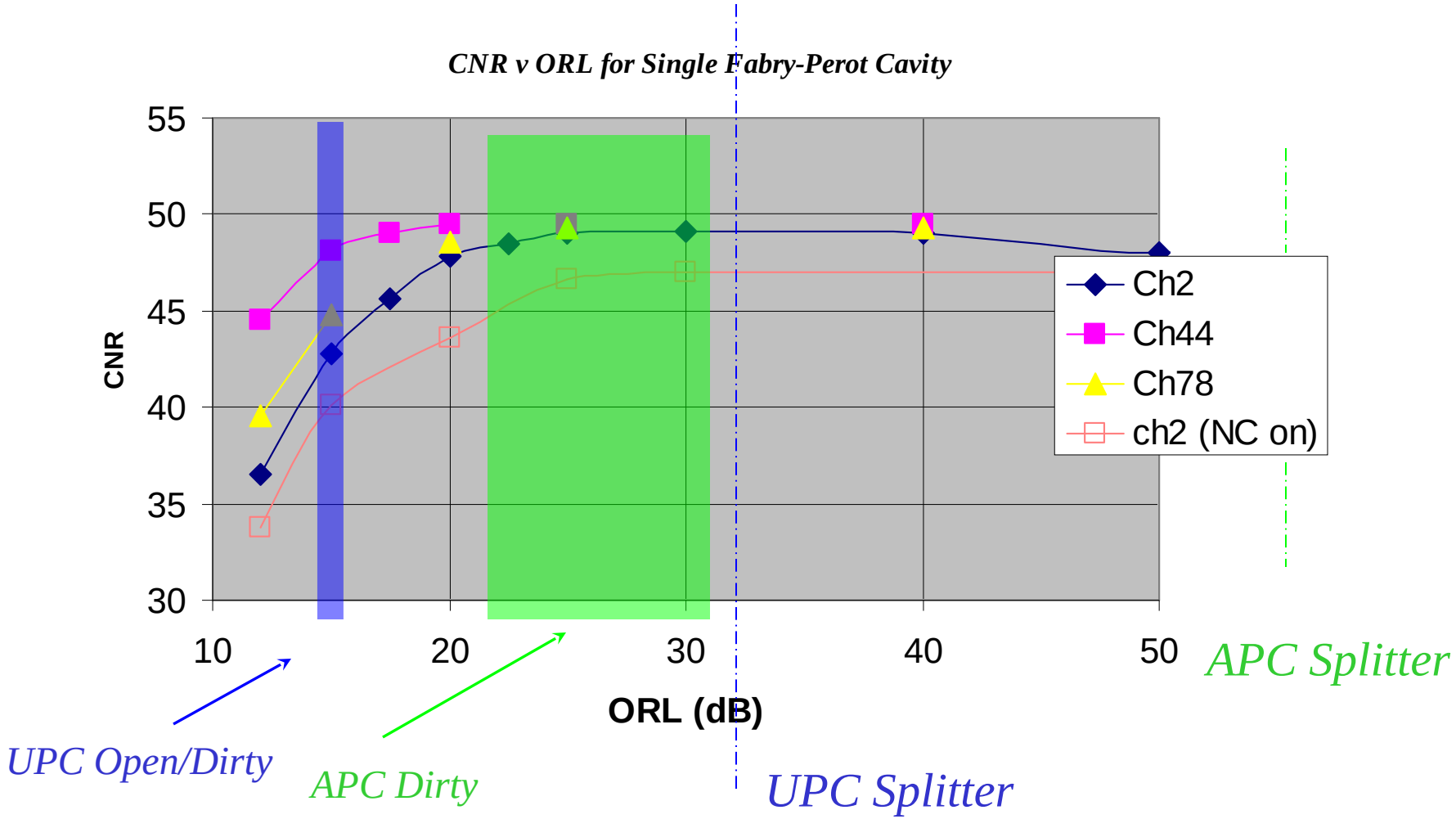


UPC and APC Connectors

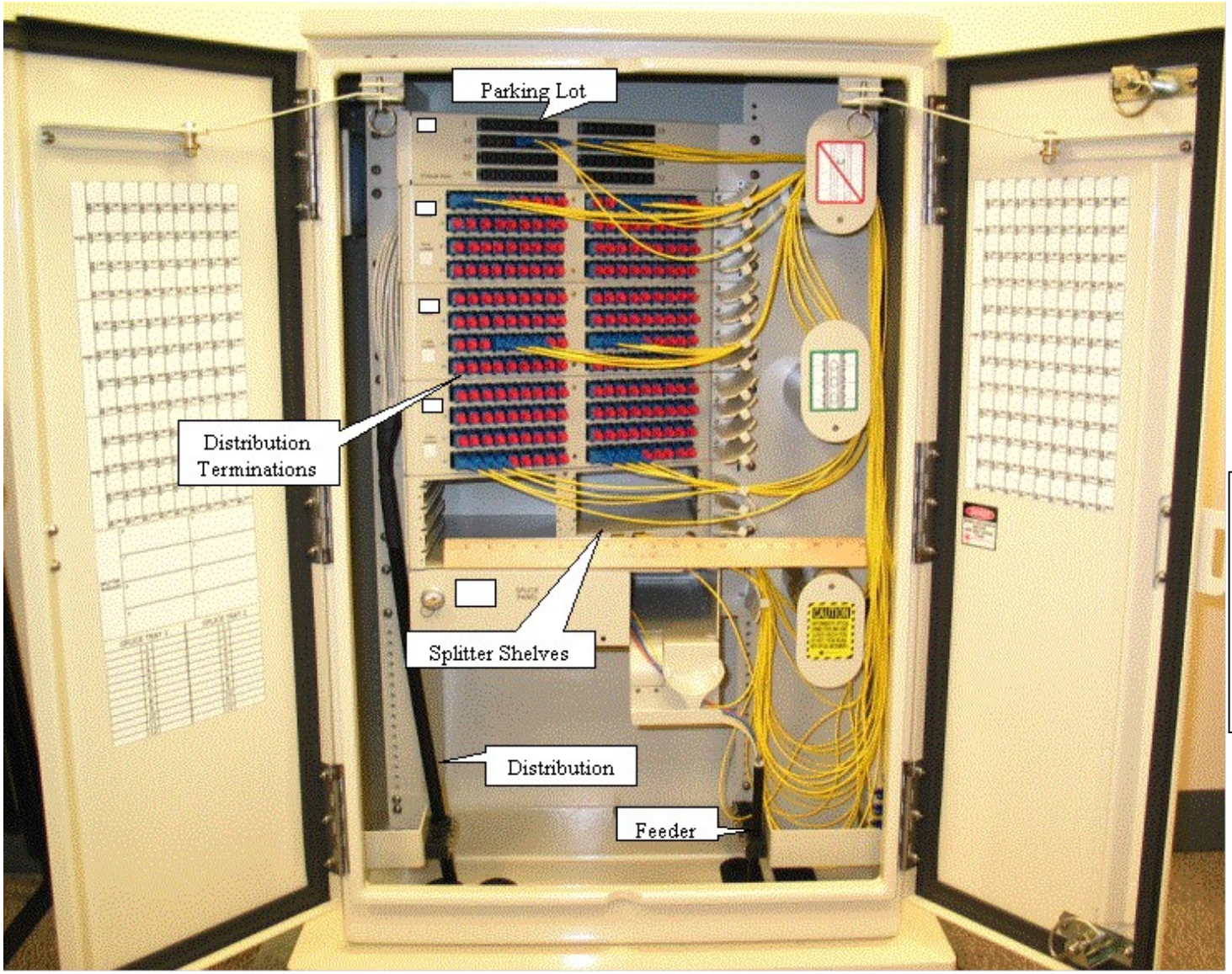


- PC Connectors
  - More prevalent, due to large deployment in digital systems
  - Lower loss than APC connectors
  - Historically issue was relative low optical return loss(ORL) ~ 50 dB, due to reflected signal being reflected back into fiber.
    - Present ORL sufficient for digital systems.
    - Newer mated connectors have much better ORL of – 60 dB.
- APC Connectors
  - More prevalent in systems carrying video
  - Historically higher insertion loss but this has improved over the last several years
  - Higher ORL of ~ 60 dB+ due to angled fiber structure, which reflects unwanted signal into surrounding cladding regardless of mated or unmated state.
  - More tolerant {from a reflection point of view} to moisture and dirt.

System Performance Testing:Illustrative example

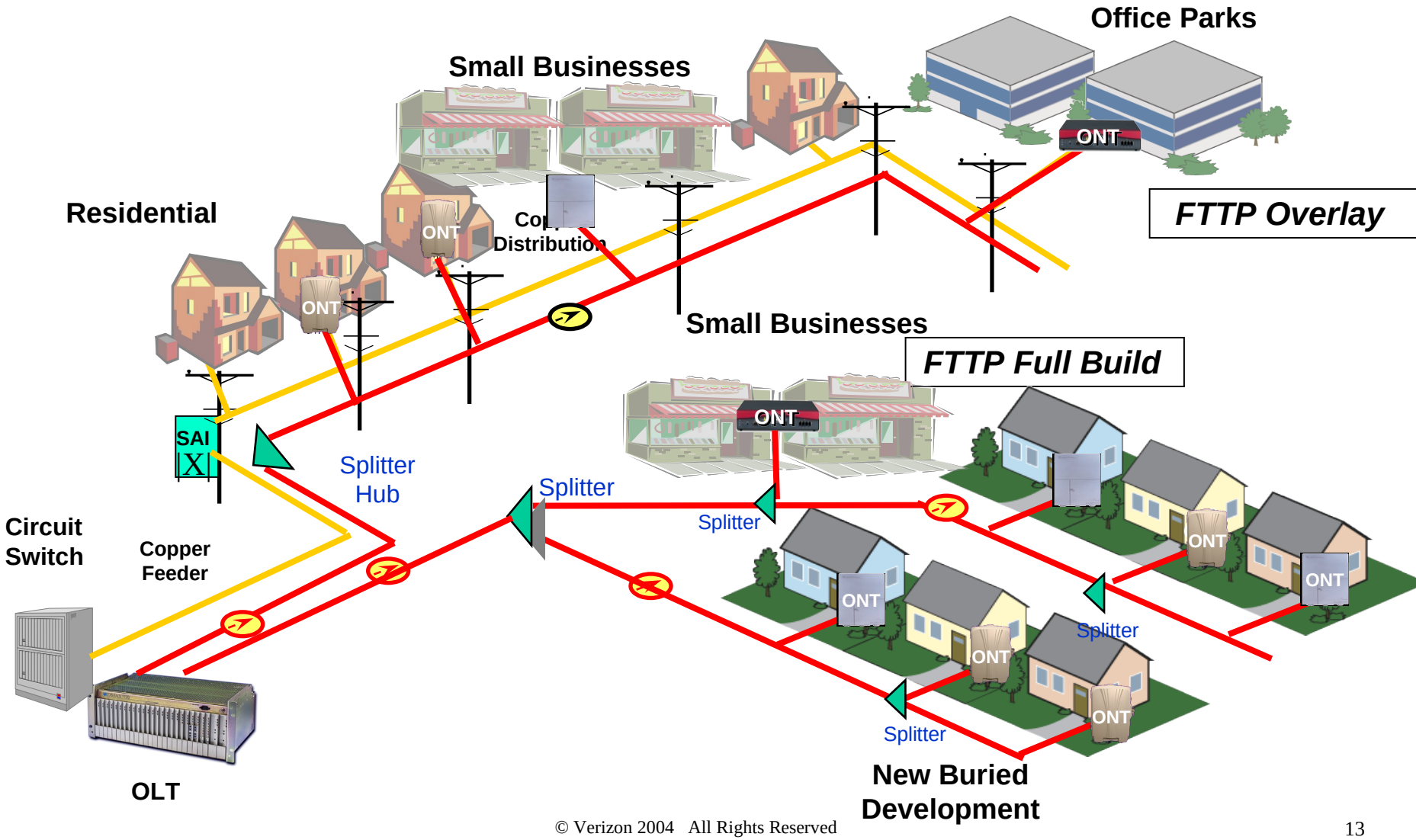


Fiber Distribution Hub (Medium)



- 39”H x 25”W x 20”D
- Premises/ONTs:
  - 216 Max
  - 175 Typical
- Pole or Pad Mount
- ~125 lbs.

FTTP Full Build and Overlay Architectures



- Target Market
  - Predominantly residential neighborhoods
    - Serves all Consumer & Small/Medium Business services
    - Residence & business customers on same PON; different ONTs/CPE
  - Services:
    - Residence - 2 to 4 POTS; 10/100BaseT; 860 MHz RF Video (Analog & digital channels; HDTV; VOD)
    - Business - 10/100 BaseT; 1-4 DS1; POTS; Specials (adjunct IAD)
    - Multiple Dwelling Units {MDUs with 12 living units}
      - 12 Ethernet/VDSL {for longer inside wiring distances}
      - 24 POTS
      - Video

FullBuild:

- Driver
  - FTTP initial Capex near parity with PMO (DLC/copper/DSL)
  - Lifecycle considerations favor FTTP (reduced Opex, deferred Capex, declining prices, increased revenues, regulatory relief)
- FTTP Built to Serve All Homes and Businesses (All Services) in Distribution Area (DA)
- Used for Greenfield
- All services offered over fiber

Overlay:

- Driver
  - Primary deployment driver is broadband service demand
  - Benefits, in addition to new services & revenues:
    - Operations/Maintenance savings for customers transitioned to FTTP
    - Improved quality of service
- Used in Established Neighborhoods for Broadband Service Demand and Plant Modernization (Relief and Rehab) Applications
- Overlay (No Replacement) FTTP Alongside Existing Access Network (Initially)
- Customers Transitioned to FTTP Over Time
- Feeder and Distribution Fiber Placed Initially Passed all Homes and Businesses
  - Electronics Added As Customers Transition
  - Makes Costs More ”Subscriber Driven”
  - Broadband Services Available to all Homes and Businesses Passed
- Employ connectorized drop, saving time,expense and maintenance costs.
- Rate of Transition Triggered by Broadband Service Demand and Repair

Re-Inventing the Network: FTTP Process

Legacy Access Network		FTTP Access Network
Manual Order Taking	→	Web-based Order Fulfillment
Copper Pair Allocation	→	Bandwidth Allocation
Service Activation via Installation Dispatches	→	Software-based Service Activation
Limited Fault Isolation With Traditional NID	→	Proactive Performance Monitoring at ONT
Manual Asset Inventory	→	Auto-discovery and Reporting of Assets

FTTP Deployment Activities

- TimeLine
  - Verizon, SBC and BellSouth launched a joint effort in February 03 to develop common FTTP requirements
    - Standards Stimulate and Focus Suppliers; Drive Volume; Reduce Prices
  - Joint RFP issued June, 2003
  - Final vendor recommendation in September timeframe
  - Contract signed in January
  - Fiber being propositioned since early 2003
- Verizon FTTP general deployment planned to begin in 2Q04
  - Overlay contiguous COs in key market areas
  - Virtually all Greenfield to be built with FTTP
  - Pass about 1 million homes in 2004
  - Potentially double in 2005

Challenges

- Cost, Cost, Cost
  - Cost of ONTs
  - Need continued “Partnership” between vendors and Operators to all mutually invest in FTTP
  - Need cost reduction in ONT components
    - Triplexors
- New and Innovative solutions to cost of deployment in Buried Areas.
- Need interoperability between vendors equipment

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