



ATLANTA, GA
OCTOBER 11-14

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UNLEASH THE POWER OF LIMITLESS CONNECTIVITY



2021 Fall
Technical Forum
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Operational Transformation

Execute the Upstream Makeover without Leaving Scars

Robert Howald

Fellow
Comcast



**VIRTUAL EXPERIENCE
OCTOBER 11-14**



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Co-Authored By... ..

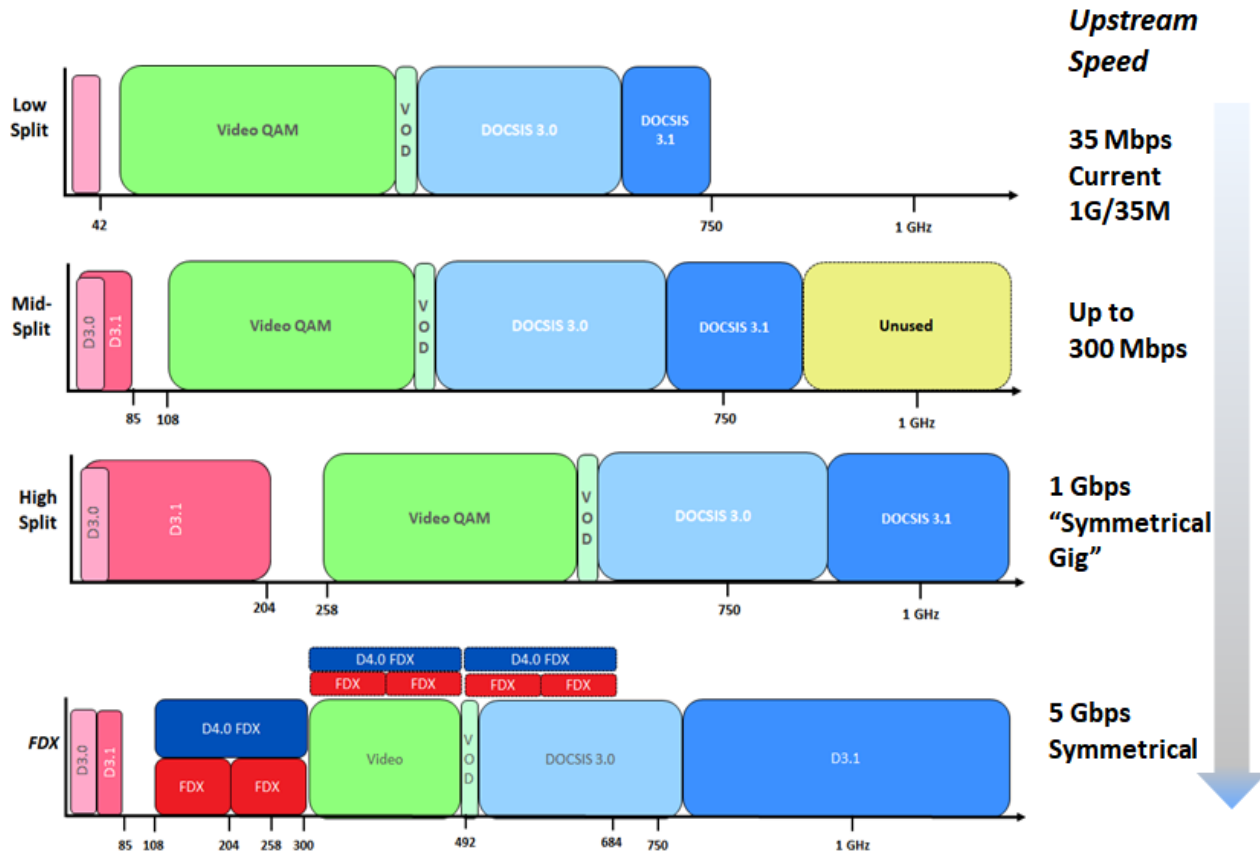
Leslie Ellis, Ellis Edits

Larry Wolcott, Comcast

- Heading Upstream: What, Why, When
- New Splits – Problem Statement
- In-Home Assessment test (iHAT)
- Add MUSL
- High-Split and DOCSIS 4.0
- Summary



The Time Has Come !



Low Split has served us well

We've consumed most of it

DOCSIS 3.1 ODFMA helps

New clean spectrum helps MORE

The usual balancing act

- Capacity vs Time
- Speed vs Time
- Make the most of a plant touch

DOCSIS 4.0 as North Star

Buy (Enough) Time

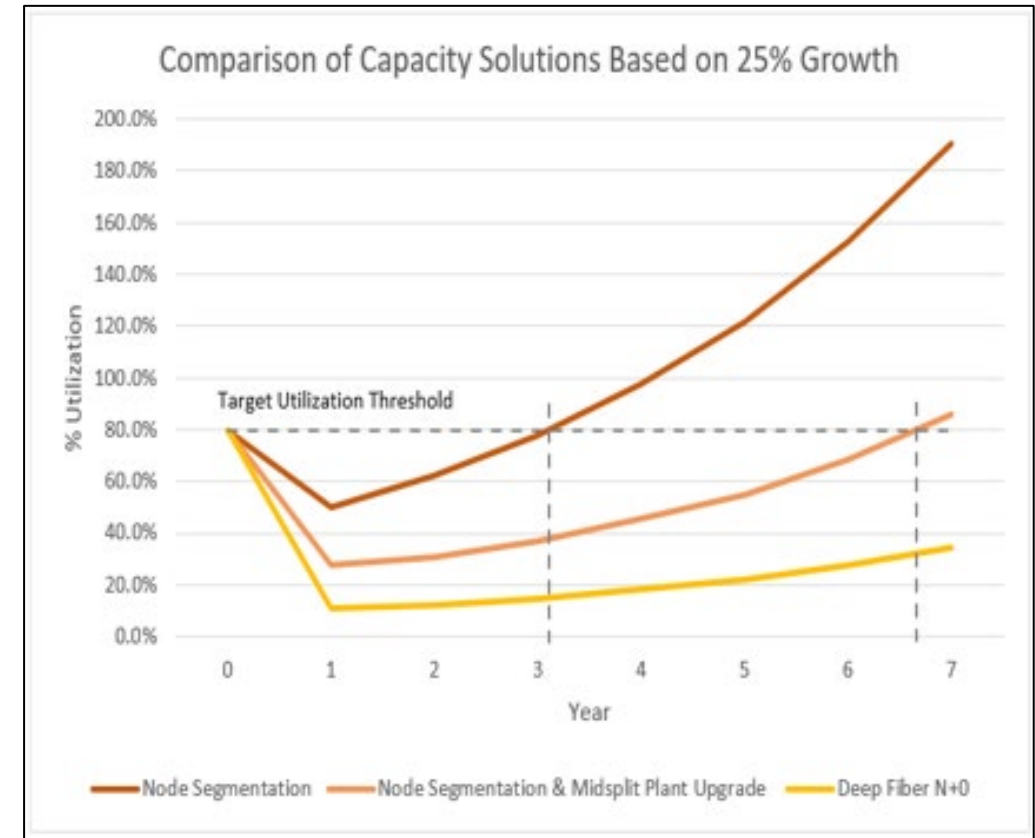
Keep ahead of demand (CAGR) w margin

Just imagine if a global pandemic forced everyone online! ...oh, wait

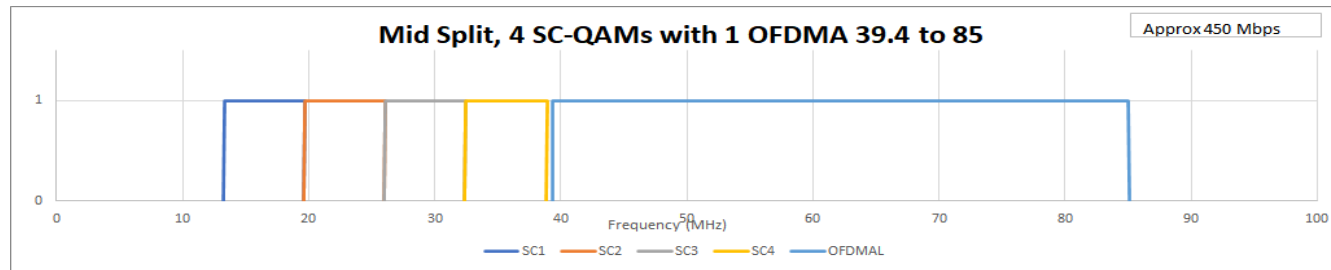
[Node split + Mid-Split] is a sweet spot for capacity lifespan for most of the network

High growth areas still most effectively managed with deep fiber solutions

Spectrum added to serve *Capacity* also enables new *Speeds*



~2x the Spectrum, 3-4x the Capacity

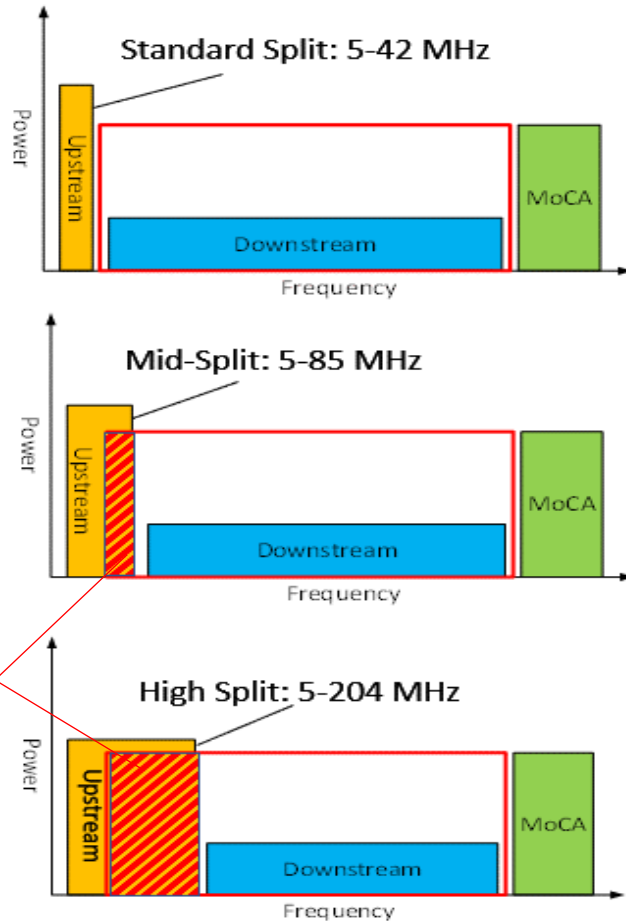


- 4x 64-QAM DOCSIS 3.0
- All Comcast D3.0 Gateways are Low-Split Only

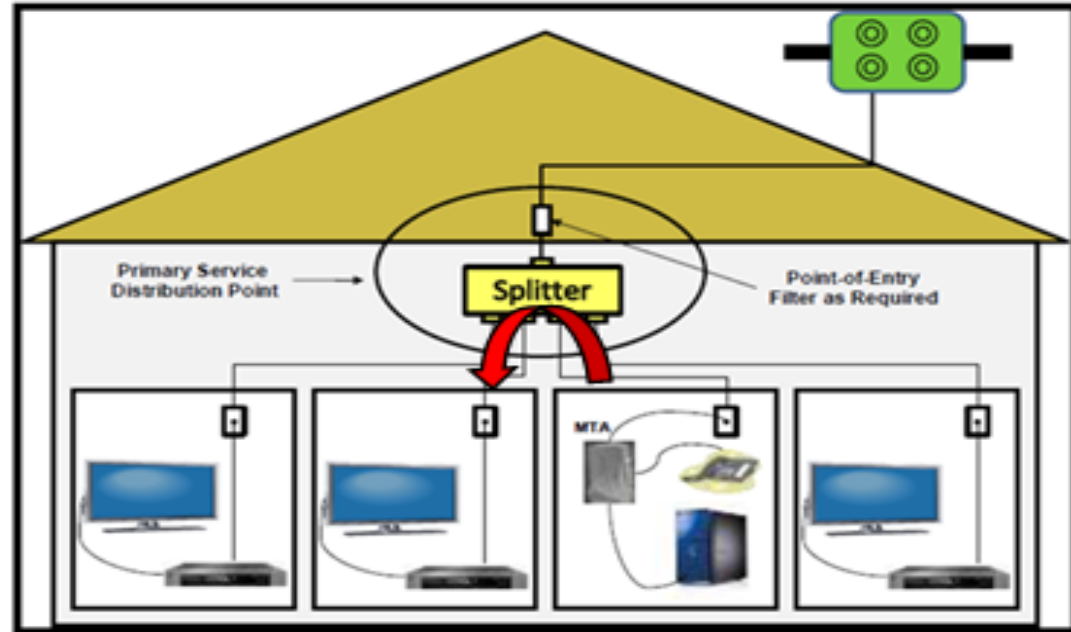


- Single 45 MHz D3.1 OFDMA Channel
- All Comcast D3.1 Gateways are Mid-Split capable (switchable) duplex

Not Made for Each Other



Carrier-to-Adjacent Channel Interference Ratio (CACIR)



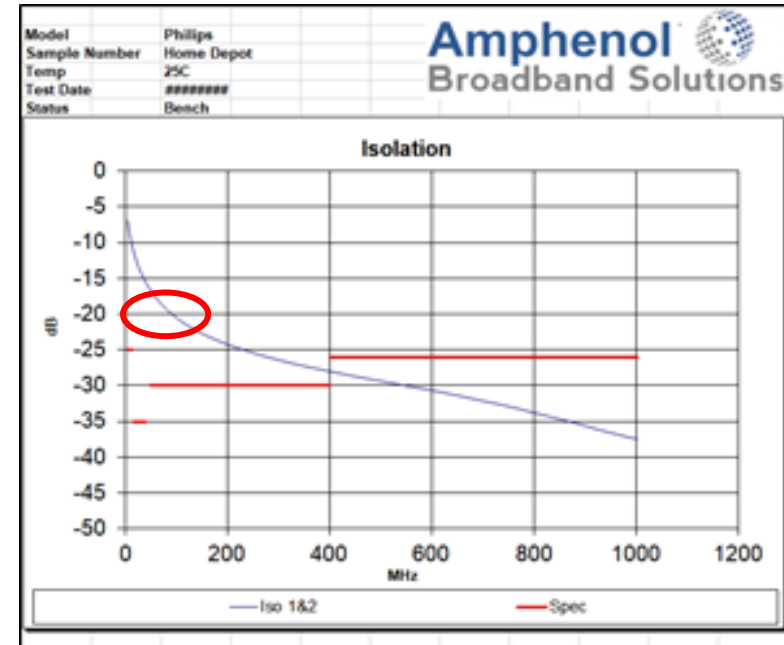
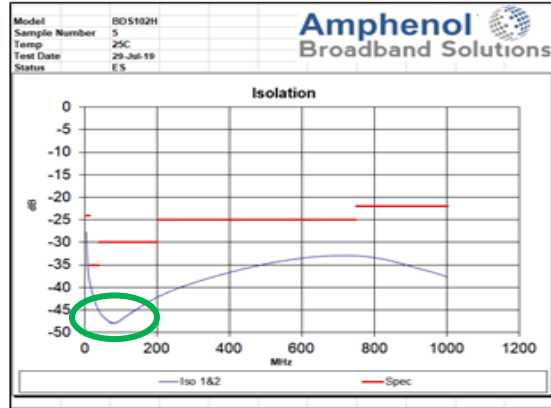
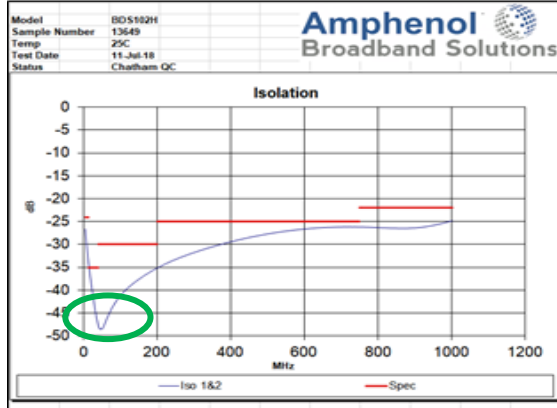
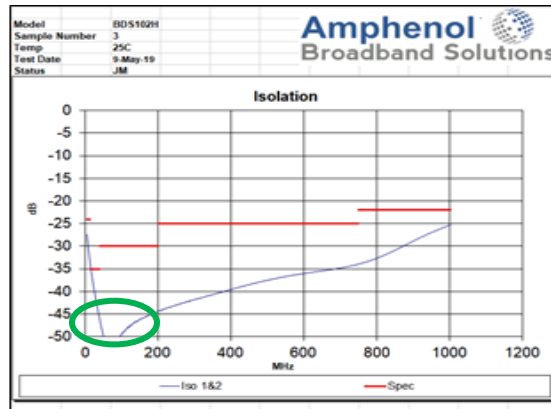
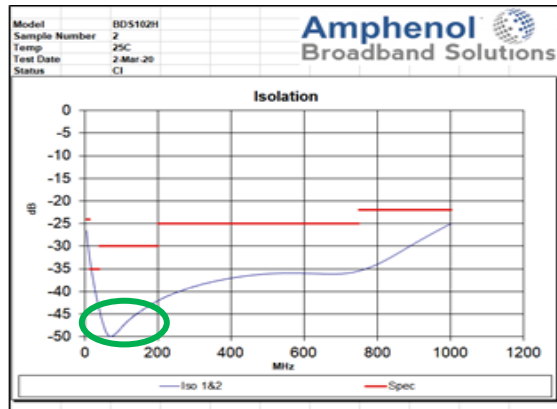
Conditions Ripe for RF Challenges

- Low DS Rx + High US Tx (correlated)
- Leaky splitters
- Short coaxial runs
- Poor terminations

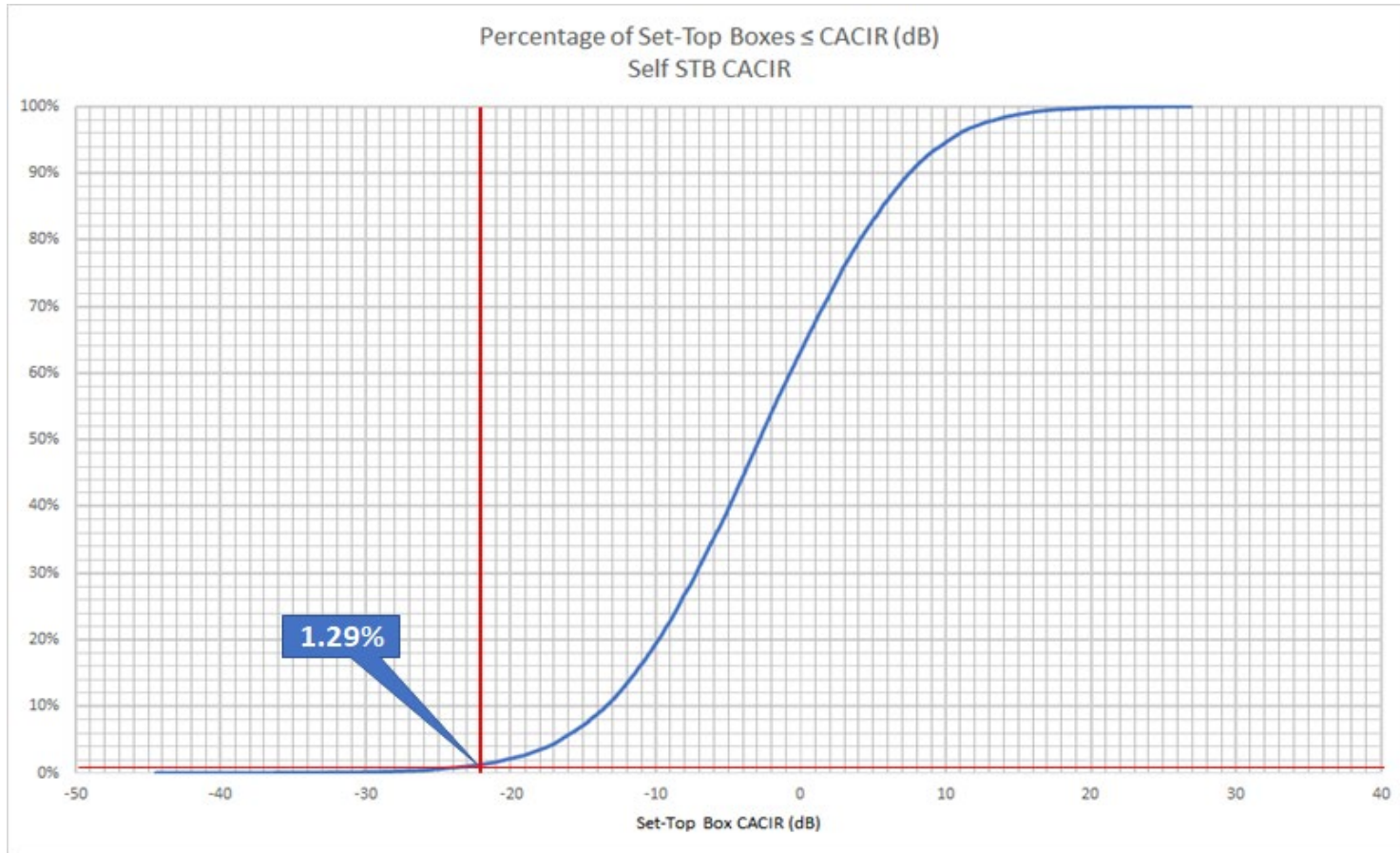
Split – the Difference

Yippee !

Yikes !



Very Small - But Not Negligible

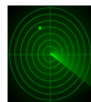


Discover Any To-Do's Upfront

Eligible accounts identified
XG* STB MAC
XB6 or XB7 or higher MAC



Remote Automated
in-Home Assessment Test
(iHAT)

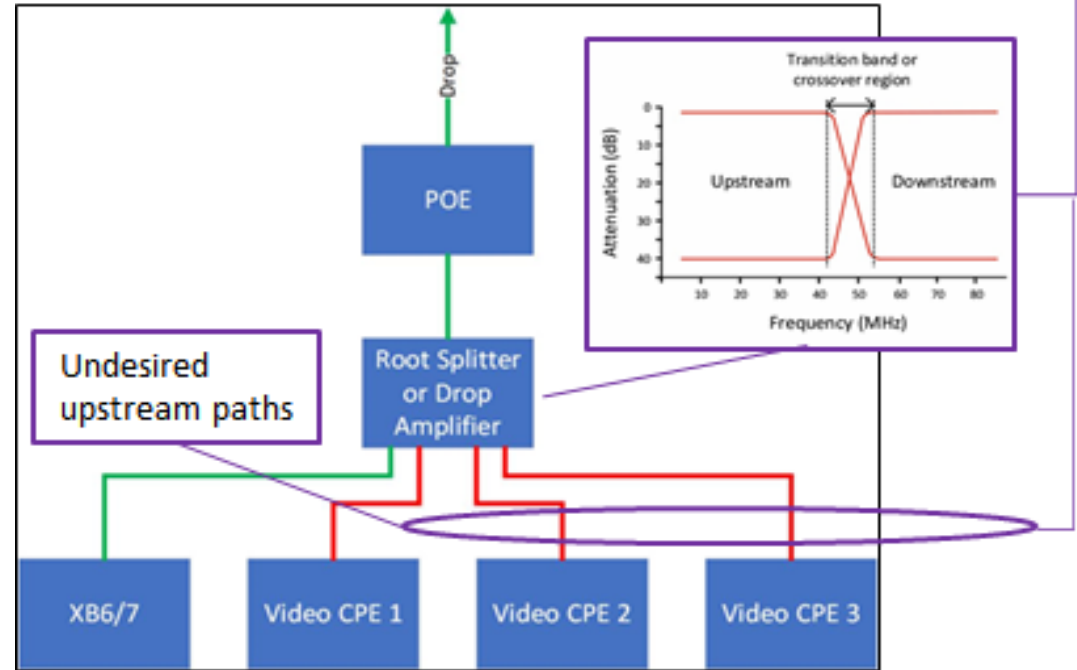


DOCSIS 3.1
OUDP Probe

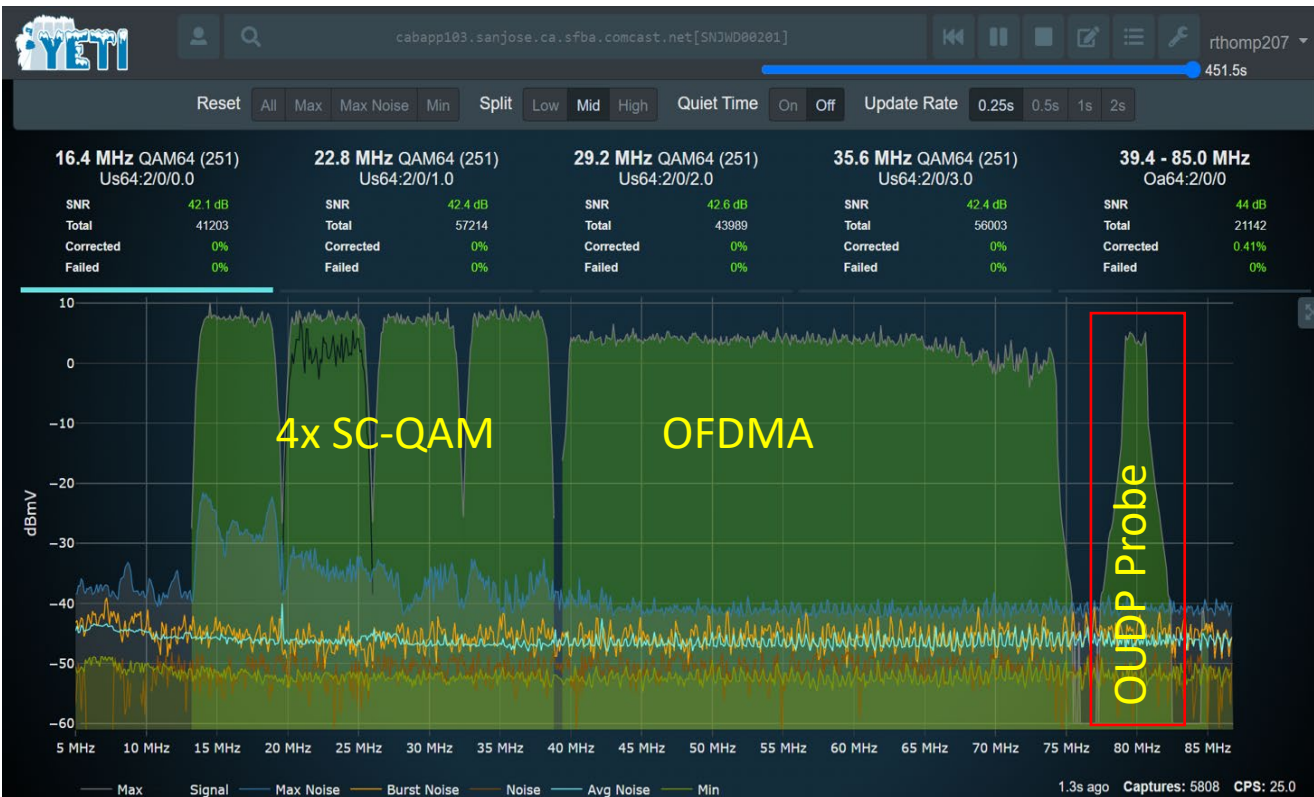


- Full Diagnosis:*
- DOCSIS is Blocked? Yes / No
 - XG video is at Risk? Yes / No
- OR No QAM Video Service*
- Partial Diagnosis:*
- DOCSIS is Blocked? Yes / No
 - Cannot determine XG Video (no XG STB – legacy only STBs)

Two Essential Assessments are Automated with iHAT (below)



Probe Home Readiness and Score the Result



```

}
info: tap-info-ihatTest - results summary for 5c:7d:7d:a8:00:66:
info: tap-info-ihatTest - QAM 1 Power (p1.6, 243 Mhz): -0.02 dBmV
info: tap-info-ihatTest - QAM 2 Power (p1.6, 249 Mhz): 0.69 dBmV
info: tap-info-ihatTest - Avg Downstream Rx Power (p1.6): 0.34 dBmV
info: tap-info-ihatTest - Upstream OUDP Power (p1.6): 2.91 dBmV
info: tap-info-ihatTest - Modem OFMDA Upstream Tx Power (p1.6): 38.75 dBmV
info: tap-info-ihatTest - US OUDP Power minus DS Rx Power: 2.57 dBc
info: tap-info-ihatTest - Isolation: 35.84 dB
    
```

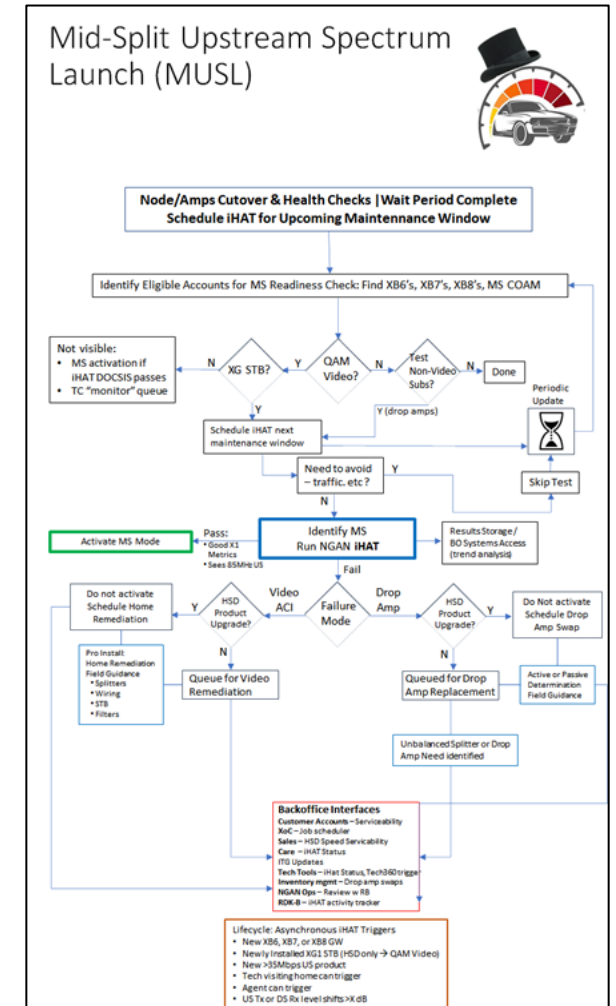
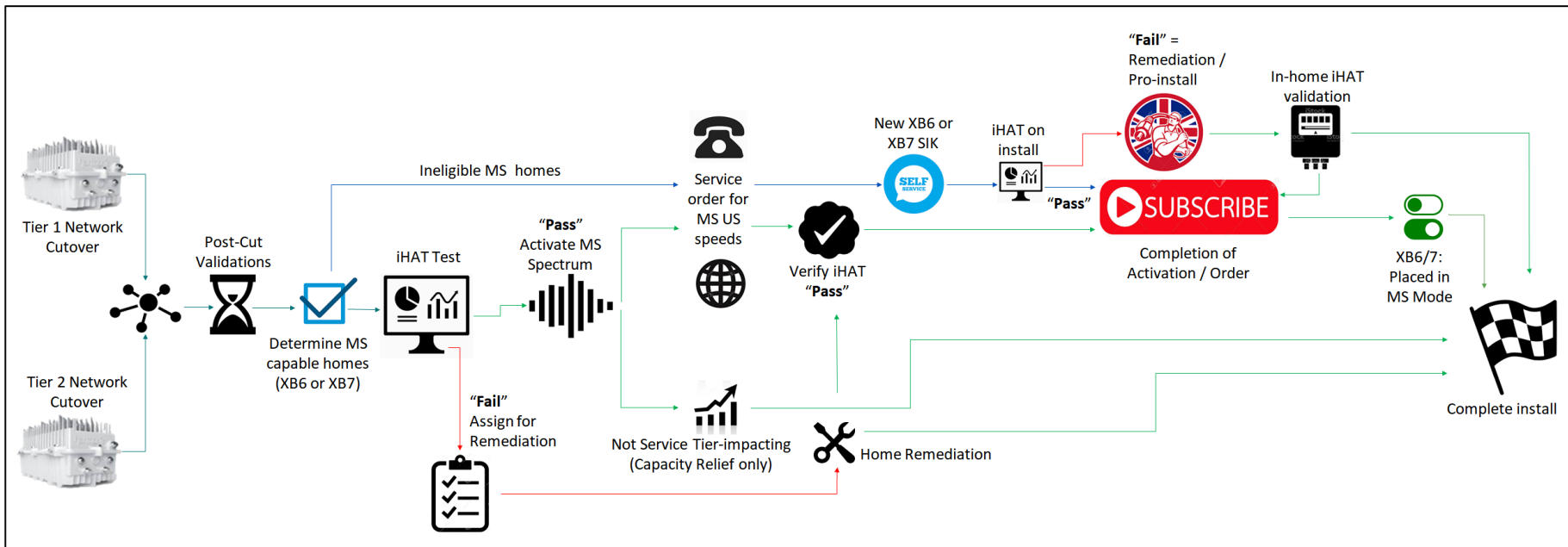
PASS: Activate

```

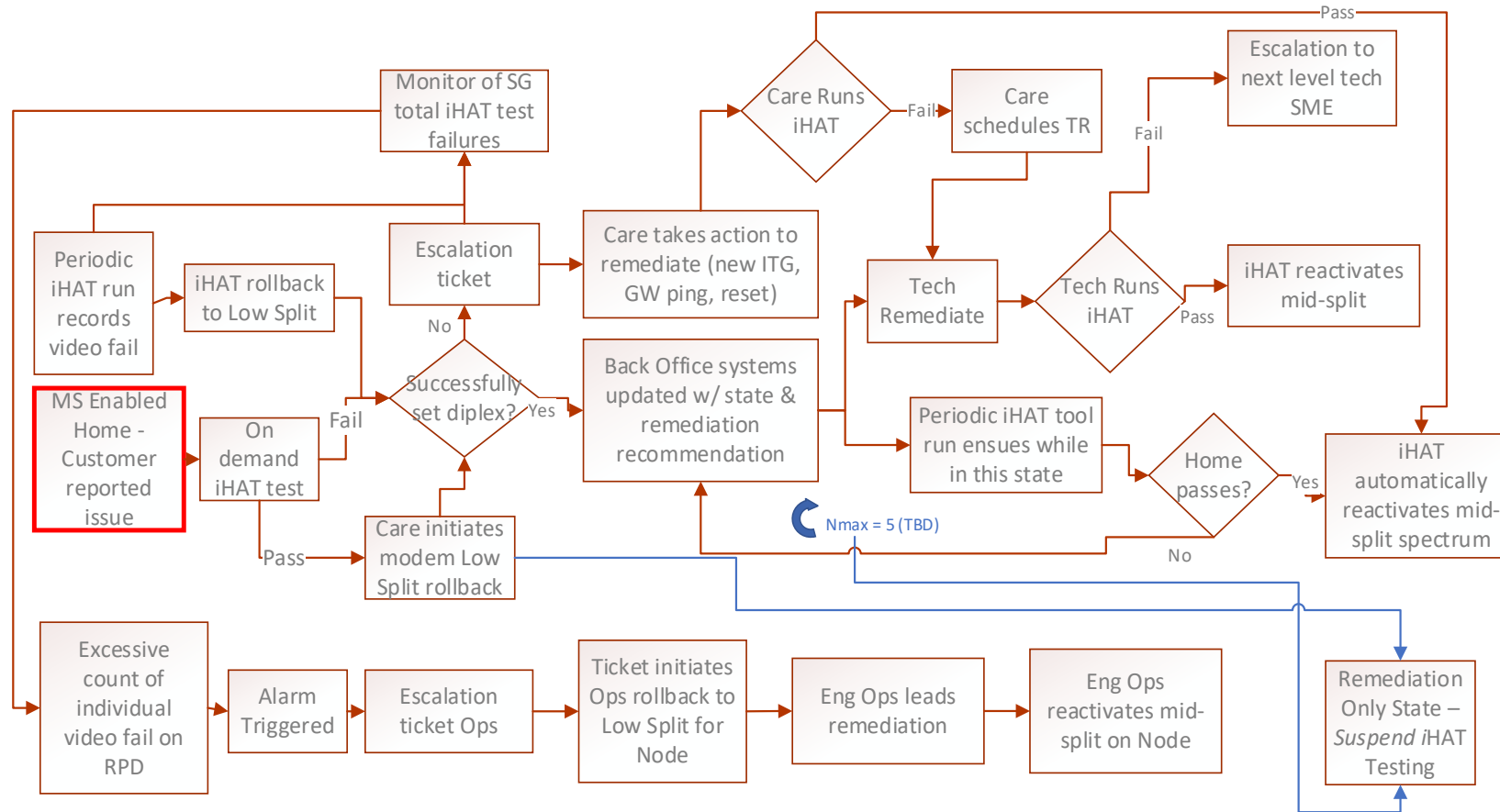
"testResult": {
  "testCapable": true,
  "testStatus": {
    "code": 102,
    "message": "Fail - Video interference was above threshold for at least one set top box"
  },
  "setTopBoxResults": [
    {
      "stbMacAddress": "6c:a6:04:0e:e2:b0",
      "threshold": 20,
      "passed": false,
      "qam1Power": -8.25388063342029,
      "qam1CenterFreq": 243,
      "qam2Power": -8.76003700654433,
      "qam2CenterFreq": 249,
      "dsRxPower": -8.50000000000000,
      "usTxPower": 45.75,
      "usOudpPower": 15.6573550262897,
      "asDelta": 24.164313886272,
      "isolation": 30.0926449737103,
    }
  ]
}
    
```

FAIL: Remediate

Construction Complete → Metrics = Solid → Configure CMTS → Unleash iHAT → Activate Ready Homes → Disposition Candidates for Remediation

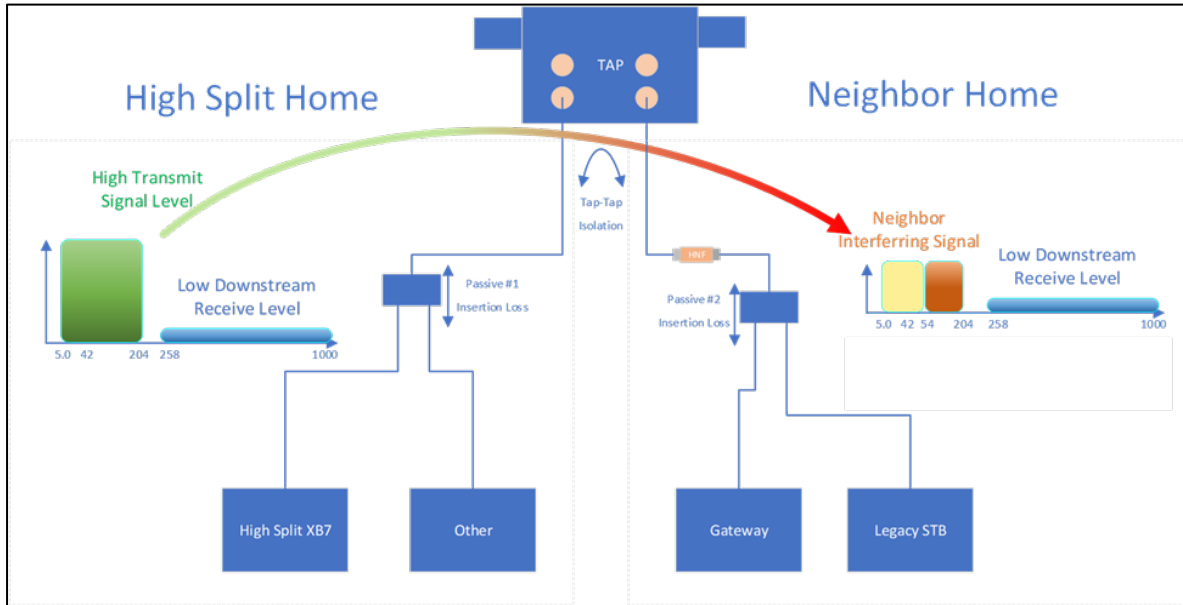


New Awareness and Processes to Tailored to Mid-Split



*Confirm home isn't in 'remediation only' mode before running periodic iHAT check

High Split

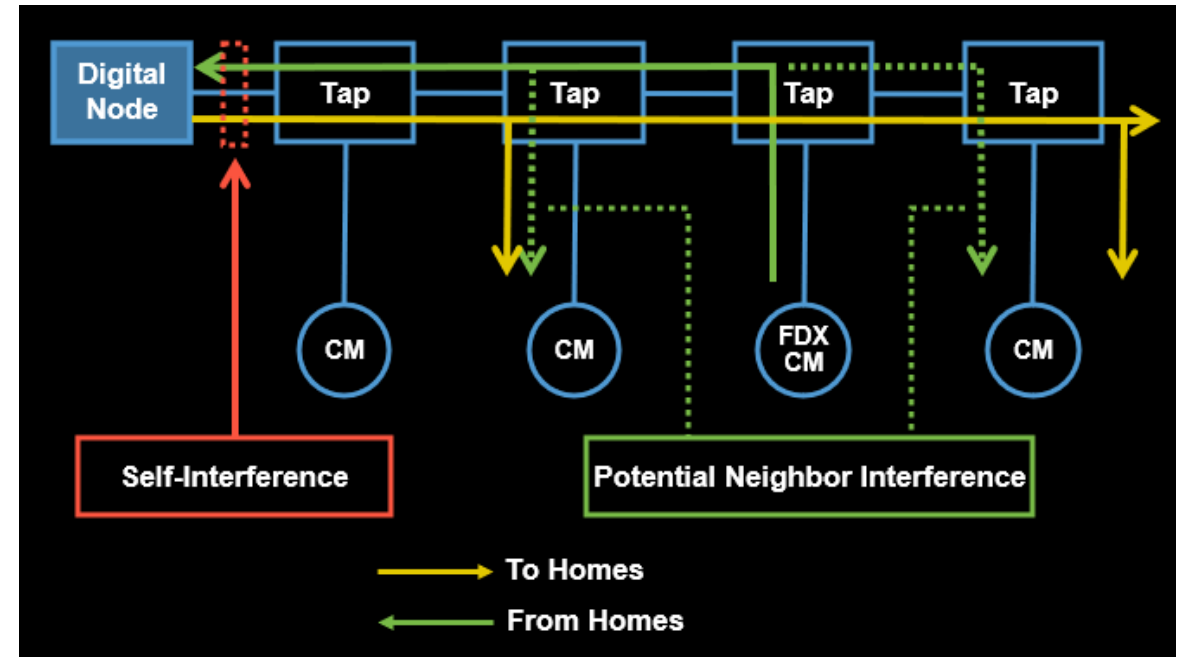


Extra upstream BW and energy brings isolation across Tap ports into play

Same conceptual analysis as MS but probe measured at adjacent home STB(s)

DOCSIS 4.0 FDD methodology similar with High Split
→ Ultra High Split; PoE obviates drop amp concern

DOCSIS 4.0 FDX



DOCSIS 4.0 FDX overlaps spectrum, by design, in the downstream and upstream

Protocol includes device isolation measurements (sounding) of DOCSIS 4.0 and DOCSIS 3.1 devices

“High-Split” process for DOCSIS 3.0 homes



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Thank You!

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