

Next Generation NBN – Lighthouse Forum 2

Design Philosophy of Next Gen NBN

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iDA
SINGAPORE

Design Philosophy of Next Gen NBN

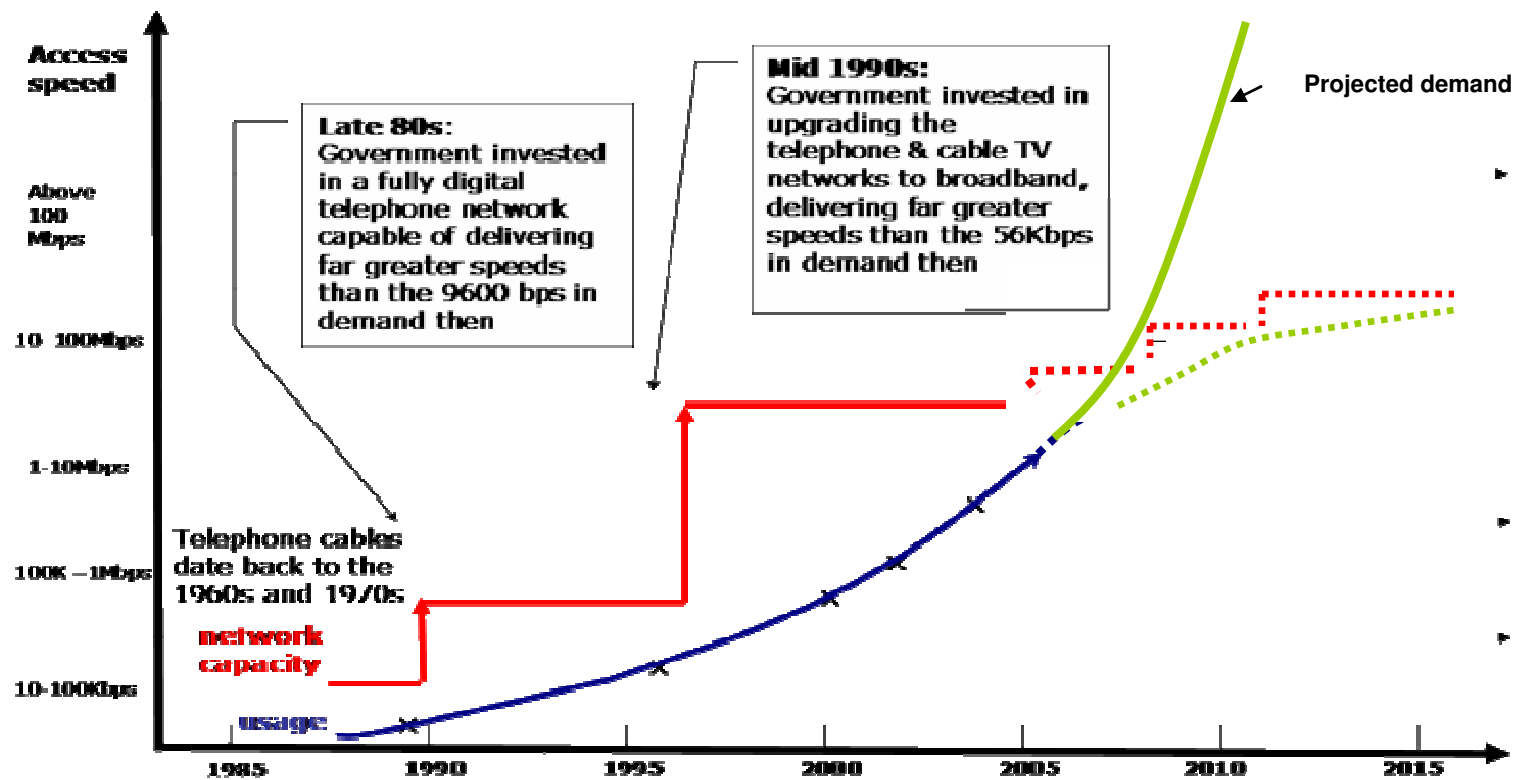
Agenda

- 1 Designing a Future Proof Network**
- 2 Universal Coverage**
- 3 Flexibility and Scalability**
- 4 Open Access**
- 5 Serving a Home from a Single Point**
- 6 Integrated Solution**
- 7 What's Next**

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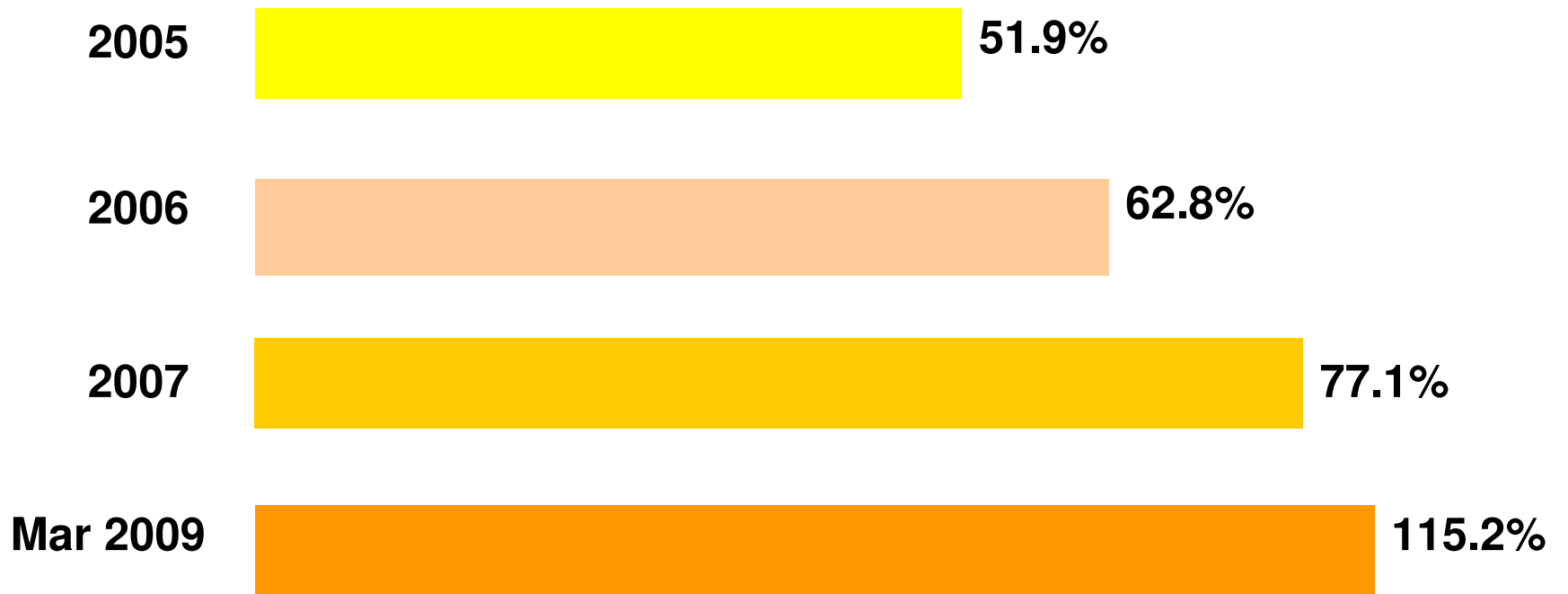
Designing a Future Proof Network

Infrastructure leadership has been critical to Singapore's competitiveness



Infocomm usage & accessibility on the rise

Home Broadband Penetration



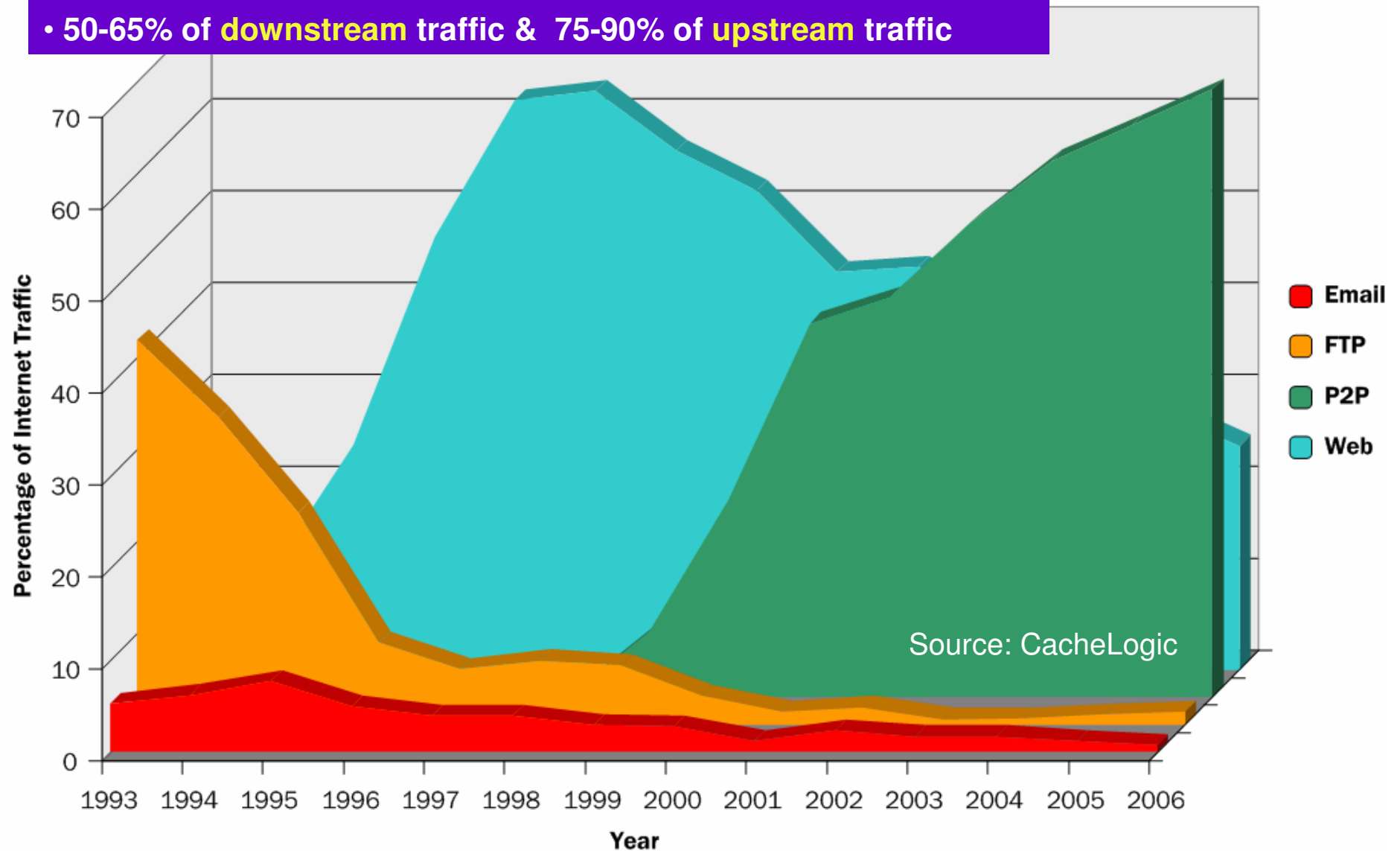
Source: IDA POI <http://www.ida.gov.sg/Publications/20090304182010.aspx>

Designing a Future Proof Network

Explosive Growth of P2P

On consumer broadband networks, P2P represents:

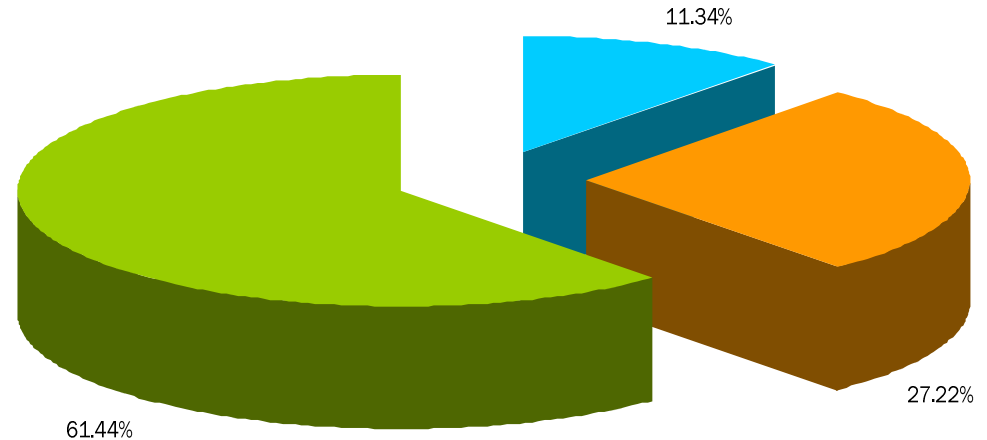
- 50-65% of **downstream** traffic & 75-90% of **upstream** traffic



Designing a Future Proof Network

Video as Main P2P Driver

- > **Average P2P file sizes are constantly growing – driven largely by video**
 - **Majority of P2P traffic volume is generated by objects with an average size >1GB**
 - **In Asia, this figure is 2.5GB**



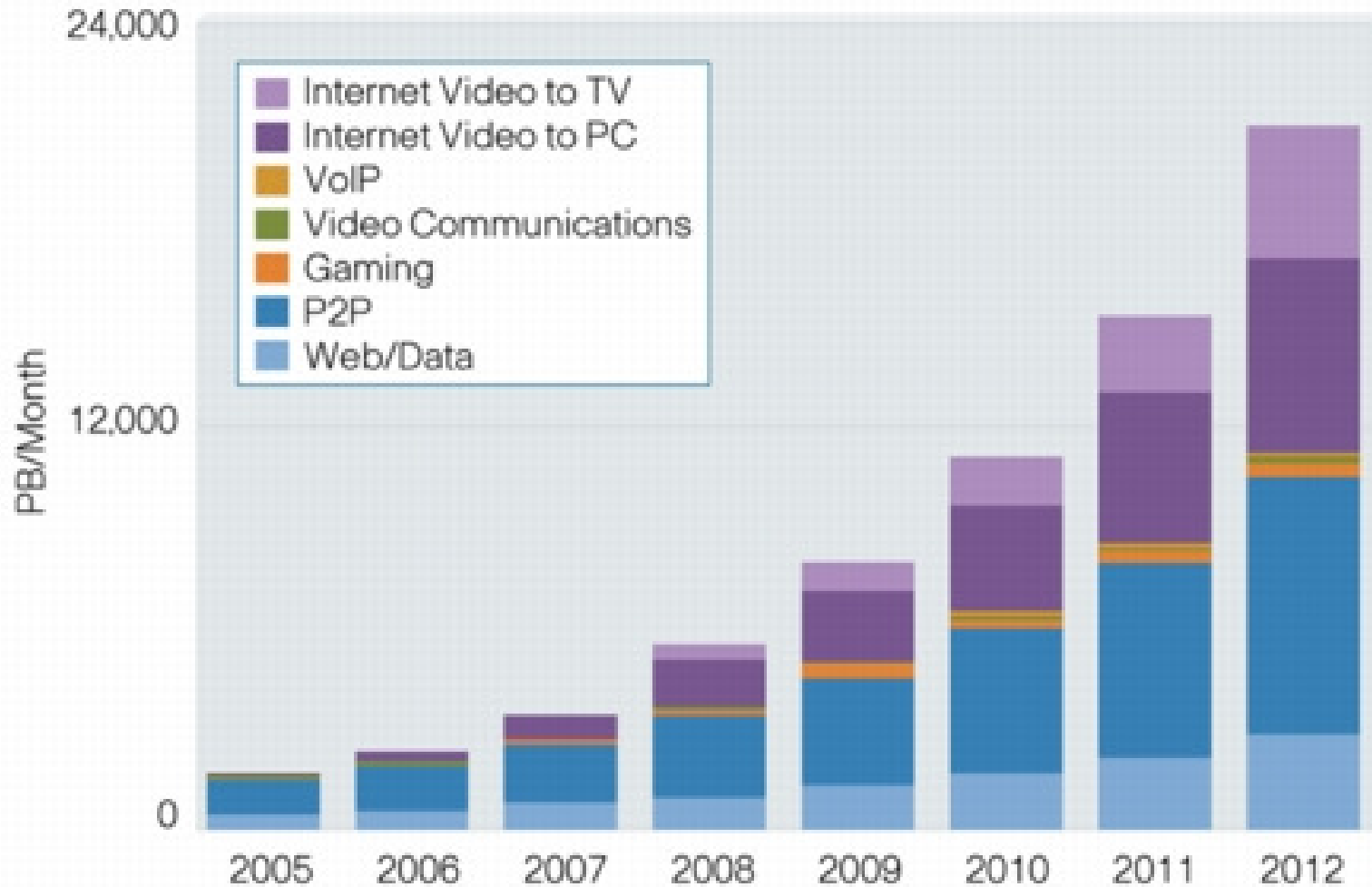
Key
File Formats

- Audio
- Other
- Video

Source: CacheLogic “P2P in 2005,” (9/05). Mix of file formats by volume of traffic generated over 4 main P2P networks: BitTorrent, eDonkey, FastTrack, and Gnutella. Weighted by volume of traffic on each network.

Designing a Future Proof Network

Explosive Growth of P2P & Internet Video

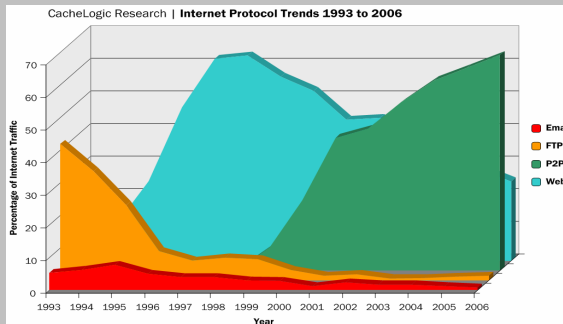


Source: Cisco, 2008, "Cisco Visual Networking Index - Forecast and Methodology 2007-2012"

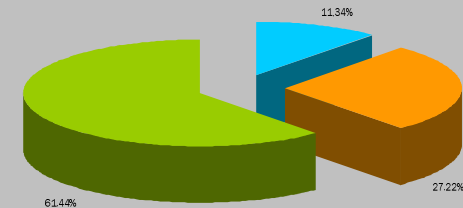
Designing a Future Proof Network (NGBN)

Assessment of Needs

Explosive Growth of P2P Driver for both upstream & downstream traffic



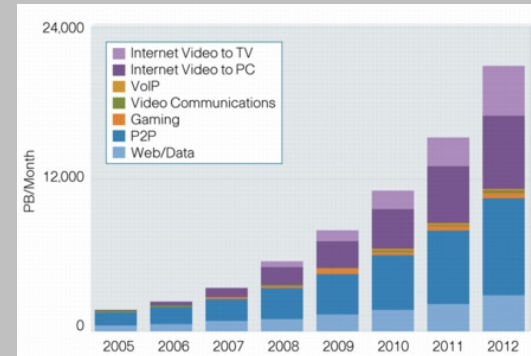
• Video as Main P2P Driver



Overall Assessment

- > Need for ultra-high speeds
- > Need to improve the symmetry of bandwidth
- > Need for committed bandwidth
- > Need for various Qualities of Service

Explosive Growth of P2P & Internet Video to PC



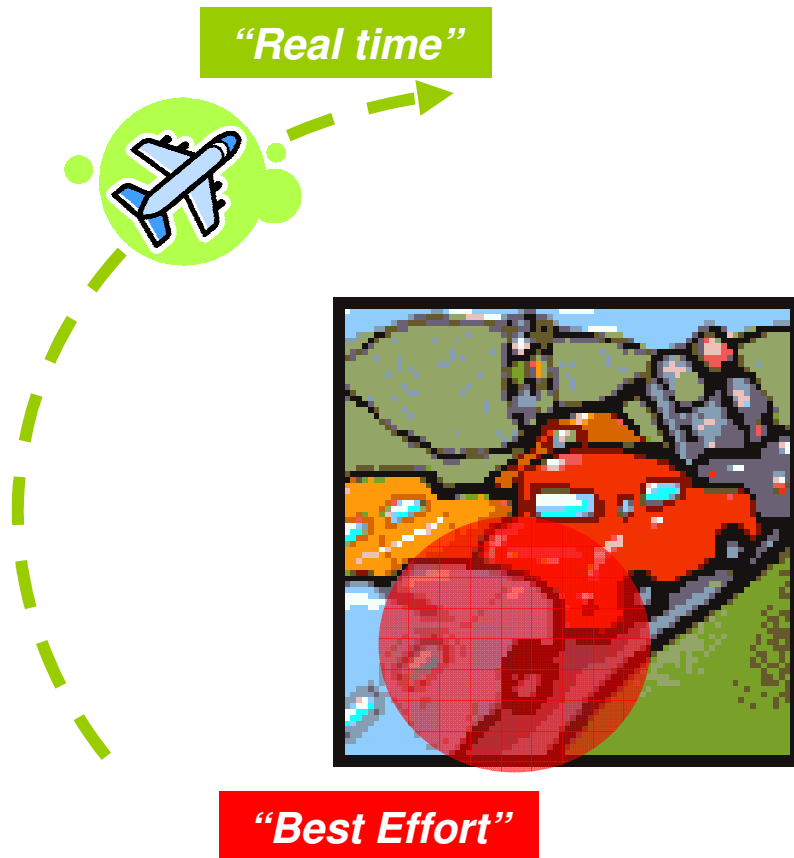
Designing a Future Proof Network (NGBN)

Bandwidth Specifications

Specification	By Commercial Operations Date
Peak Downstream Bandwidth	100 Mbps from Day 1. Scalable to 1Gbps and beyond.
Peak Upstream Bandwidth	50 Mbps of Uplink available
Committed Downstream Bandwidth	25 Mbps committed bandwidth offered to RSPs
Quality of Service	4 Classes of Service

Designing a Future Proof Network (NGBN)

Multiple Classes of Service



- > 4 classes of service offered
 - Real Time
 - Near Real Time
 - Mission Critical
 - Best Effort
- > Network performance targets for jitter, latency and packet loss
- > Supports applications with varying QoS requirements

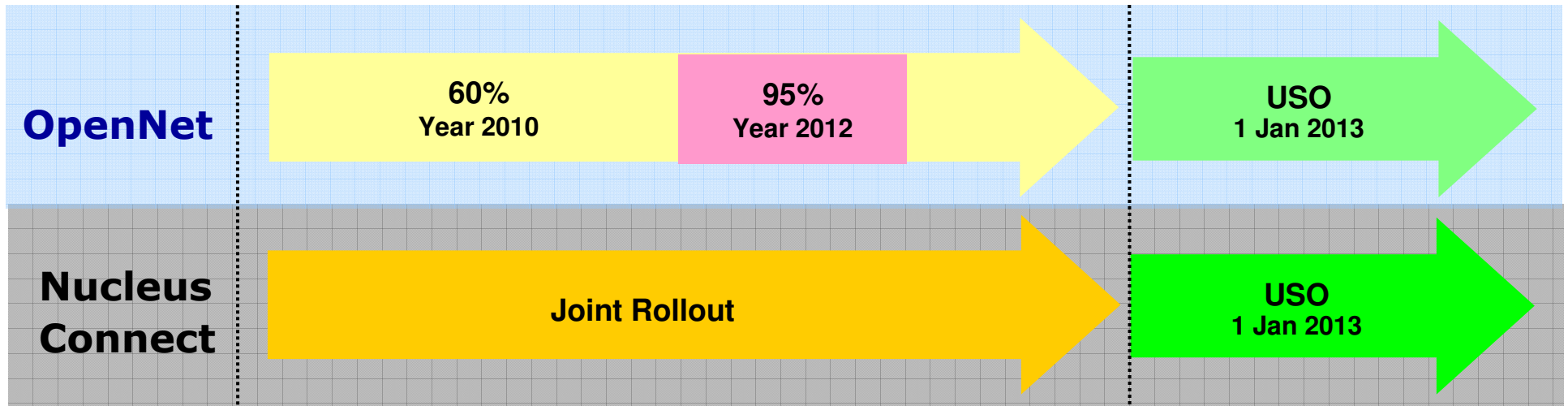
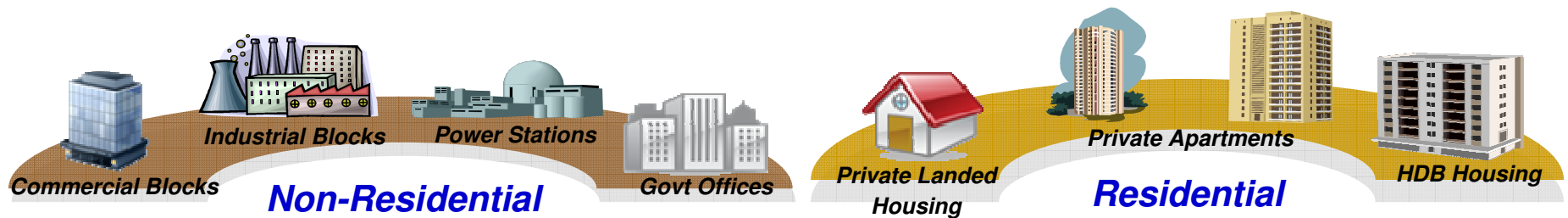
Designing a Future Proof Network (NGBN) Multiple Classes of Service



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Universal Coverage

Next Gen NBN Timeline Moving Forward



- > Nucleus Connect's services made available within 7 working days after OpenNet has declared coverage of a building;
- > Universal Service Obligation (USO) from 1 Jan 2013.

Categories of End-User Connections

Residential

- ***public housing***
- ***private apartments***
- ***private landed housing***

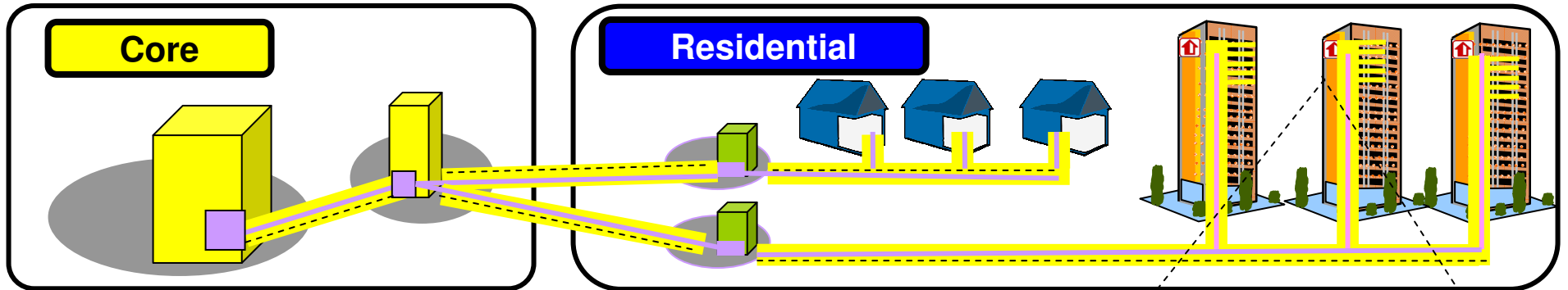
Non-Residential

- ***commercial blocks***
- ***industrial blocks***
- ***institutional properties***
- ***government offices***
- ***schools***
- ***hospitals***
- ***libraries***

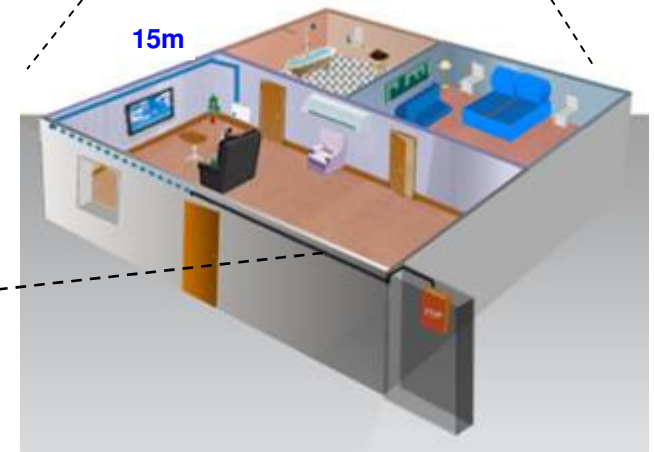
Non-Building Address Points

- ***lamp-posts***
- ***bus stops***
- ***traffic junctions***
- ***outdoor wireless access points***
- ***street-side display signs***
- ***other points in Singapore and connected islands***

Universal Coverage FTTH (Fiber To The Home)



- > Deploy at least two 2 Wirelines into each Residential Premise
- > Consult homeowner of location on 1st TP



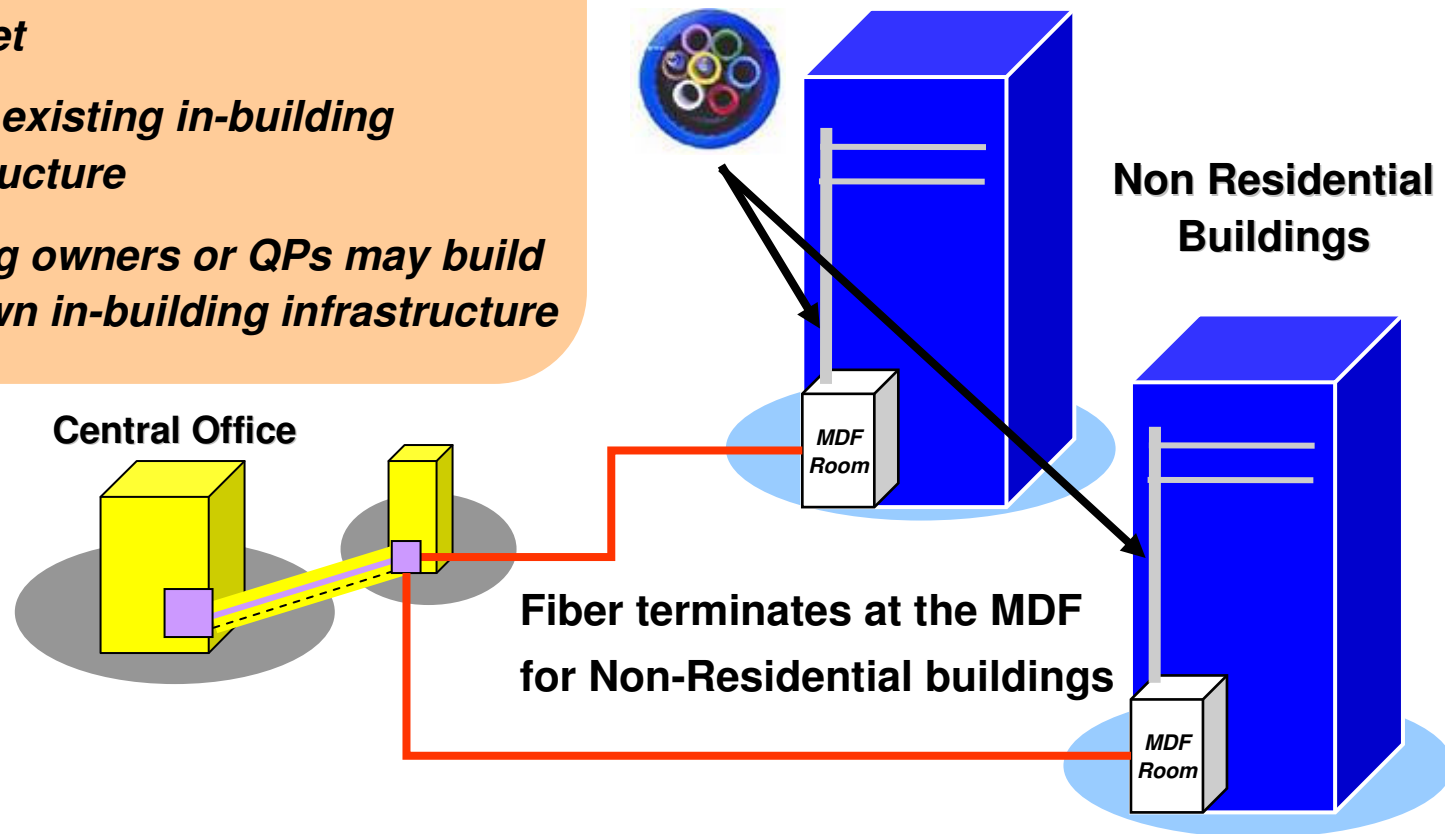
Universal Coverage

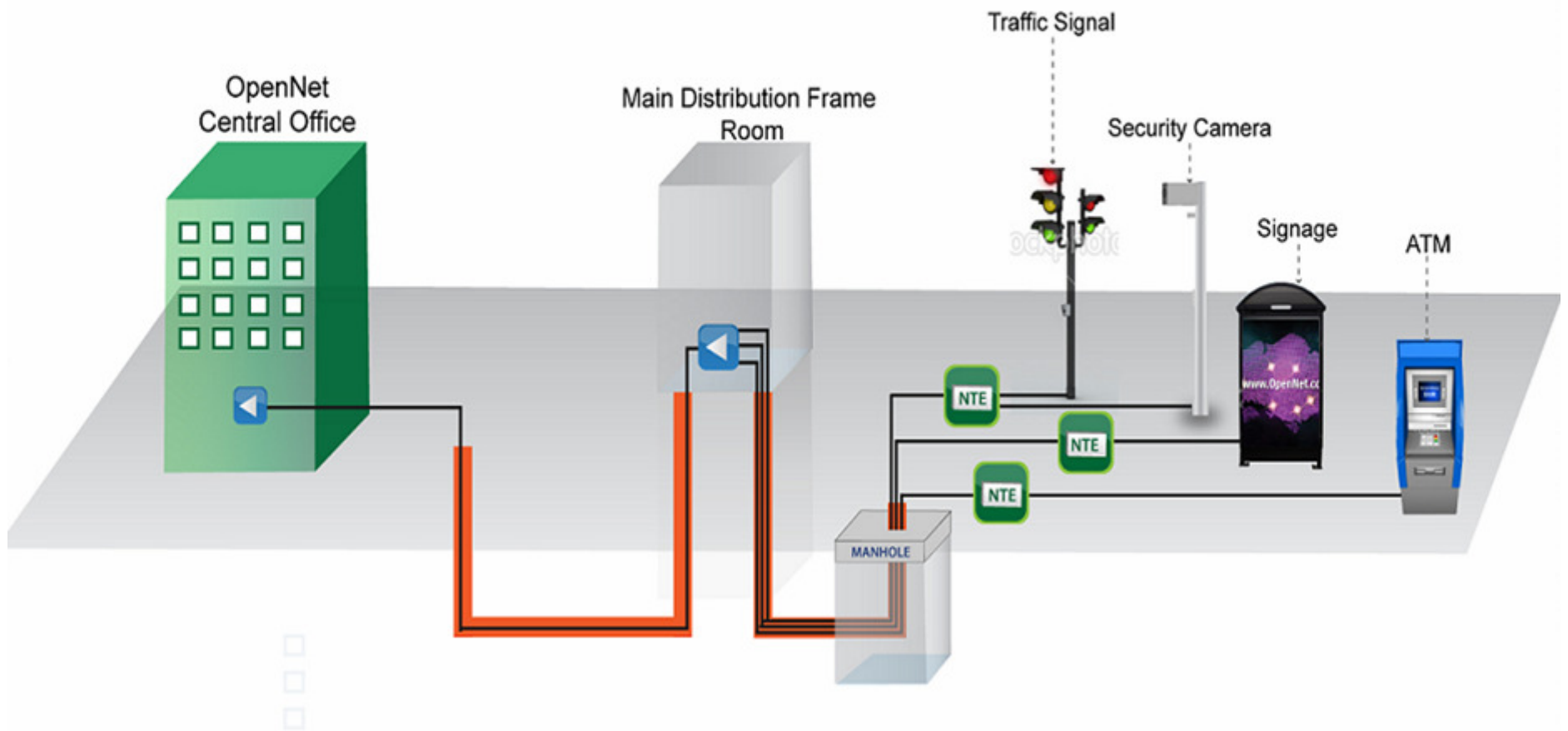
Non-Residential Building Coverage

Options for Building Owners & QPs:

1. Order End-User connections from OpenNet
2. Re-use existing in-building infrastructure
3. Building owners or QPs may build their own in-building infrastructure

Air Blown fibre system may be deployed by OpenNet



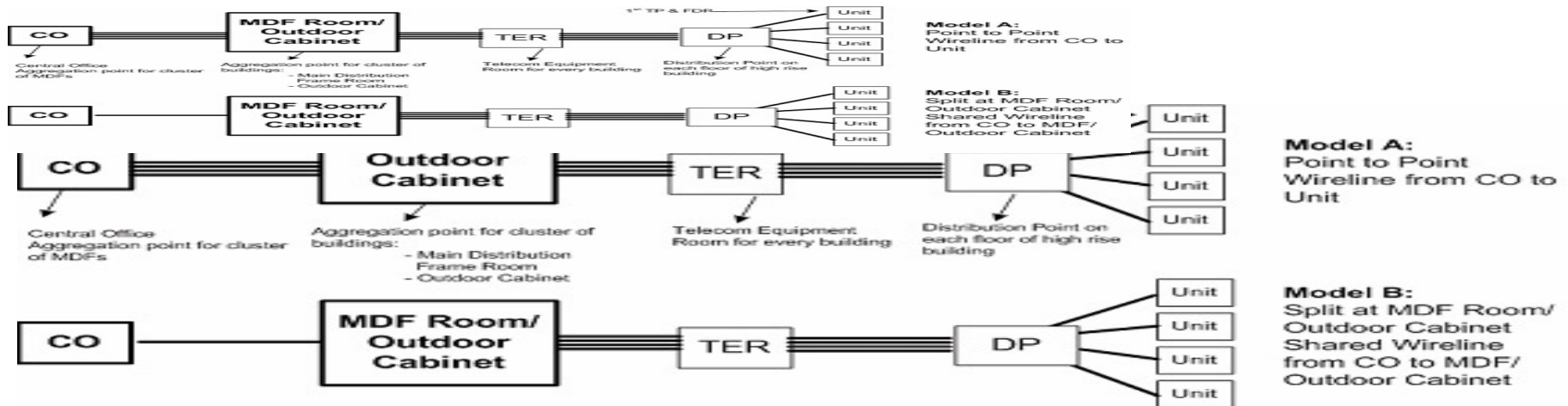


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Flexibility and Scalability

Flexibility and Scalability

Access Network Topology Model



Implementation Criteria

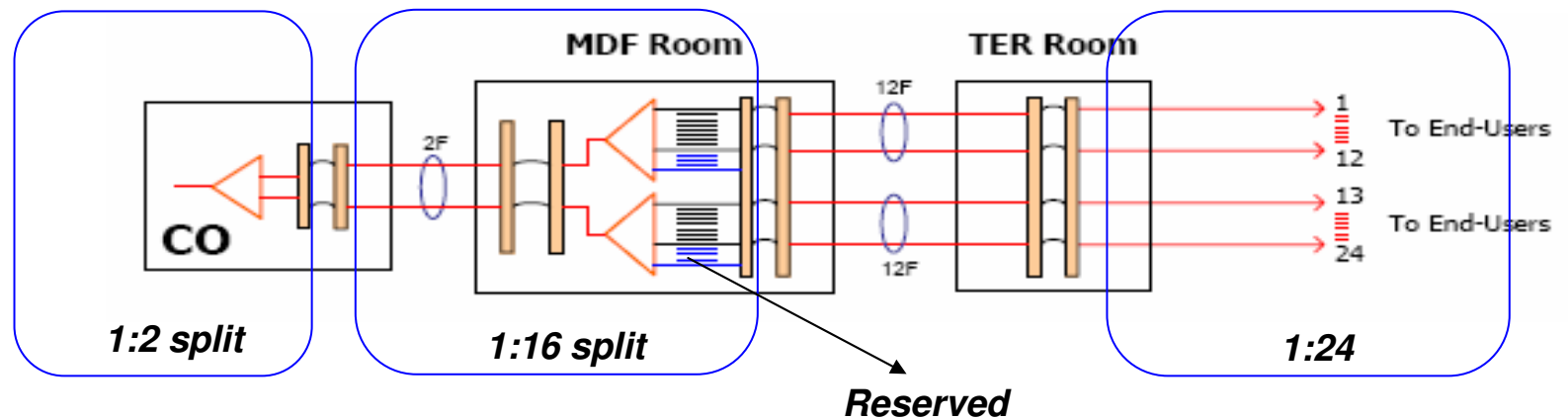
- **Minimum 25% additional Wireline capacity** in the backhaul from the Connectivity Point back to CO
- Design and physical implementation must **support at least 2 access technologies** in line with Open Access principles
 - **GPON** - available for all connection types
 - **Active Ethernet** - available as additional option for Non-Residential connections

Flexibility and Scalability

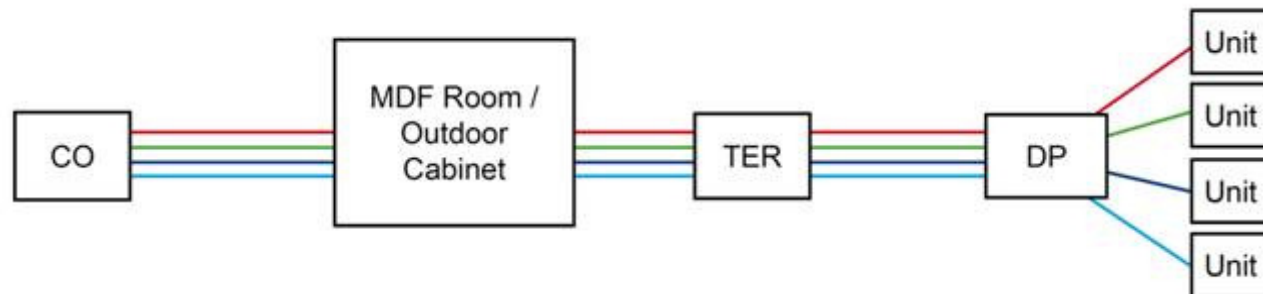
Choice of Split Ratios to scale bandwidth requirements

- > The split ratio can be adjusted to small ratio to cater for higher bandwidth to be allocated.

GPON



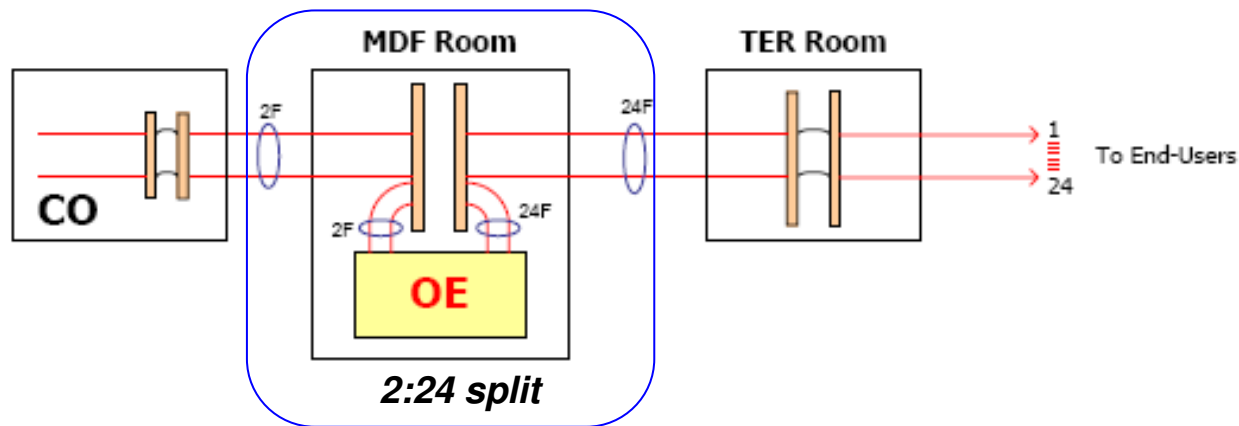
1:1 split



Flexibility and Scalability

Choice of Split Ratios to scale bandwidth requirements

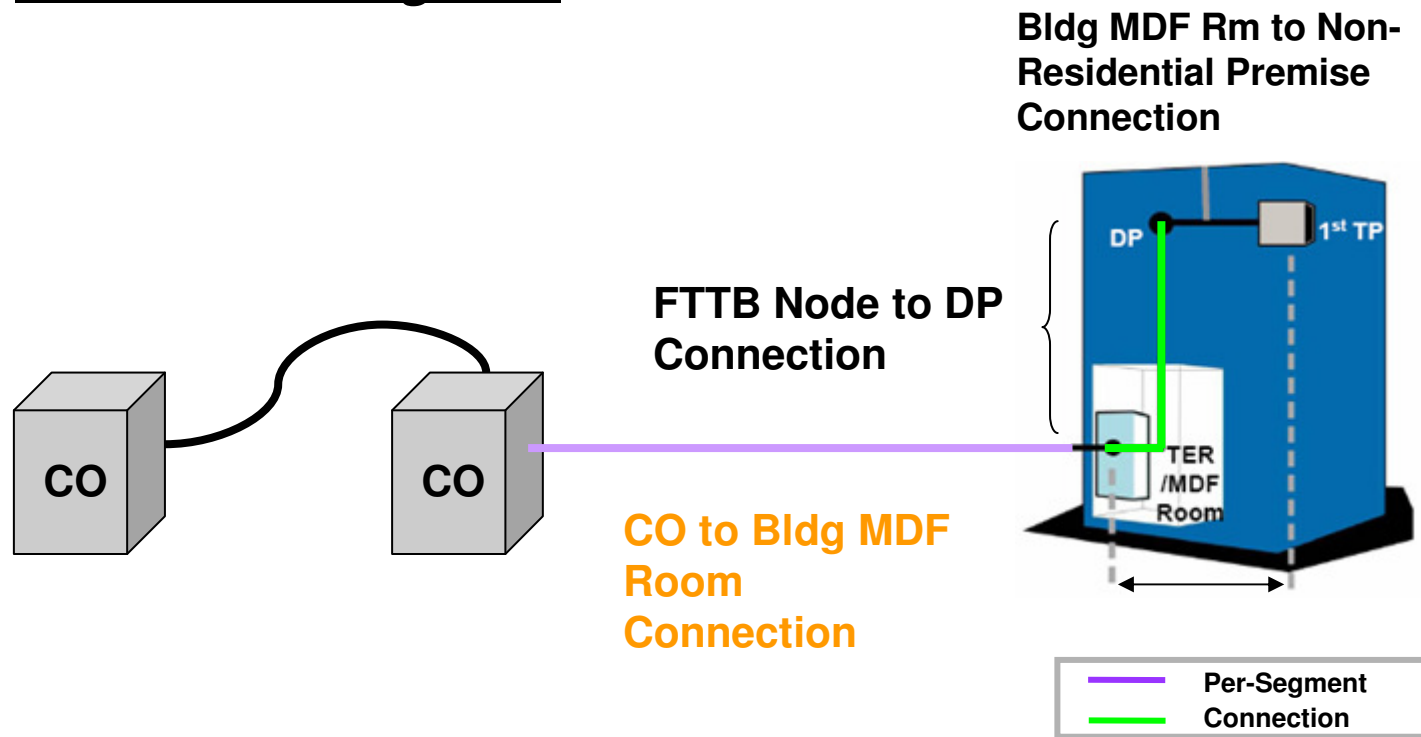
Active Ethernet



Flexibility and Scalability

Choice of Split Ratios to scale bandwidth requirements

Purchase of Segment

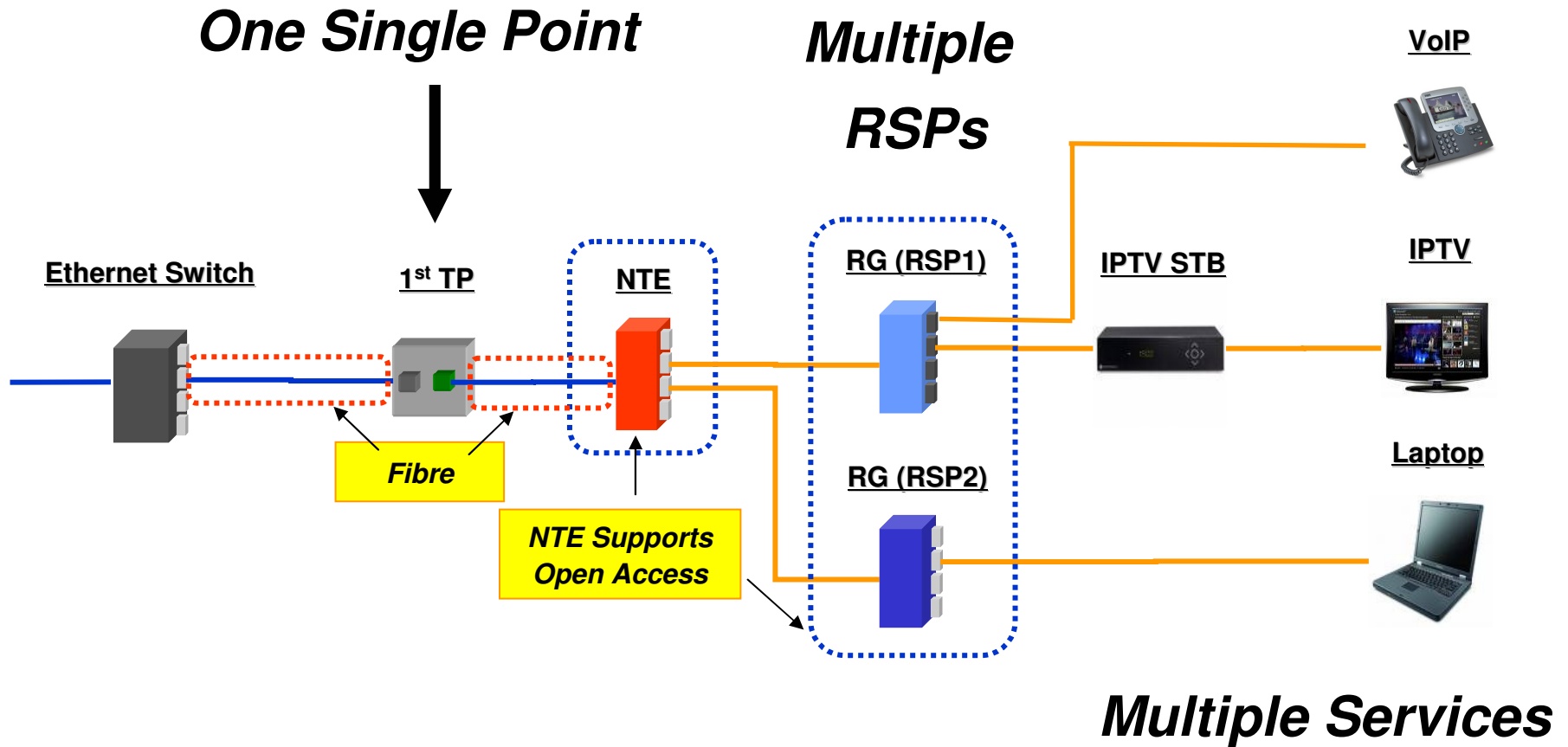


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Open Access

Serving a Home from a Single Point

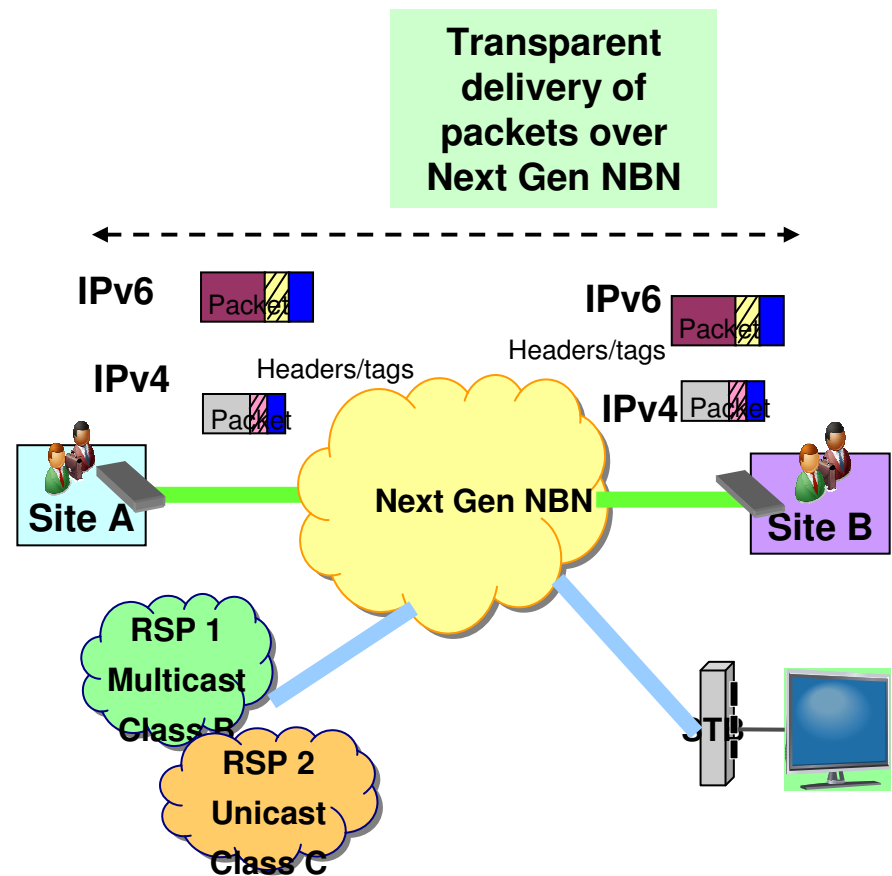
Support for Multiple RSPs and OpCos



Open Access

Service Transparency

- > IPv4 and IPv6 protocol are both supported and can co-exist
- > Unicast, Multicast and Broadcast capabilities; particularly for the co-existence of multi-channel Broadcast IPTV streams based on IPv4 and IPv6
- > Traffic segregation and prioritisation tags by RSPs are preserved
- > Able to preserve “Double-tags” by RSPs

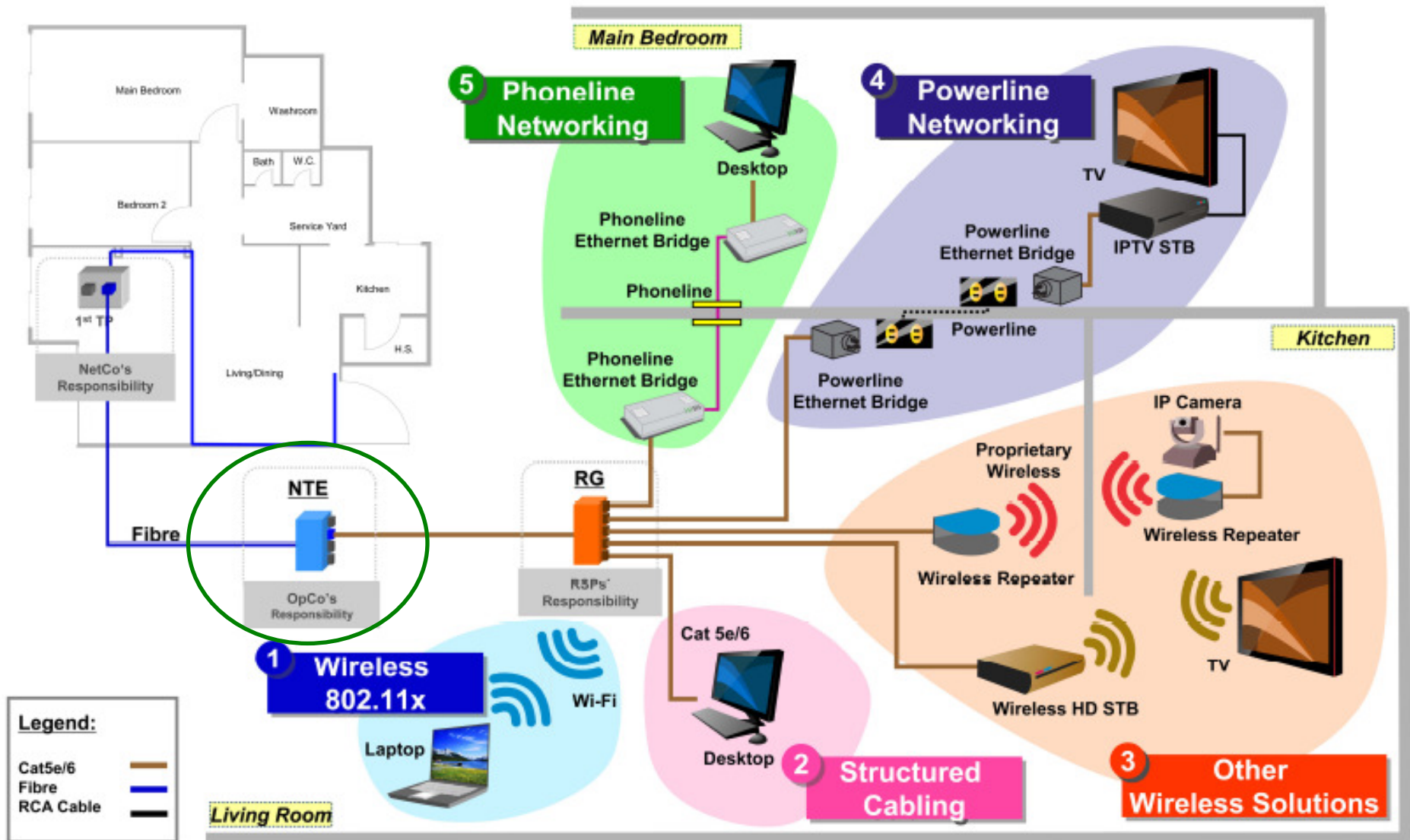


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Serving a Home from a Single Point

Serving a Home from a Single Point

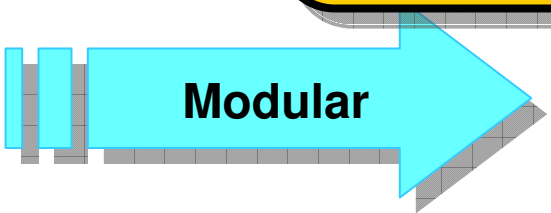
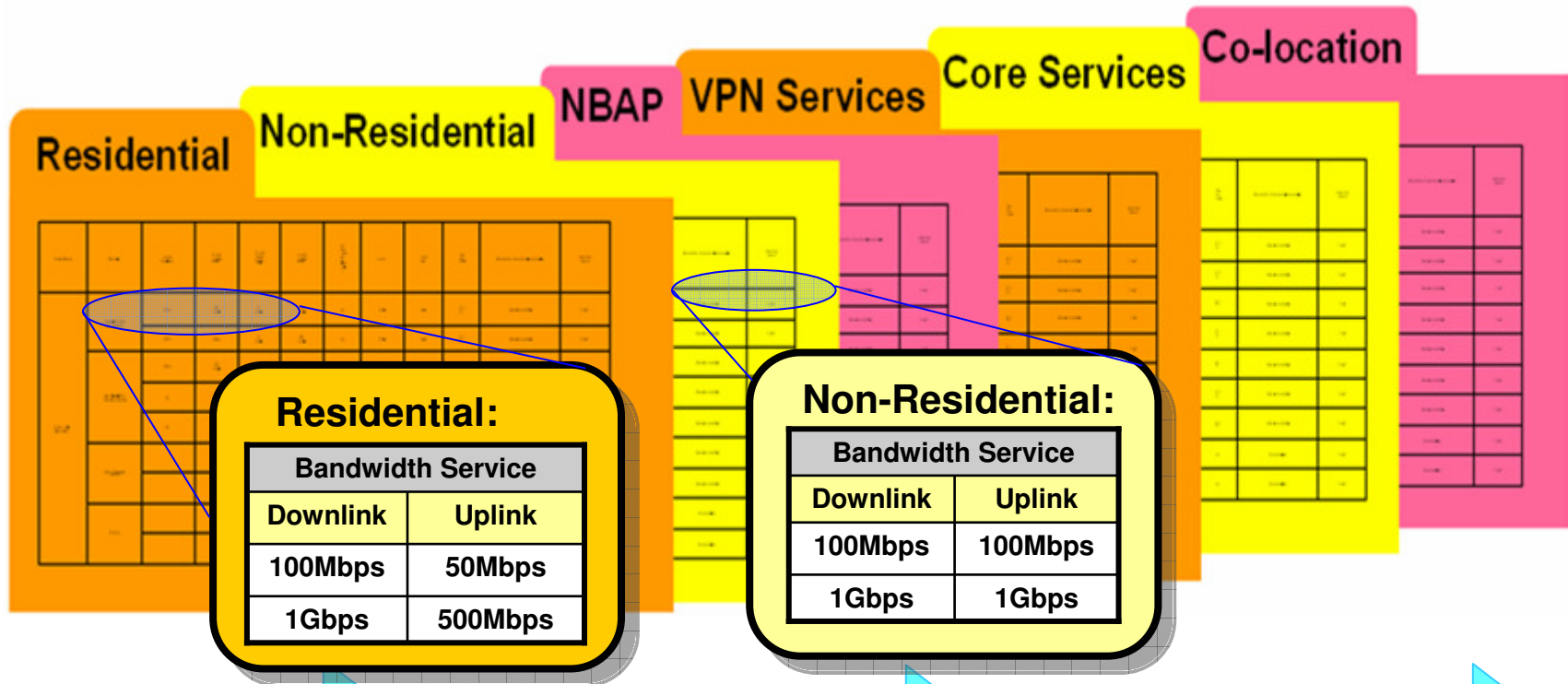
Home Networking Options



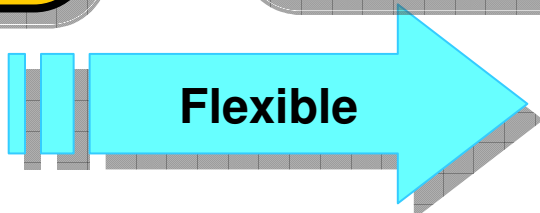
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Putting It All Together

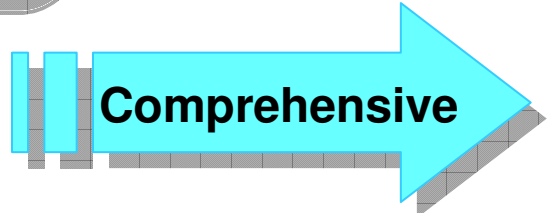
Wholesale Service Offerings



- > Unbundled services
- > Able to add-on bandwidth increments and different classes of service



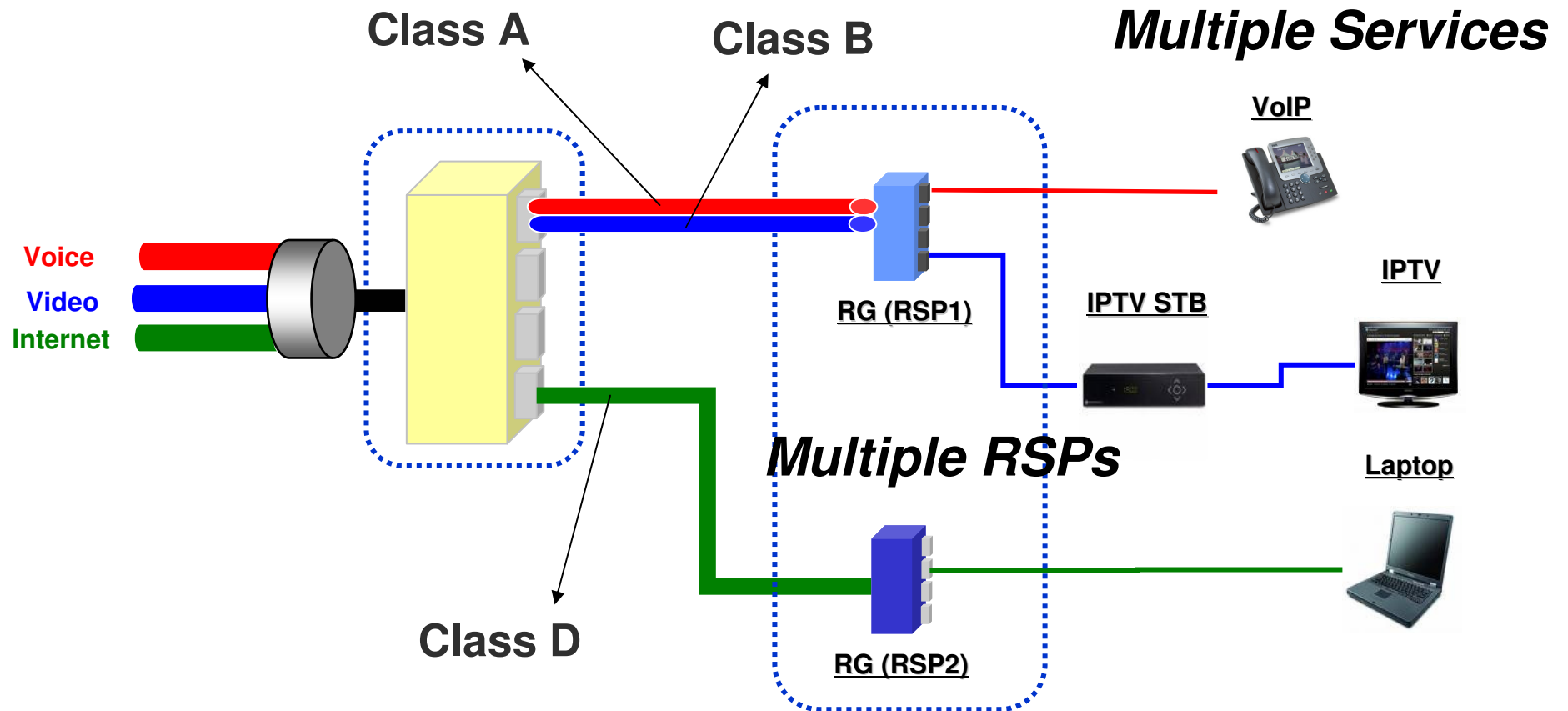
- > OpCo provides online platform for self-provisioning by RSPs



- > 1 Gbps available
- > Facilitates RSPs having fast and easy market entry

Putting it All Together

Residential Setup Scenario



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What's Next

What's Next

Technical Workshop

OpenNet's Agenda:

*Passive Network Architecture
(30 mins)*

- Introduction
- Technical Network
- Architecture & Deployment
 - Merits Of Fibre Platform & Fibre Deployed For NGNBN
 - General Core & CO Connectivity
 - Redundancy & Resiliency
 - Outside Plant Architecture
 - In Building Cabling
 - Challenges
- Rollout Coverage

Nucleus Connect's Agenda:

*Active Network Architecture & Operation
(45 mins)*

- Network Design and Architecture Overview
- Network Topology
- ICO Offerings
- RSP Scenarios
- Open Access - OSS/BSS Overview
- Q&A

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Thank You

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