Singapore's Next Generation Nationwide Broadband Network & Role of IPTV

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Introduction

- Agency for Science, Technology & Research (A*STAR) is funded by the Ministry of Trade & Industry, Singapore.

- Role is to be the engine for transforming Singapore's economy into a knowledge-based and innovation driven one.

- Institute for Infocomm Research (I^2R) is 1 of 14 members of A*STAR, leading the R&D in the information, communications and media (ICM) technologies.
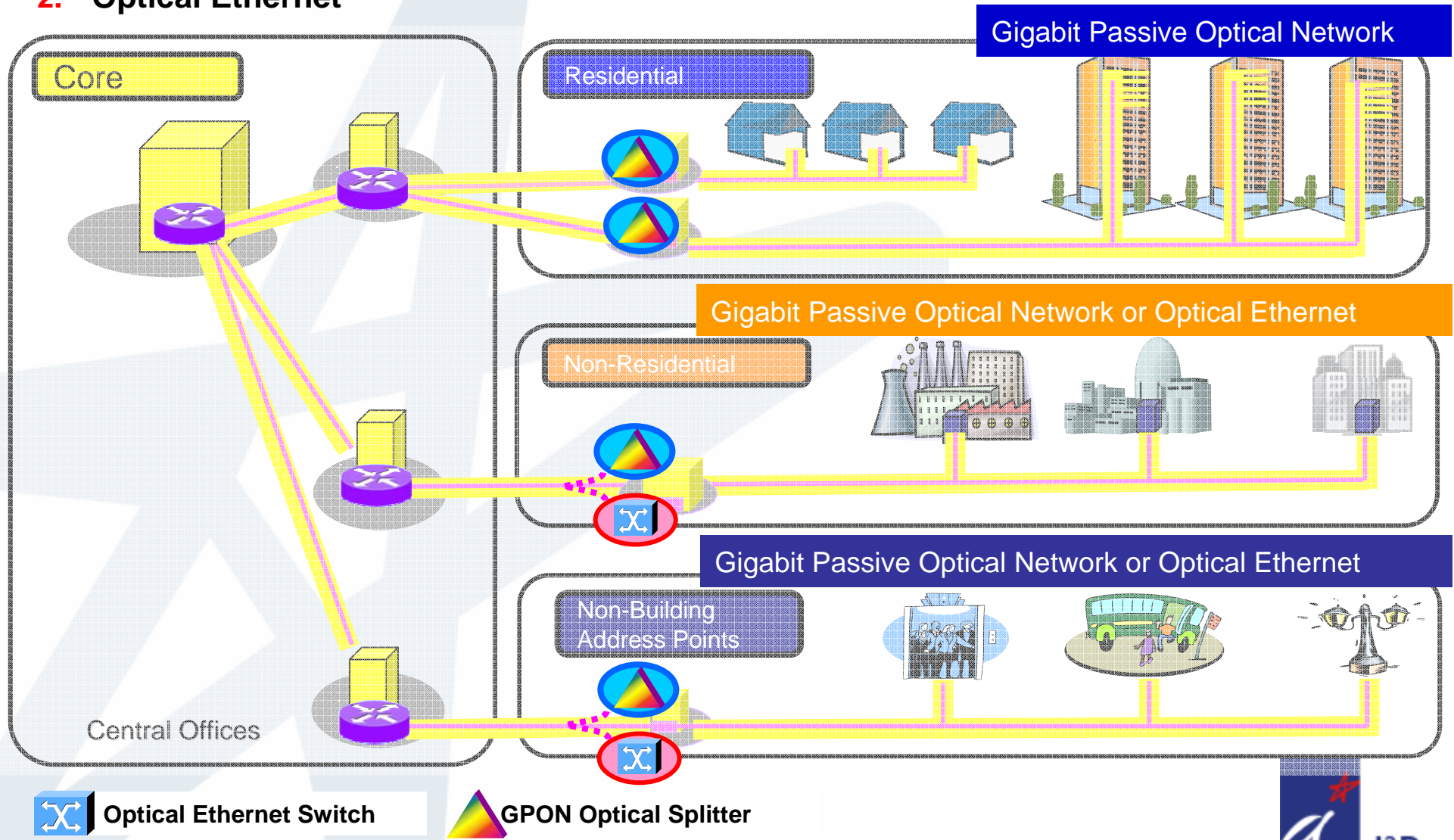
Next Generation Nationwide Broadband Network (NGNBN)

1. Fiber to the home & business premises; downlink and uplink bandwidth of 1Gbps

2. Nation-wide coverage, ~60% completed; 95% by mid 2012

3. Layered structure to achieve Open Access:
   - Passive infrastructure operator (Netco): wholesale wireline
   - Active infrastructure operator (Opco): wholesale bandwidth
   - Retails services providers (RSPs): services

4. Non-discriminatory access & pricing.
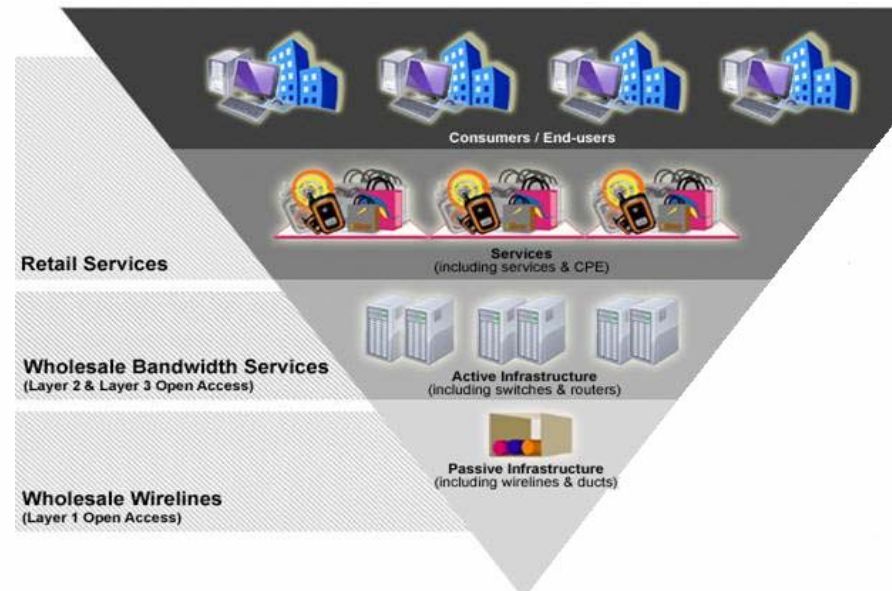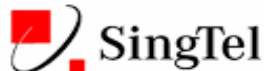
NGNBN Access Technologies

1. **Gigabit Passive Optical network**
2. **Optical Ethernet**

Gigabit Passive Optical Network

Core

Residential

Gigabit Passive Optical Network or Optical Ethernet

Non-Residential

Gigabit Passive Optical Network or Optical Ethernet

Non-Building Address Points

Central Offices

Optical Ethernet Switch

GPON Optical Splitter

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Wholesale Service Offerings

Residential:

Bandwidth Service	
Downlink	Uplink
100Mbps	50Mbps
1Gbps	500Mbps

Non-Residential:

Bandwidth Service	
Downlink	Uplink
100Mbps	100Mbps
1Gbps	1Gbps

Residential | Non-Residential | NBAP | VPN Services | Core Services | Co-location
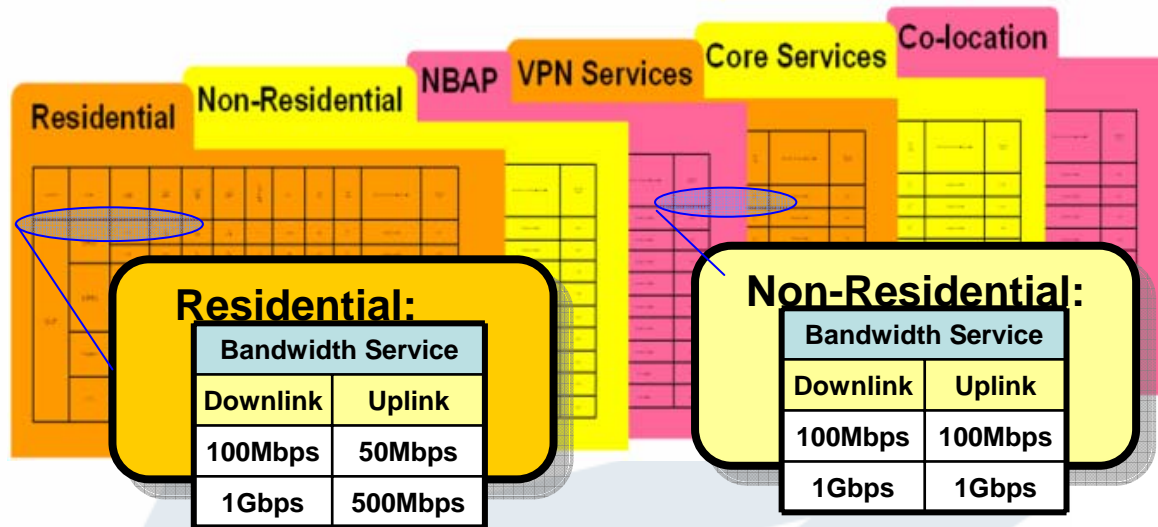
Modular
> Unbundled services
> Able to add-on bandwidth increments and different classes of service

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

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

Class D
Best Effort

Examples of Services:
Internet surfing, VoIP

Class C
Mission Critical

Examples of Services:
ATMs,
Data Centres,
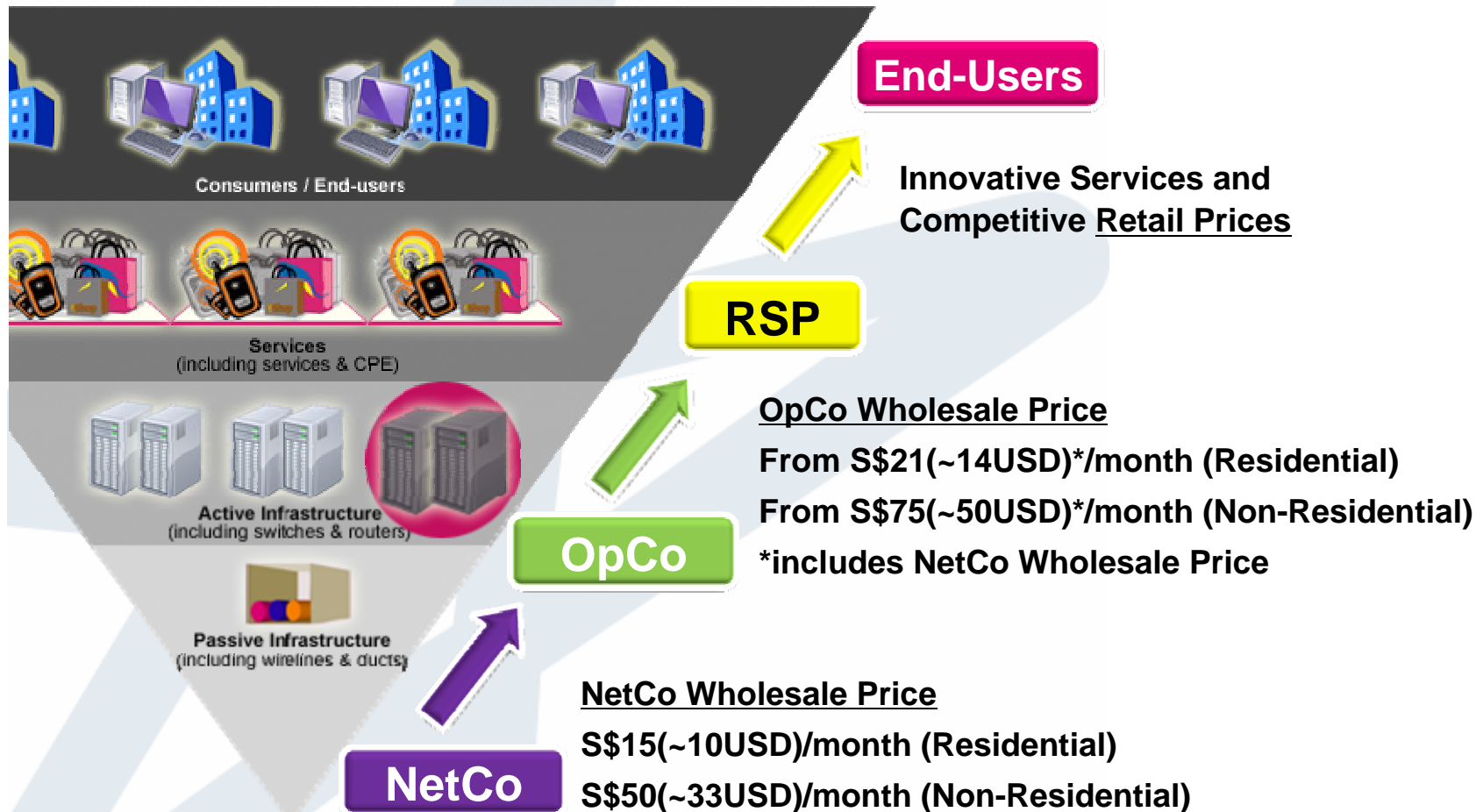Control Systems

Class B
Near Real Time

Examples of Services:
IPTV
Video Streaming,
Gaming, Video
Conferencing

Class A
Real Time

Examples of Services:
Video Conferencing,
Premium VoIP
Gaming

Flexibility of service offerings allowing RSPs to meet the needs of diverse range of applications & services

Source: Infocomm Development Authority

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Next Gen NBN Wholesale Prices

End-Users

Innovative Services and Competitive Retail Prices

RSP

OpCo Wholesale Price

From S$21(~14USD)*/month (Residential)

From S$75(~50USD)*/month (Non-Residential)

*includes NetCo Wholesale Price

OpCo

NetCo Wholesale Price

S$15(~10USD)/month (Residential)

S$50(~33USD)/month (Non-Residential)

NetCo

Role of IPTV

- NGNBN should not be just larger bandwidth to differentiate from cable & DSL

- IPTV is only the beginning - needs interplay of ultra-high broadband, smart home/building and new media technologies

- Testbed:
  - Next Generation Nationwide Broadband Network
  - Fiber network within building: Fusionopolis
  - Smart home lab at Fusionopolis: STARHome
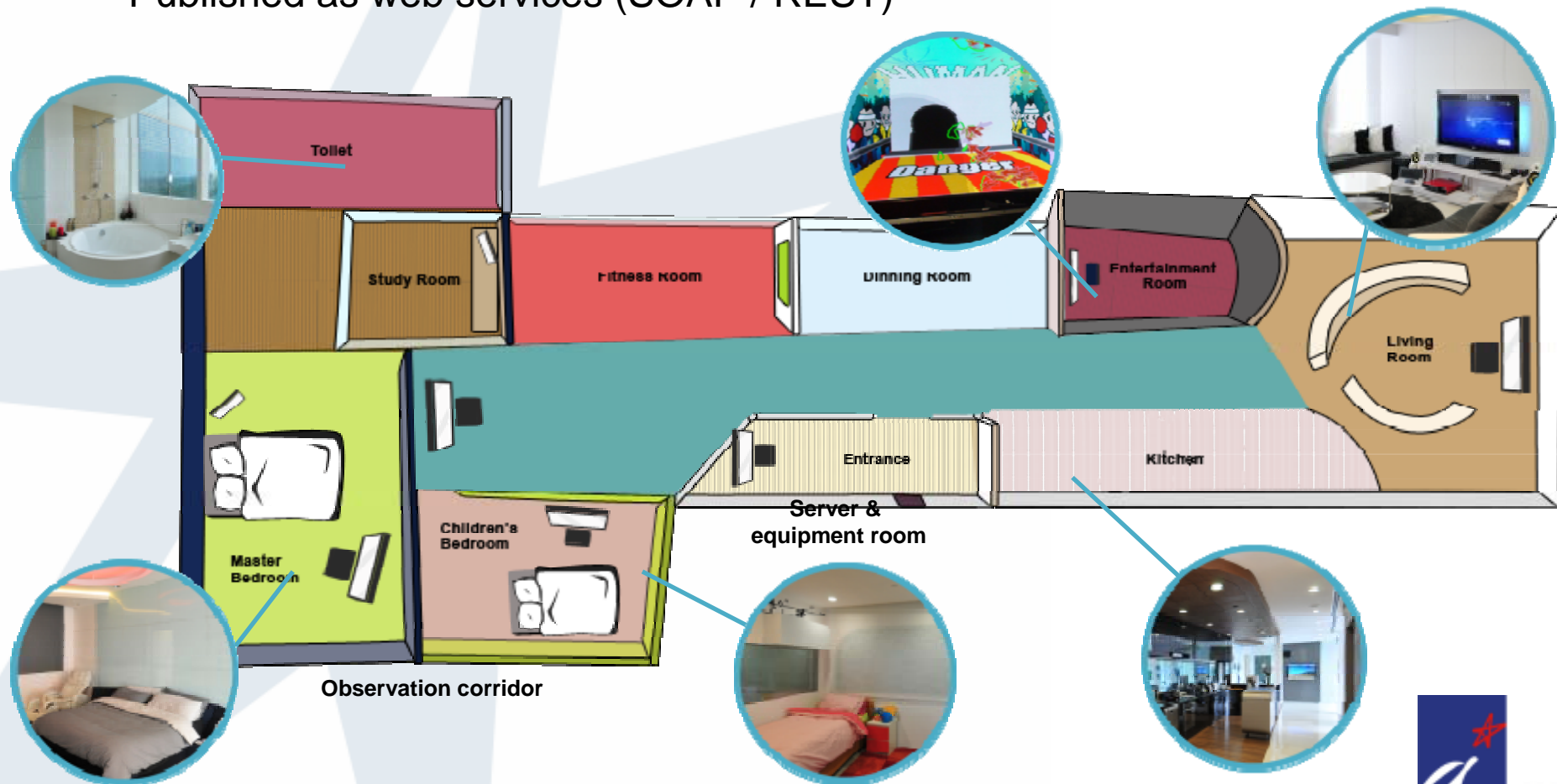 - IPTV architecture

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Fiber within Building: Fusionopolis

- Dedicated fiber network (1.25Gbit/s & 10 Gbit/s bidirectional)
- Mini city-like settings (work, live, play)
- Single mode fiber in the entire building including to every desktop, labs, resource centers, classrooms, meeting rooms …

A*STAR HQ

Institute of High
Performance Computing
[WDM PON, iOPEN]

Data Storage Institute
[Storage Area Network (SAN)]

Institute for Infocomm
Research
[WDM PON, EPON, GPON]

Auditorium
[Wavelength-Division-
Multiplexed (WDM) PON]

Sky Gardens
[Radio-over-Fiber (ROF)]

Serviced Apartments
[Ethernet PON (EPON)]

Media Development
Authority of Singapore
[WDM PON]

Cafe, Lift Lobbies
[Ethernet PON (EPON)]
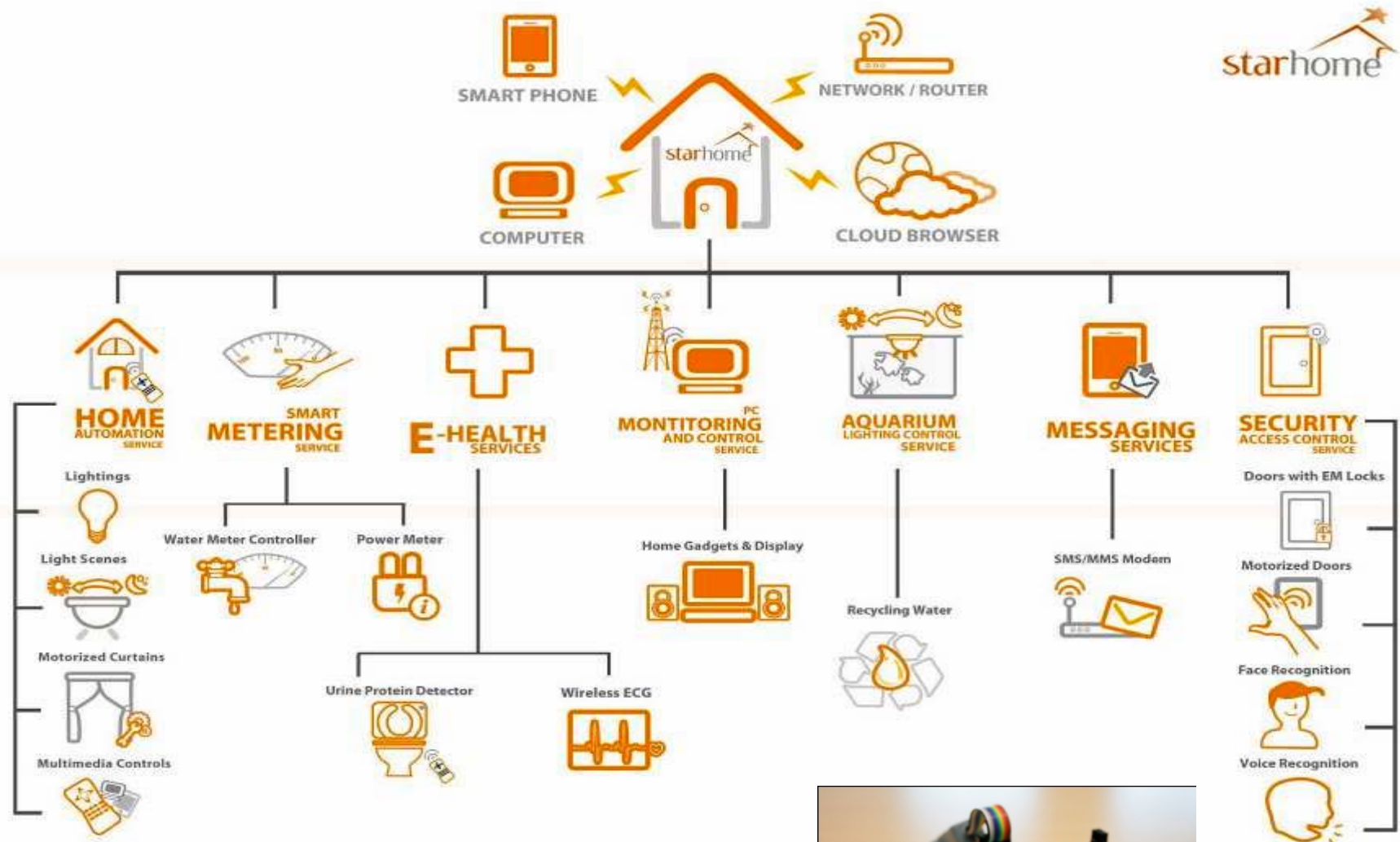
Supermarket
[Radio-over-Fiber (ROF)]

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# Lab as Home @ Fusionopolis: STARHome

- Fiber to every room
- Each utility point (electricity & water) connected with an electronic meter
- Equipped with home automation system
- IP cameras and display monitors/TVs installed at strategic points
- Published as web services (SOAP / REST)

Toilet

Study Room

Fitness Room

Dinning Room

Entertainment Room

Living Room

Master Bedroom

Children's Bedroom

Entrance

Kitchen

Server & equipment room
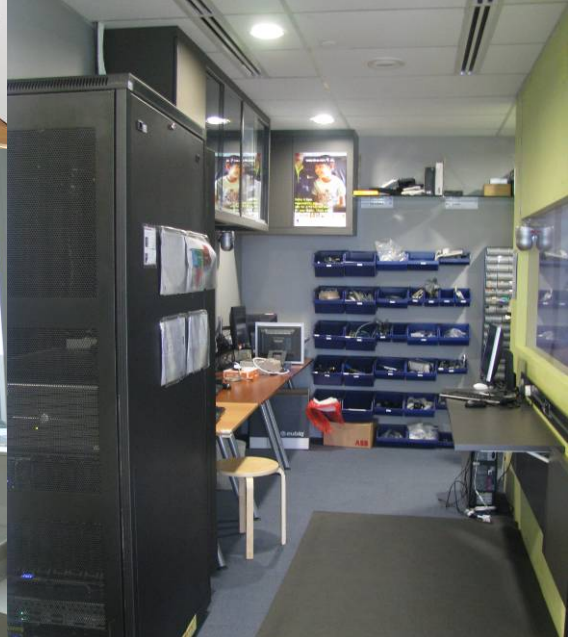
Observation corridor

STARhome Infrastructure

- Sensor node to interface to any sensor and publish as web service
- Ethernet, GSM/GPRS, Zigbee, RS232 interface
- Easy drag & drop GUI to configure sensor node
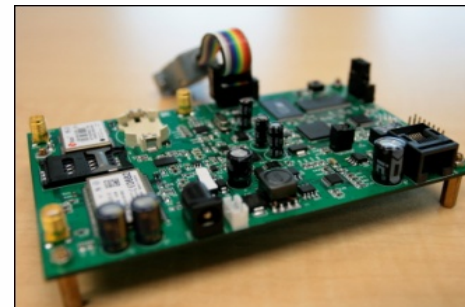
IPTV Test-bed @ STARHome

- Experimentation of what is possible for future smart home with convergence of ultra-high broadband, cloud computing & storage, sensor network and many displays
- Incorporates multiple forms of UI – keyboard, remote control, smartphone, gesture, voice
- Focus on interactivity and personalization
- Testbed for new services prior to roll-out at NGNBN
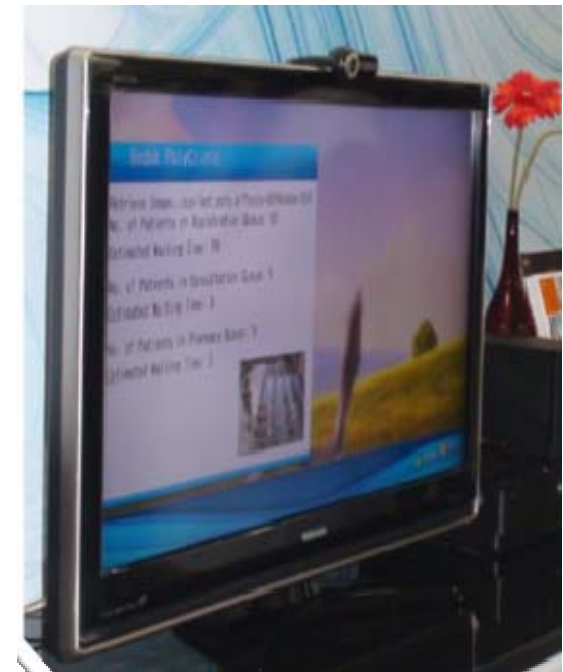
Additional Features in Testbed

- Scalable media streaming
- Multimedia content tagged with rich metadata
- Audience measurement
- User authentication,
- Privacy-preserving & security
- Micro payment
- Social network interface
- Video conferencing
- Multi-lingual support

IPTV in NGNBN

- Need to maintain Open Access spirit of NGNBN
- Envisage multiple RSPs – VOD, FTA re-transmission, live broadcast, premium entertainment services …
- Customers should be able to access Services from RSPs on their Customer-Premise Equipment (CPE) for basic IPTV functions
- Catalyst to new services:

  - Multi-view content streaming
  - Tele-presence
  - Distance education
  - Private broadcast
  - Social TV

  - Gaming
  - Tele-collaboration
  - Tele-health
  - Tele-gov services
  - Tele-shopping

Thank you

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