An example of System Implementation of
Broadband Wireless Access in Japan

Broadband Access by "Fiber + Radio"
-WIPAS (Wireless IP Access System)-

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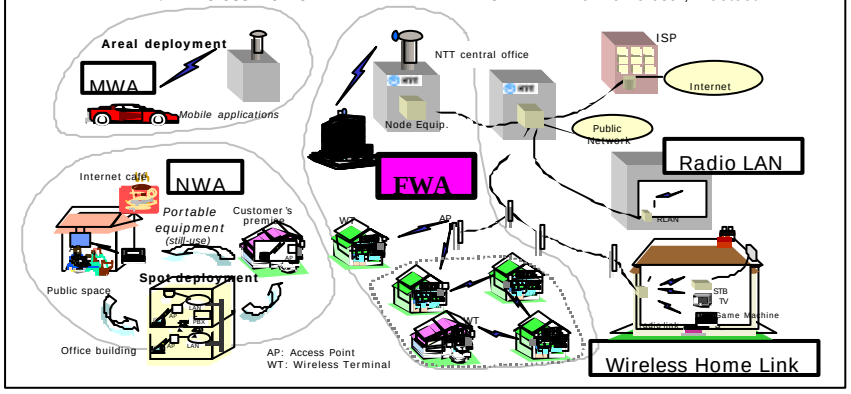
Classification of Wireless Access Systems

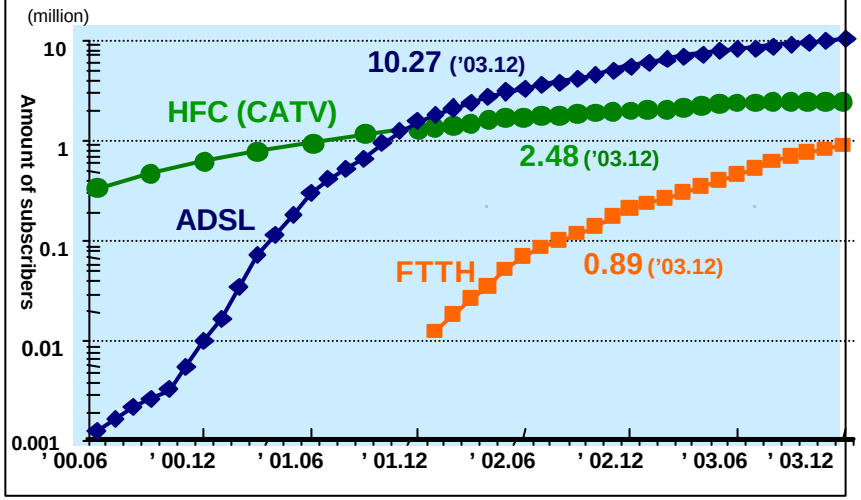
Network Service System

Customer System

- ? **FWA (Fixed Wireless Access) ... ex. Broadband Access by "Fiber+Radio"**
- ? NWA (Nomadic Wireless Access) ... ex. *"Hot Spot"* service
- ? MWA (Mobile Wireless Access) ... ex. Cellular phone
- ? Radio LAN ... ex. RLAN for office (indoor)
- ? Wireless Home Link ... ex. RLAN for home user, Bluetooth

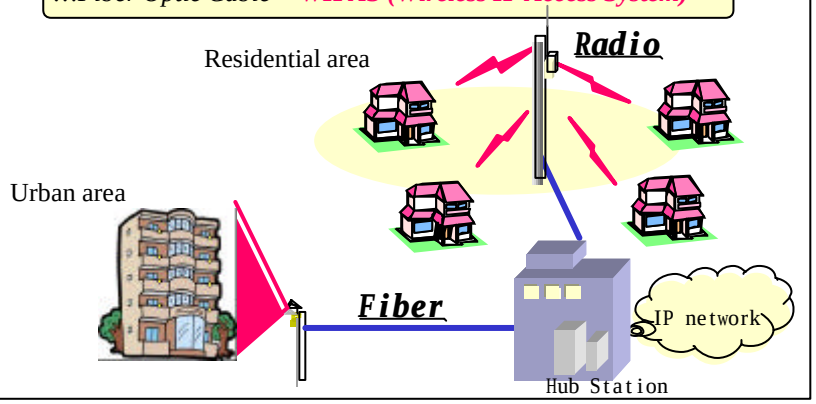


Broadband Service Market in Japan



Broadband Access by “Fiber+Radio”

Broadband Wireless Access, compatible speed to FTTH
…Fiber Optic Cable + ***WIPAS (Wireless IP Access System)***

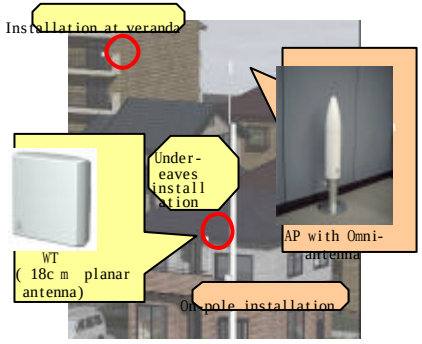


WIPAS: Wireless IP Access System

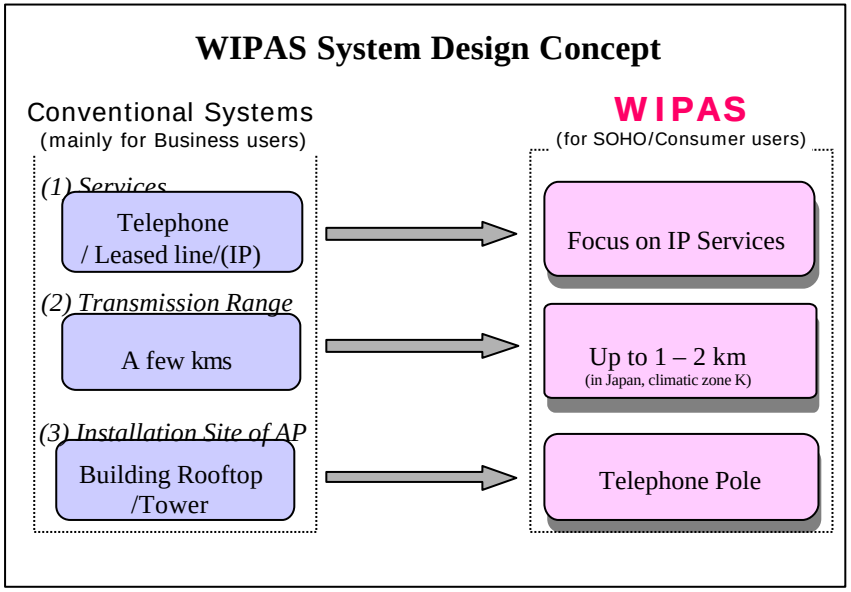
WIPAS *is the Broadband FWA (Fixed Wireless Access) system that consists of AP (Access Point) and WTs (Wireless Terminal) employing upper SHF: 26GHz band. Transmission rate of the wireless section is 80Mbit/s (Maximum transmission rate of Ethernet is 46Mbit/s), which is shared among the plural WTs.*

- **Transmission rate**
  16QAM: 80 Mbit/s (46Mbit/s)
  QPSK : 40 Mbit/s (23Mbit/s)

? ( ) : Maximum transmission rate of Ethernet frame



WIPAS System Design Concept

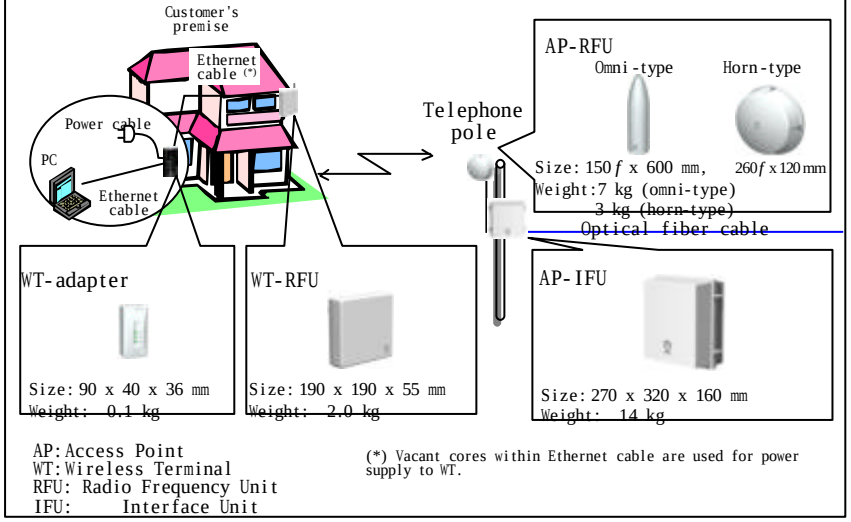


Technical Specifications of WIPAS

…conformable to ARIB STD T 58(P-P) / T 59 (P-MP)

Frequency Band		26 GHz band
Communication Scheme		TDMA/dynamic TDD
Symbol Speed		20M Symbol/Sec
Modulation Scheme		Adaptive Modulation (16QAM/QPSK)
Wireless Transmission Speed (Maximum forward rate of Ethernet frame)		QPSK: 40 Mbps (23 Mbps) 16 QAM: 80 Mbps (46 Mbps)
Transmission Power		QPSK : 14dBm 16 QAM : 11.5dBm
Maximum Number of Subscriber		239 Subscriber Stations per Access Point
Network Interface		100 Base-TX or 100 Base-FX (Interactive service can be attained by one optic fiber)
User Interface		100 Base-TX or 10 Base-T
Antenna Gain	Access Point (AP)	Horn Antenna (5.5 dBi) Omni Directional Antenna (6 dBi)
	CPE (WT)	18cm Flat Antenna (31.5dBi)
Transmission Range		1-2 km (Line of Sight)
Bandwidth Control		-Fairness Queuing Control by Round-robin -Minimum Bandwidth Grant by Priority Queuing

Overview of WIPAS Equipment

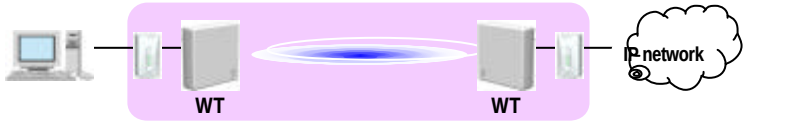


AP: Access Point
WT: Wireless Terminal
RFU: Radio Frequency Unit
IFU: Interface Unit

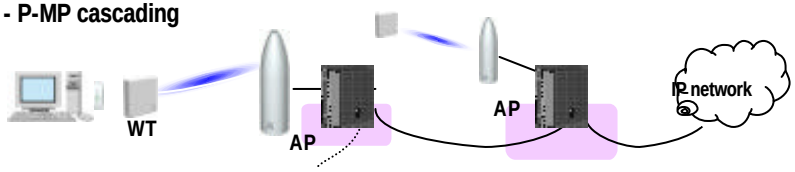
(*) Vacant cores within Ethernet cable are used for power supply to WT.

Variations of System Configuration

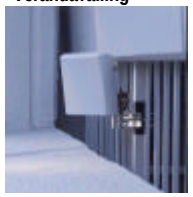
- P-P access line / entrance line



- P-MP cascading



WT/AP Installation Images

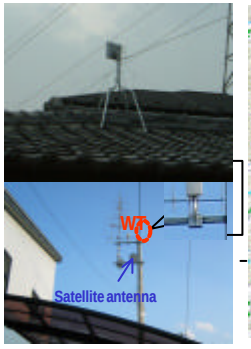
WT	Veranda railing 	Concrete fence 	Indoor (window glass) 
AP	Dedicated pole 	Common pole 	Building rooftop 

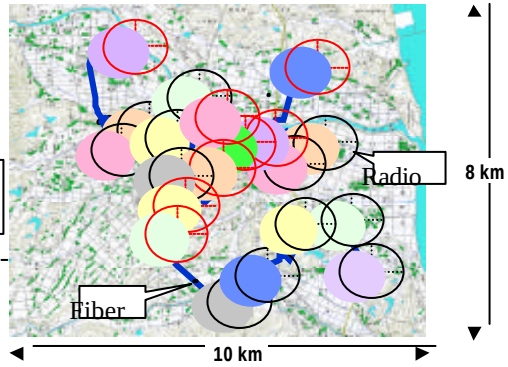
Examples of Broadband Services by “Fiber + Radio”

- Suburban redidential area-

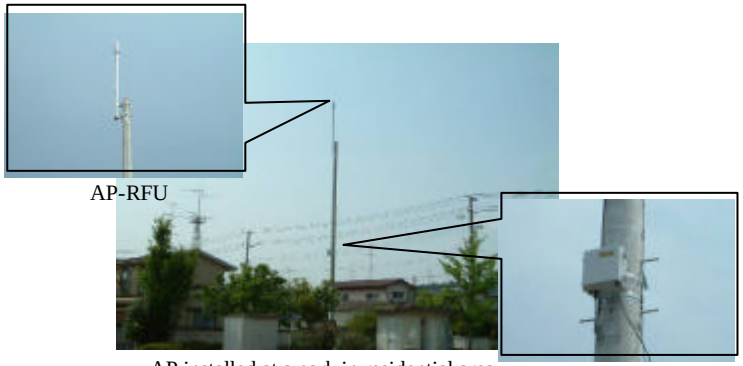
Dense deployment in Haramachi city

- designed to have more than 80 % LOS with premises in the cell





Installed AP at suburban residential area



AP-RFU

AP installed at a park in residential area.

AP-IFU

Aerial view of residential area

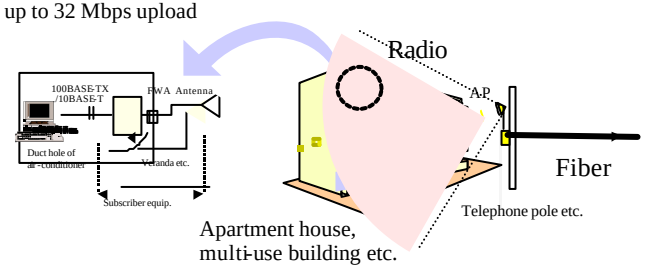
Examples of Broadband Services by “Fiber + Radio”

- Urban redidential spot-

Spot deployment at apartment houses

- fiber construction problems due to architectural limitations

Share connection of up to 46 Mbps download
and up to 32 Mbps upload



Apartment house,
multi-use building etc.

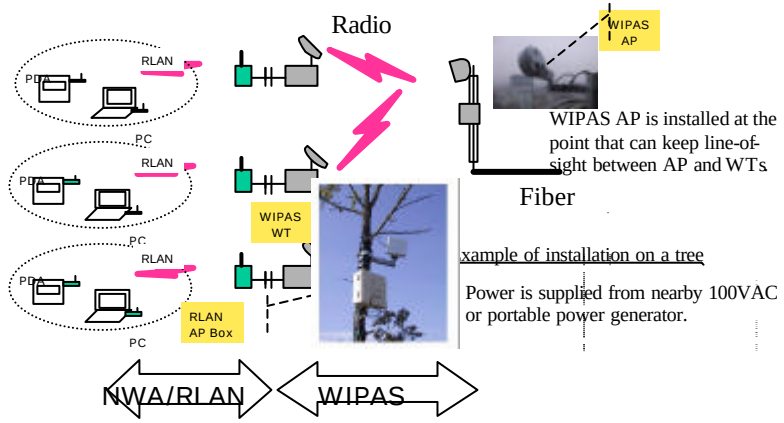
Installed Equipment at urban spot area

(1) AP (Installation height : 8-10m)

(2) WT

Examples of Broadband Services by “Fiber + Radio”

- NWA/RLAN Backhaul -



WIPAS AP is installed at the point that can keep line-of-sight between AP and WTs.

xample of installation on a tree

Power is supplied from nearby 100VAC or portable power generator.

Required Technologies for Higher Speed
"Fiber + Radio" FWA

Background
- Digital broadcasting services has been started in 2003 in Japan.
- Last-one-hop problem is still essential.

High speed
(>100 Mbit/s)

Key technologies
- Frequency resource management
- Multi-level modulation
- Selected beam antenna
- Transmitter power problem
- Higher efficiency for MAC

Summary

-Broadband Access by "Fiber+Radio" may be useful concept for deploying of Broadband Wireless Access Network.

-FWA systems using upper SHF band (for example: 26GHz band) can be introduced in Broadband Access Sevice Network effectively.

-Higher speed capability of FWA will be also required as complement for FTTH in the future.