Ed. 01

OfficeServ VoWLAN
Administration Guide

SAMSUNG

ELECTRONICS

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INTRODUCTION

Purpose

This document describes how to install, register and maintain SMT-R2000, which is an Access Point(AP) to use Voice over WLAN(VoWLAN) service by interworking with the OfficeServ system, and WIP-5000M and SMT-W5100, which are wireless LAN phones.

Document Content and Organization

This document consists of four Chapters, six Appendixes and Abbreviations as follows:

CHAPTER 1. Overview

- Overview of OfficeServ Wireless LAN
- System Layout
- Specifications of SMT-R2000, WIP-5000M and SMT-W5100

CHAPTER 2. Designing VoWLAN Sites

- Procedure to design wireless LAN
- Selection of the location to install SMT-R2000
- Site optimization

CHAPTER 3. Programming VoWLAN Service

- Programming the OfficeServ system
- Programming SMT-R2000
- Programming WIP-5000M/SMT-W5100

CHAPTER 4. Maintenance

- How to monitor SMT-R2000
- How to upgrade

APPENDIX A. Troubleshooting

Troubleshooting helps a user find and fix the problems likely to occur in the installation and operation of the OfficeServ Wireless System.

APPENDIX B. WLAN PRE-SALES CHECKLIST

Appendix B provides a form for checking a site with reference to its suitability for VoWLAN.

APPENDIX C. Capacity for each OfficeServ system

Appendix C describes the service capacity of VoWLAN for each service.

APPENDIX D. WLAN Site Survey Form

Appendix D provides a survey form which should be used prior to every VoWLAN installation, and is helpful as an after installation maintenance tool.

APPENDIX E. VoWLAN Check List

Appendix E provides a checklist for post installation problem solving.

APPENDIX F. TCP/UDP Port used by Samsung

Appendix E shows the ports to used messages between the OfficeServ system and WLAN terminals.

Abbreviations

Abbreviations used in this document are described here.

Conventions

The following types of paragraphs contain special information that must be carefully read and thoroughly understood. Such information may or may not be enclosed in a rectangular box, separating it from the main text, but is always preceded by an icon and/or a bold title.

WARNING

Provides information or instructions that the reader should follow in order to avoid personal injury or fatality.

CAUTION

Provides information or instructions that the reader should follow in order to avoid a service failure or damage to the system.

CHECKPOINT

Provides the operator with checkpoints for stable system operation.

NOTE

Indicates additional information as a reference.

Console Screen Output

- The lined box with '`Courier New`' font will be used to distinguish between the main content and console output screen text.
- '**`Bold Courier New`**' font will indicate the value entered by the operator on the console screen.

Revision History

EDITION	DATE OF ISSUE	REMARKS
00	08. 2007.	First Edition
01	02. 2008	Second Edition

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SAFETY CONCERNS

For product safety and correct operation, the following information must be given to the operator/user and shall be read before the installation and operation.

Symbols

	Caution
	Indication of a general caution

	Restriction
	Indication for prohibiting an action for a product

	Instruction
	Indication for commanding a specifically required action

⚠ CAUTION

⚠	**Caution for passing a gate during a call** A gate with large blocking effect for electric wave may cause voice jitter or release of a call(in serious case) if handover is attempted during a call.

⚠	**Caution for combining AP and phone** Make sure that the types of APs on the same system are not mixed. It is strongly recommended that you should not mix the types of phones used on SMT-R2000.

ⓘ	**Maintaining the power-on state while downloading** Make sure that the power of the OfficeServ system or WIP-5000M/SMT-W5100 is turned on while downloading. The WIP-5000M/SMT-W5100 may be powered off while downloading because its battery is dead. If the WIP-5000M/SMT-W5100 is powered off while downloading, the download may fail. Before starting the download, check the battery status of the WIP-5000M/SMT-W5100. If the remaining charge amount is not sufficient, carry out the download procedure, whilst charging the phone with a charger.

ⓘ	**Cautions for the connection of antenna cable** Make sure that the antenna cable is not bent. Once the cable is bent, about 2~3 dBi is attenuated.

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CHAPTER 1. Overview

This chapter introduces the Voice over WLAN(VoWLAN) service of the OfficeServ system. In addition, this chapter describes the whole layout of each component to provide the VoWLAN service.

1.1 OfficeServ VoWLAN Overview

The VoWLAN service of the OfficeServ system needs Wireless LAN Access Points(AP) and Wireless LAN phones. The wireless LAN AP interworking with the OfficeServ system is SMT-R2000, which is Dual Band AP, and wireless LAN phones are WIP-5000M of IEEE802.11b standard and SMT-W5100 of IEEE802.11g standard. However, the WIP-5000M and the SMT-W5100 should not be mixed in the same site. Basically, this document is based on SMT-R2000 and SMT-W5100. However, some necessary items are described by taking account of WIP-5000M.

1.2 OfficeServ VoWLAN Service Components

This section describes OfficeServ system, SMT-R2000, WIP-5000M and SMT-W5100, which are components of the OfficeServ VoWLAN system.

OfficeServ System

- The OfficeServ system series, OS 12, OS 100, OS 500, OS 7100, OS7200 and OS 7400 are available for the SMT-R2000 and SMT-W5100 VoWLAN.

- As the circuit capacity and the number of extension terminals supported by each system are different, the correct system should be selected by taking into account the number of users on the site.

- For detailed information according to each system, refer to the corresponding system manual.

SMT-R2000

- SMT-R2000 is a Dual Band AP supporting wireless LAN service 2.4 GHz(IEEE 802.11b/g) and 5 GHz(IEEE802.11a) bands simultaneously.

- SMT-R2000 supports IEEE 802.11e, which is Wireless LAN Quality of Service(QoS) standard.

- SMT-R2000 supports WEP, WPA1, WPA2(IEEE802.11i) for wireless LAN security.
- SMT-R2000 can be powered by Power over Ethernet(PoE) switch that has IEEE802.3af.

WIP-5000M

- WIP-5000M is a wireless mobile phone used for voice communication through IEEE802.11b.
- WIP-5000M supports Wired Equivalent Privacy for wireless LAN security.

SMT-W5100

- SMT-W5100 is a wireless mobile phone used for voice communication through IEEE802.11b/g
- SMT-W5100 supports WEP, Wi-Fi Protected Access 1(WPA1) and WPA2(802.11i) for wireless LAN security.

Table 1.1   Combination of AP and Phone

AP	Phone
WBS24	WIP-5000M
SMT-R2000	WIP-5000M SMT-W5100

⚠️ **CAUTION**	**Caution for combining AP and phone** Make sure that the types of APs on the same system are not mixed. It is strongly recommended that you should not mix the types of phones used on SMT-R2000.

1.3 OfficeServ VoWLAN Installation Procedure

To provide the VoWLAN service efficiently, the installation and management should be carried out after a sufficient site survey and analytical design.
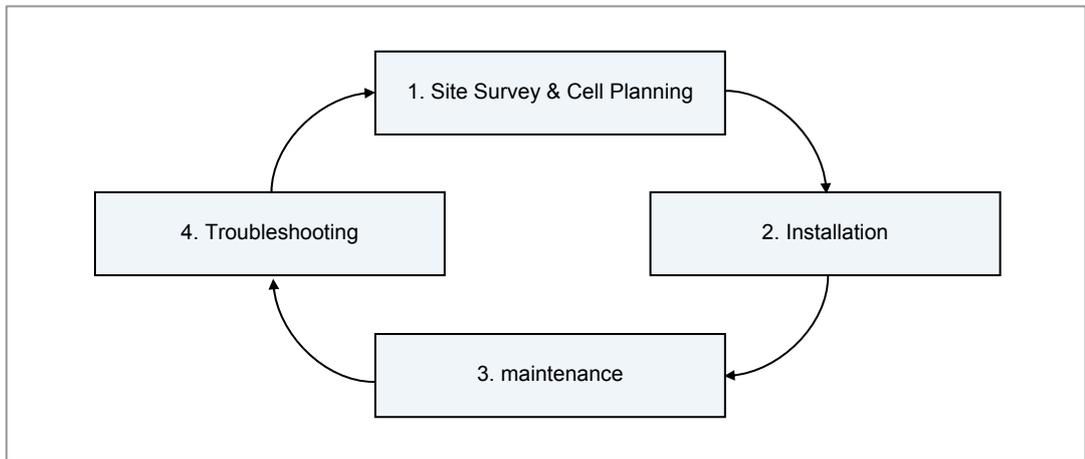
Figure 1.1   VoWLAN Installation Procedure

During the site survey and cell design stage, selection of the service range, recognition of the existing wireless environment, design of cell capacity area and channel design are carried out. When the design stage is completed, select the optimized location to install the actual AP. Then set the system AP and register the terminals. After completing the installation, you can start the 'tuning stage' to raise voice quality or monitor the AP, if necessary. If any problem occurs, take action by considering Appendix A and, if necessary, re-survey the site and adjust the cell design.

CHAPTER 2. **Designing VoWLAN Sites**

This chapter describes basic concepts and the cell design procedure that must be understood before the design of any VoWLAN site. In addition, this chapter describes how to select the location of the APs and carry out the site survey and the tuning to provide the optimal service.

2.1 About Basic Concepts

Overview of Wireless LAN Technology

As the wireless LAN technology standards, IEEE802.11b/g using 2.4 GHz band and IEEE802.11a using 5 GHz band are supported. In default, the wireless LAN technology is Random Access Protocol and wireless terminals freely access the system and share the limited radio frequency band. In other words, as the number of terminals that access and use the same frequency band is increased, the bandwidth available for a terminal is reduced. In addition, 2.4 GHz band is a part of Industrial, Scientific and Medical(ISM) radio band and the frequency band that not only wireless LAN devices but also other devices, such as Bluetooth and Microwave oven, can use. Therefore, the wireless LAN is the environment that noise can, basically, exist and its performance is determined by how much noise is detected.

Voice over WLAN (VoWLAN)

VoWLAN is the service providing voice communication on wireless LAN. Unlike general data communication, the voice communication is sensitive to packet transfer time, so network performance between two terminal users. That is because, if voice packets are delayed or lost during the packet transfer due to the decline of network performance, the user recognizes as the degradation of call service quality immediately.

Since the limitation of bandwidth on wireless network is bigger than that on wireless network, many conditions should be considered to provide voice communication service at the adequate level. The existing wireless data communication brings to focus only covering large area to the maximum extent. However, the voice communication should consider guaranteeing QoS at a certain level in the serviceable area as well as covering wide area.

To this end, the voice communication should consider organizing cells to guarantee data rate at a certain level and, also, the capacity of a cell(i.e., number of the calls that can make simultaneously). In addition, free movement and call without the degradation of call quality in handover should be, also, considered.

Noise Level

When installing wireless LAN, the site survey starts from the measurement of surrounding noise level. The noise directly affects on the performance of voice and data communication service. In case of SMT-W5100, Signal Level(SL) and Noise Level(NL) are displayed in Test mode. Noise mentioned above may include all signals of other technologies(2.5 GHz FHSS, Bluetooth technology or Microwave oven of ISM band) other than 802.11 b/g Direct Sequence Spread Spectrum(DSSS). In addition, the signals of 802.11b/g DSSS for long distance can be recognized as noise. In the mean time, the signals of an unregistered terminal(association) at a short distance are recognized as a kind of data to APs and terminals on the same channel. Each device receiving data analysis the signals and discards packets determined(in the comparison with MAC address) as the signals that matters little to itself. This activity causes the result to lower the RF channel availability(service capacity supported).

Most radio receives sensitivity of wireless LAN has a value of -90 dBm or lower in 1 Mbps. The radio receive sensitivity is closely connected with data rate and the receive sensitivity is approximately -83~-87 dBm in 11 Mbps.

NOTE

Direct Sequence Spread Spectrum(DSSS)

DSSS as one of spectrum is one of spread spectrum technologies is the technology that distributes digital signals to wide band at very low power and simultaneously transmits the signals

NOTE

Direct Sequence Spread Spectrum(FHSS)

FHSS as one of spread spectrum technologies is changed signals with the change of time without fixing the frequency and transmits the signals.

CHECK

Environmental Characteristics of WLAN Radio Wave

The environment of WLAN radio wave may vary depending on the characteristics and arrangement of buildings and surrounding radio environment. Therefore, this document is not optimized in all cases.

Single Cell

The figure below shows the range of radio transmission at AP. The circles, theoretically, show the cell area but the actual shape may be different according to surrounding environment, such as installation location and structures.

Most of the use environment of radio solutions for domestic purpose is composed of only one cell. Single cells are independent each other, so one cell does not affect on another cell. The configuration of single cells is as shown in the figure below:
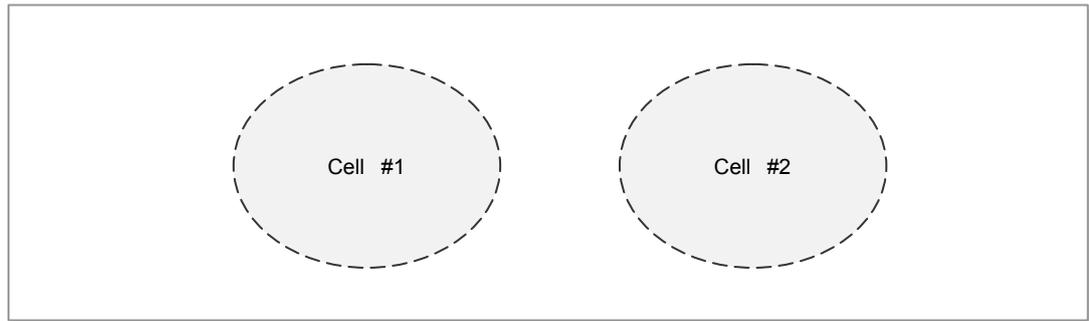
Figure 2.1   Configuration of Single Cell

As shown in the figure above, if two independent single cells are organized in the same area, it should be checked if there is a device using the same RF in the area.

If there are no other devices using RF channels in the area and wireless LAN IEEE802.11b/g is used, then following channels should be used: one of channel 1, 6 and 11 that do not interfere with each other should be used.

(Areas that can use channels 1 to 13 like Europe, channel 1, 5, 9 and 13 can be allocated and used. This RF channel allocation is allowed when the surrounding areas are clear, i.e., when neighbouring channels causing interference with your channels are not used. If used, channel allocation should be done by providing RF channel interval of at least 4 channels.

Multi-cell

Multi-cell is an environment where two or more single cells are overlapping each other and the terminal should maintain its service even while moving between single cells. In general, the cell boundary indicates the distance that the radio wave can reach from each AP. However, the cell area is not simply considered as radio range, but is considered as the service area that is designed to enable a radio service terminal to move into another area with no delay or loss, maintaining the eservice. Actually, the cell service range varies depending on the location where APs are installed. At this time, what is considered first is that the cell range should be variably adjusted at the request of a user for radio service type(Voice/Data) and terminal numbers by means of the change of Data Rate or transmission power control. Therefore, the most important element to determine the quality of radio service is to implement the multi-cell environment to enable radio service users to move into another cell area with no delay or data loss. This is achieved by carrying out a site survey, which will be covered in the next chapter,.
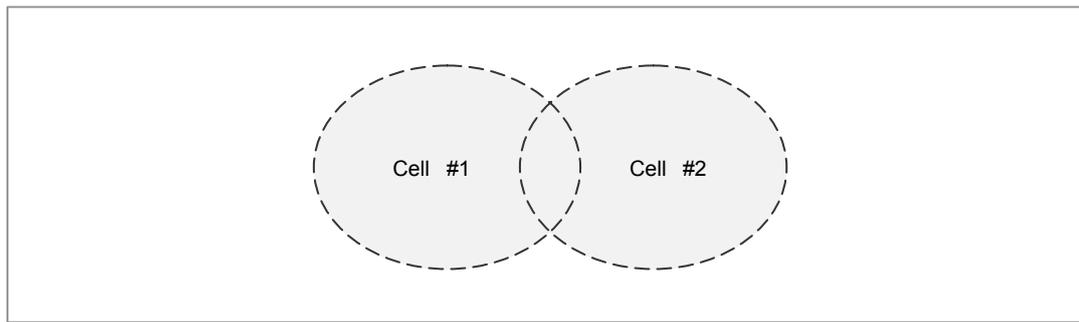
Figure 2.2   Multi-cell Configuration

Handover

To provide a continuous service to a terminal in a-multi cell environment, the system should send a handover request for the new cell to be moved into, create the service DB for the corresponding service terminal in the new cell and send the removal request of the service DB for the service terminal to the old cell.

If SMR-R2000 is used, the handover is completed and the voice call is maintained while moving between cells by updating the service terminal ARP Mapping table within WLAN switch or LAN switch. To these ends, Inter AP Protocol(IAPP) is usually supported.

Location Registration

In a multi-cell environment, the procedure to register a location on an AP that a terminal accesses, the system updates a WLAN Switch/LAN Switch quickly and, as a result reduces the packet switching time of the terminal. As mentioned above, a terminal executes the procedure by reporting to the system the AP that the terminal itself access when it moves between different cells. This procedure is called 'Location Registration'. This location registration is carried out when a cell location is changed or the specified location registration time is expired.
(In case of the timer expiring, the location registration is usually at every three to five minutes).

Data Rate

The data rate that is supported varies according to the different wireless LAN standards. IEEE802.11b can support 1, 2, 5.5 and 11 Mbps and IEEE802.11g/a can support 6, 9, 12, 24, 36, 48 and 54 Mbps. Data rate is closely connected with the capacity of any Wireless LAN service. If the data rate is high, the transmission packet only stays for a short time on the wireless interface. As a result, the possibility of a conflict with other wireless packets is reduced and packet transmission delay is also reduced. In other words more packets can be processed at the same time, better service quality is obtained and serviceable capacity is increased. Here, the capacity can be considered as the number of the terminals that can make calls at the same time.
However, the wireless environment becomes poor because noise is increased as the data rate is higher or re-transmission or packet loss is increased as the distance becomes greater. The data rate for the transmission of actual data varies depending on the current wireless channel environment.

Better wireless environment and shorter distances between APs and terminals needs a higher data rate. In addition, if a terminal gets away from the AP or noise is increased, packets are sent at a lower data rate.

The figure below shows the relationship between system capacity and data rate. The figure indicates the test result when voice packets are transmitted in Codex G711, 20 ms by using SMT-R2000 and SMT-W5100. In the picture, a farther distance from the centre of the circle means that a terminal gets away from the AP. Hence, the figure indicates that data rate becomes lower and the numbers of simultaneously available calls are also reduced.
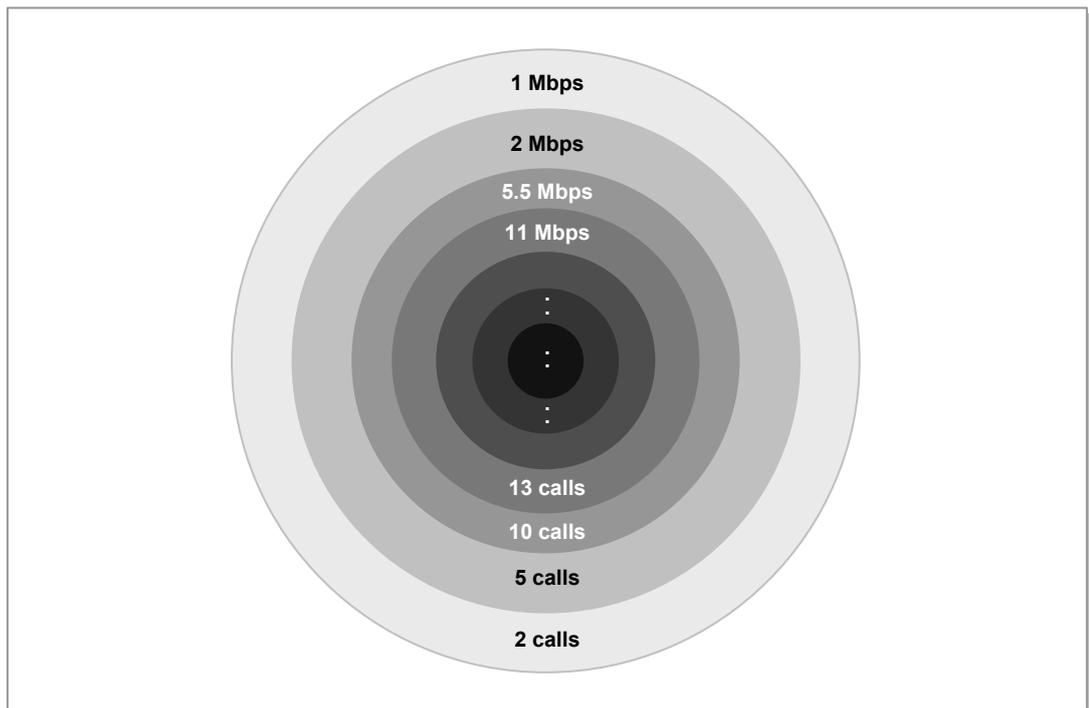
Figure 2.3   System Capacity and Data Rate (G.711, 20 ms)

NOTE	This result may be changed according to wireless environment and actual Codec type and packet transmission unit(packetization). Therefore, consider this result as a reference showing the relationship between transmission speed and capacity.

When SMT-W5100 is within the coverage of 30 m radius from an AP under an Open/RF clear environment, it can provide the transmission quality with 11 Mbps data rate.
It is recommended to use 8 terminals or less in an AP. The number of available terminals may vary according to surrounding structures and RF environment but it is recommended to use the SMT-W5100 under the environment that 11 Mbps data rate is guaranteed. SMT-W5100 has coverage of 80 m in the open office area in 1 Mbps and a coverage of 30 m in 11 Mbps.

Coverage may vary according to the environment. As usual, all data rates mentioned above are used, but, if too many data rates are selected, the voice quality is not normally secured in the environment with many re-transmission attempts. Therefore, it is better to select and use only one or two special data rates for the improvement of voice quality, after checking the capacities and coverage required in each cell. In other words, it is better to select a data rate that can support the minimum capacity based on the required capacity for the minimum data rate. If the coverage in comparison with capacity is important, it is better to lower the data rate.

RSSI

The signal strength or Tx power of an AP is the value of the default Rx power and antenna gain of an AP combined. If an antenna cable is added between an AP and the existing antenna, the total Tx power is reduced and the signal strength is lowered.
Therefore, total signal strength is calculated by considering an APs Tx power, loss by the antenna cable and antenna gain, and the calculated strength is called Effective Isotropic Radiated Power(EIRP).
For example, if the Rx power is 100 mW corresponding to 20 dBm, cable loss is 6 dB and antenna gain is 3 dBi, EIRP becomes 17 dBm.
As for cable loss, besides the default cable loss, 2 to 3 dBi per meter is added according to cable length. Therefore, the length of the antenna cable should be as short as possible.

Codec Packetization Period

Compressor and De-compressor(Codec) is the hardware or software module that compresses or decompresses analog sound signals into digital signals of bit streams. Depending on the Codec type, the digital signal is created at a different bit rate. For example, G729 and G711 use 8 Kbps and 64 Kbps, respectively. The digital signal created in a Codec is inserted on an 802.11 frame and is transmitted along with IP/UDP and RTP packet header. The Codec splits a signal in a certain unit(Packetization Period) and transmits the signal in an IP packet format. As the unit time gets smaller, more IP packets will be transmitted.
The transmission of more IP packets creates more overheads and, as a result, requires wider bandwidth. Whereas, if packets with large unit time are transmitted, even the loss of a packet is resulted in the loss of a lot of information, so the call quality is reduced a lot more. Normally a Wireless LAN uses 20 ms Packetization for G.711 and 40 ms for G.729.

2.2 Designing VoWLAN Cells

During the Cell design stage, cells should be designed and APs should be installed after checking the site environment in advance, considering the following requirements:

- Minimize wireless interference by checking other WiFi devices another AP and surrounding wireless environment.

- Create a network separately thereby considering the quality of voice and data communication.

- Minimize the interference between the same channels.

- Provide seamless handover.

- Optimize the AP location by considering walls and obstacles.

2.2.1 Investigating Service Area

The first stage of the site survey is to check the range of the area where the VoWLAN service is provided. Listen to the customer's requests regarding the required coverage range, such as offices, corridors, passages and stairs. Put the requests in writing. Study the use age pattern of the customer, such as places where users are concentrated(e.g., meeting rooms or offices) and time zones when service use is concentrated, and reflect the study results into your cell design later. In short, a suitable data rate is only achieved by the design of the capacity and coverage of the customer's site. In addition, use a building plan and study the area of the building, number and height of floors, internal walls, windows and material/type of the walls.

The survey for wired/wireless network environment is as follows:

For wireless network, check if there is any other device using 2.4 GHz frequency band. We recommend Wi-Spy or Omnispectrum analyzer(Cognio spectrum analyzer) as a tool to check the interference. Not only wireless LAN devices but also other devices, such as Bluetooth and Microwave ovens may affect the wireless environment. Check if such devices exist and survey the locations of the devices. For example, if a microwave oven is used, it is recommended to use RF #1 and RF #11 or higher because the band around RF #6 cannot be used. (However some microwave oven uses frequency that affects RF#11. So you should check the microwave oven spec.) For wired network, separate the network for voice communication from the network using common data, if at all possible, to prevent the degradation of voice quality caused by the excessive traffic(ARP, Multicasting and Broadcasting) from the wired network.

Put all data surveyed above in writing.(Refer to Appendix Pre-Sale Check Form). The data prepared above will come in handy for efficient cell design as well as cause analysis and troubleshooting when any problem occurs.

⚠ CAUTION	**Caution for Passing a Gate during a Call**
	A gate with large blocking effect for electric waves may cause voice jitter or release of a call(in a serious case) if handover is attempted during a call.

2.2.2 Designing Cell Capacity and Area

The 802.11 standards define several data rates according to the communication environment. A data rate is changed according to the distance between a terminal and AP or the wireless environment. The maintenance of an appropriate data rate between AP and a terminal is necessary to provide the optimal service to the terminal. To this end, it is very important to determine the number of the optimal APs and the best locations for the wireless environment to be designed.

Cell design and configuration can be carried out in two ways:

*   Design by capacity

*   Design by area

The design method by capacity is used when data and voice call traffic is heavy. If users are of a comparatively small number, the design method by cell area measured is used.

The criteria to calculate the number of APs in a cell capacity and area design will be presented in the following section. However, the cell design should not be carried out by depending on only theoretical numeric data. In the cell design, environmental elements for the actual installation area should be, also, considered because its coverage and data throughput vary according to internal walls, windows, partitions and materials and types of the gate displayed on the building design.

2.2.2.1 Design by Cell Capacity (Number of Data and Voice Users)

Above all, user density and the type of the used wireless LAN services should be known. The way to calculate the number of APs to be installed varies depending on data or voice services.

Data User

The expression to decide the number of APs to be used is calculated by data throughput as follows:

$$\frac{Bandwidth * \text{Number of user} * \text{Activity rate per user(\%)}}{\text{Efficiency(\%)} * \text{Association rate per AP}}$$

For example, if the data throughput required is bi-direction data of 500 kbps for 100 users under 802.11b, the following expression shows that it is suitable to install approximately six APs.

$$\rightarrow \frac{(2*500\text{kbps})*100*25\%}{40\%*11\text{Mbps}} = \frac{(1Mbps)*100*25\%}{4.4\text{Mbps}} = \frac{25Mbps}{4.4Mbps} = 5.7 \cong 6APs\ needed$$

Voice User

In addition, call traffic should also be considered. The number of APs can be decided by dividing the whole simultaneous call traffic by the number of calls that can be processed.

For example, if a maximum 27 calls are used at the same time and 4 calls can be processed by the AP, the following calculation shows that about 4 APs are required.

$$\rightarrow \quad \frac{\text{Number of simultaneo us voice calls}}{\text{simultaneo us voice calls per one AP}} = \frac{27}{4} = 6.8 \cong 7\,APs\ needed$$

However, the above two formulae are provided to roughly determine the mathematical number of APs and not to achieve the optimized value.

Unlike the above formula, 100 users do not actually use the equally distributed data, the data rate is reduced exponentially because of data conflict when many users access an AP. In addition, the suitable data rate is changed depending on distance between user's terminal and the AP and communication terminal.
This data rate prescribed in 802.11 indicates the data rate includes only WLAN protocol. Since the data rate that users actually feel includes to the upper protocols, such as TCP/IP protocol, the data rate in view of users is 40~50% of the data rate on wireless network.

Table 2.1 below lists the number of simultaneous calls to ensure the minimum call quality in accordance with data rate based on SMT-R2000 and SMT-W5100. This result combined with the environment that RF is cleared may vary depending on actual wireless environment or structures. Since the data rate may be slowed down in a poor wireless environment, the number of serviceable calls should be calculated in an AP by considering this situation. In short, when G.711 is used and the given data rate is 1 Mbps, the maximum number of calls is limited to two calls. Therefore, if five or more users attempt calls at the same time, 1 Mbps data rate should not be provided.

Table 2.1   Number of Terminal That Can Make Simultaneous Calls for Each Data Rate

Maximum Data Rate	Number of Maximum Terminal Calls (G.729 40 ms frame)	Number of Maximum Terminal Calls (G.711 20 ms frame)
11 Mbps	14	13
5.5 Mbps	12	10
2 Mbps	10	5
1 Mbps	8	2

In addition, Codec type or voice frame transmission unit, also, have an affect on service capacity. Under the same environment, when Codec G.711 is used, not G.729, and the voice fame unit is smaller, the number of simultaneous calls is reduced.

2.2.2.2 Design by Cell Area

In the design by call area, the number of APs is based on cell covering distance and calculated by using the following expression.

For example, if, the serviceable distance for an AP is 30 m and the area to be served is 50 m x 100 m, the following expression shows approximately two APs are required.

$$\frac{The\ total\ service\ areas}{The\ coverage\ of\ AP} = \frac{50m*100m}{\pi*r*r} = \frac{5000m^2}{3.14*30m*30m} = \frac{5000m^2}{2826m^2} = 1.76 \cong 2APs\ needed$$

Distance, 'r' is the radius of the area that an AP can serve. If many users use the AP or data throughput is high, the value of 'r' should be reduced to allow the use of more APs. The actual cell covering area and the cell installation AP numbers may vary depending on the area landform and build structure where the APs are installed and terminal capacity.

The expressions for cell capacity and area designs mentioned above are used to roughly calculate the number of APs to be installed. These expressions assist to calculate the optimized number of APs by considering terminal numbers and service protocol type and, as a result, determine the locations of APs.

2.2.3 Designing Channel

The purpose of channel allocation is to minimize wireless interference. In 802.11b/g, WLAN channels are allocated at the interval of 5 MHz based on the centre frequency, each channel has 22 MHz bandwidth and the frequency bands of adjacent channels are overlapped. Therefore, if adjacent channels are used, the channels are overlapping each other.
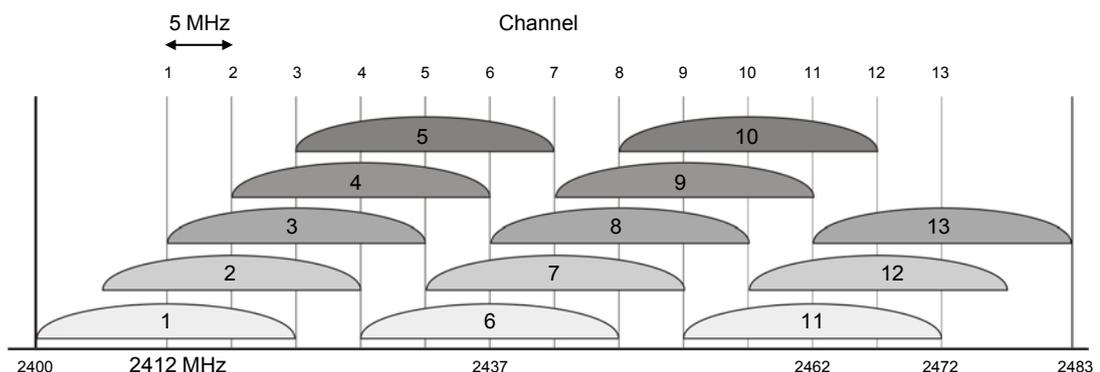
Figure 2.4   Channel Allocation

To minimize any interference, channels whose frequency bands are not overlapped should be used. If available channels are from channel 1 to channel 11, use channel 1, 6 and 11. If available channels are from channel 1 to channel 13, use channel 1, 5, 9 and 13. An ideal multi-cell environment is achieved when only 2.4 GHz Clear channel(mentioned below) is used. Such Clear channel can be measured on the edge of a cell on the basis of the signal level or communication quality data value obtained from SMT-W5100. Handover should be seamlessly carried out within these intervals.
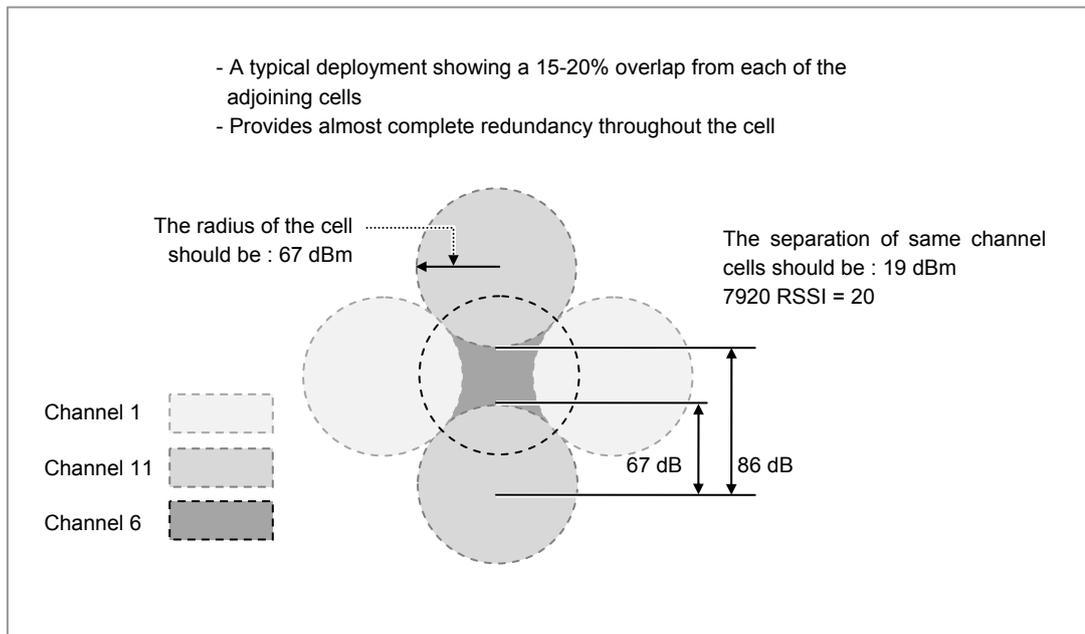
Figure 2.5   Usage Example of Channel 1, 6 and 11

In the environment where the above Clear channel is not always allocated, the same channel allocation algorithm is selected. If the same channel is used, a confliction/interference of RF signals is generated and, as a result, data rate is reduced. When SMT-R2000/SMT-W5100 is used and G.729a 40 ms is used, this algorithm can simultaneously support at least eight users within a cell. As shown in the above figure, the rate overlapped between adjoining cells is approximately 20%. If the overlapped rate is increased, the roaming quality for calls and data is improved and the service capacity in a cell is increased. In comparison with the case where no area is overlapped, the service capacity can be allocated more than about 15 % when the overlapped area is about 20 %.

The way to re-allocate channels when several APs are installed on a floor is as shown in the figure below:
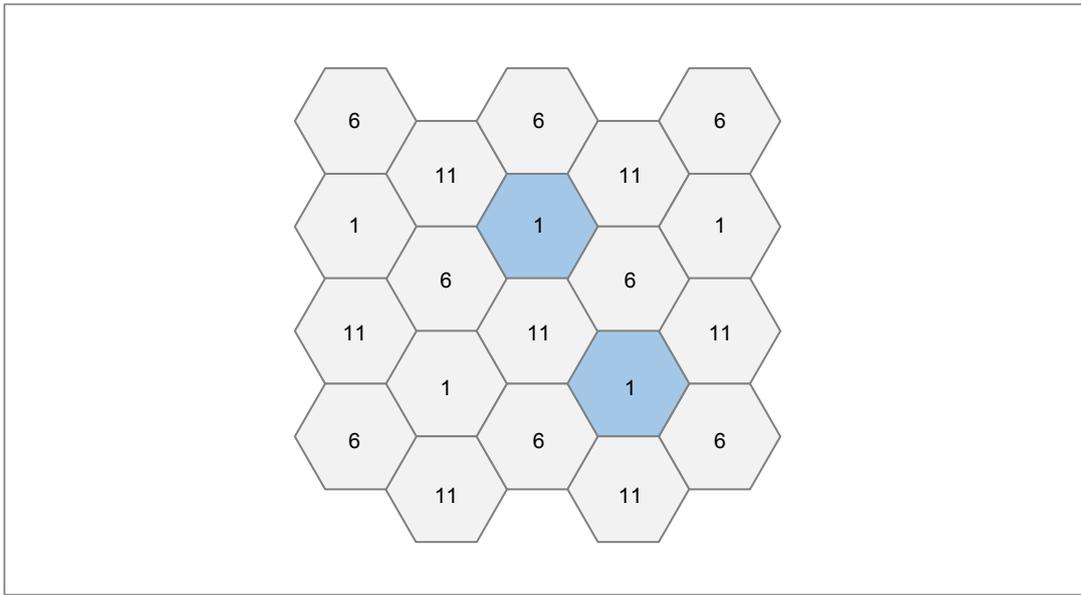
Figure 2.6   Channel Reallocation When Several APs are installed on a floor

This figure is an example of channel allocation for a site using 1 ~ 11 channels like America. If your location is in Europe and it is using 1 ~ 13 channels, we recommend you use 1, 5, 9, 13 channels.
Each cell using channel 1(see the yellow parts on the above figure) should have the difference of 86 dBm from the middle of a cell to the edge of another cell and this difference should be applied to the cells between floors. This value can be measured by using the test mode on SMT-W5100/WIP-5000M.

The figure below shows the channels to be allocated to each AP when 9-APs are used on three floors. When several APs are installed over several floors, the interference between floors as well as the interference within a floor should be considered.
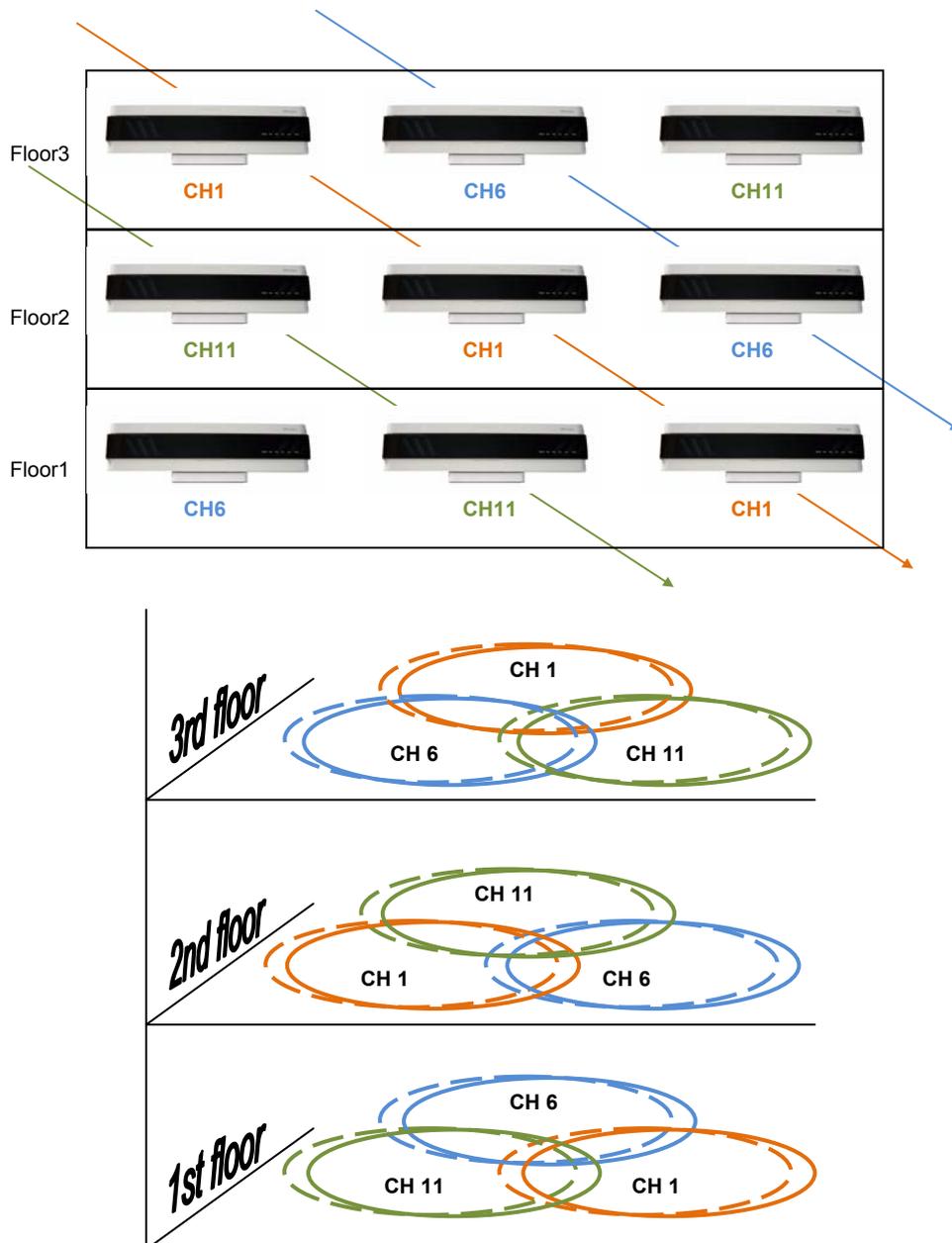
Figure 2.7   Channel Allocation for each AP When 9-APs are used on 3-layer

2.2.4 Selecting AP Location

On the basis of the information obtained from the above design procedure, the locations to install actual APs are decided.

1) Mark the expected AP locations and service areas on the site block map first.
2) Check the wireless environmental elements on the expected location/building structures or obstacles, existence of other wireless devices, number of users and service requirement functions.
3) With an actual terminal(WIP-5000M or SMT-W5100), measure the signal strength and transmission rate from the planned installation locations of each AP to the expected cell areas.
4) According to the result of Step 3), determine the appropriate locations by moving the location of an AP.

The table below shows the relationship between sound quality and signal strength. Check the signal strengths based on Communication Quality(CQ) value for WIP-5000M and Signal Level value for SMT-W5100.

Table 2.2   Sound Quality and Signal Strength

Voice Quality	WIP-5000M(CQ)	SMT-W5100(SL)**
Good	92-45	00~-55
Poor	45-25	-55~-75
Bad	25-0	-75~-99

> **SL of SMT-W5100**
> The SL of SMT-W5100 indicates the value of Signal Level(dB). Therefore, lower number means better signal strength.

The table below shows the relationship between Communication Quality(CQ) and Antenna level of SMT-W5100. The antenna level display is different according to S/W version. Refer to the table for checking wireless environment.

Table 2.3 Communication Quality and Antenna level

Antenna level	CQ (above V01.07.01)	CQ (below V01.07.01)
Level 6	above 75	above 50
Level 5	65 ~ 74	42 ~ 50
Level 4	55 ~ 64	33 ~ 41
Level 3	45 ~ 54	24 ~ 32
Level 2	35 ~ 44	15 ~ 23
Level 1	30 ~ 34	10 ~ 14
Level 0	below 30	below 10

The table below lists the signal attenuation values depending on structures. Refer to the table for checking wireless environment.

Table 2.4   Signal Attenuation Depending on Structures

Structure	Signal Attenuation [dB]
Floor	30
Brick wall with window	2
Office wall	6
Metal door in office wall	6
Cinder block wall	4
Metal door in brick wall	12.4
Brick wall next to metal door	3

Next section describes how to design the network by terminals.

2.2.4.1 Cell Design with WIP-5000

Preparations

- One Officeserv system
- 2-AP(SMT-R2000)
- 2-WIP-5000M
- One digital phone
- LAN cable: 100 m 1 ea and 10 m 4 ea
- One Ethernet LAN Switch
- Tripod, power cable and Serial Input/Output interface(SIO) cable

The installation example for the WIP-5000 cell design is as follows:
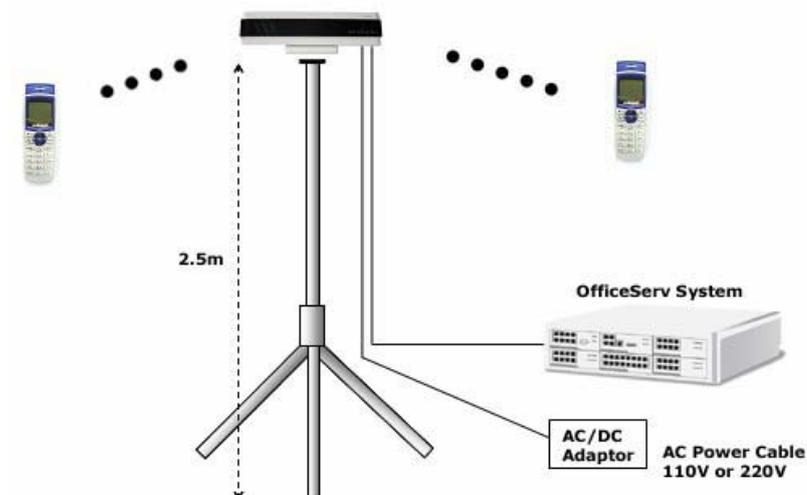
Figure 2.8   Example of WIP-5000M Cell Design

Test mode Setup

Connect an AP to the OfficeServ system and register terminals. Put the terminals in test mode.

How to put the WIP-5000M into test mode:

- In standby mode: **[Menu]** → **[Hold]** → **[*]**→ **[#]**
- In Call mode: **[♫]** → **[#]**. Even though the mode is changed, the call is still available.

Test mode screen and the functions of each item are as shown in the figure below:

The number of scanning APs
AP's MAC address
Signal Level(RSSI)
Signal to noise
Communication Quality
Used channel
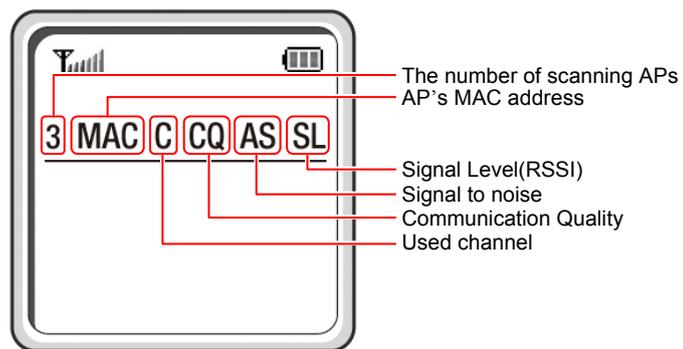
Figure 2.9   WIP-5000M test mode Screen

Selection of AP Location

1) Place a tripod to the AP installation location decided by the previous work and install a test AP.

2) Configure the system as shown in the test system configuration.

3) Connect a call between terminals.

4) Change the status of a test terminal into Test mode.

5) Move away from the AP, write down the CQ value on a map.
   - After moving the terminal to the body of the tester, read the CQ value for 2~3 seconds in a standstill status at the normal call height.
   - The tester should hold the same posture to get the corrective CQ value.
   - Since the CQ value can be lowered during actual calls because of a human body, the value read may be somewhat attenuated.

6) Draw a border line on the basis of the CQ value to determine the level of voice quality(Good, Poor and Bad).

7) Determine the location of the AP to overlap its cell area with another AP's cell area in CQ 25~45 area.

2.2.4.2 Cell Design with SMT-W5100

Unlike WIP-5000M, calls between terminals are available with no registration to the system.

Preparations

- 2-AP(SMT-R2000)
- 2-SMT-W5100
- LAN cable: 100 m 1 ea and 10 m 4 ea
- Tripod, Power cable and, SIO cable

Setting AP Call Test

1) In terminal Idle mode, press **[Menu]** → **[Hold]** → **[*]** → **[#]** buttons in turn to move to the Hidden menu(irrespective of the registration of the terminal).

2) Select '10 AP call Test' on the Hidden menu.

3) Input of Terminal IP: Set the IP address for the terminal and press **[OK]** button.
   Ex) 192.168.111.30('.' Input: '*' key)

4) Input of system ID(SSID input): Enter the SSID of the AP and press the **[OK]** button.
   Ex) 124578
   Short key(pressing for a long): Enter alphabetical letters
   Long key(pressing shortly): Enter numbers
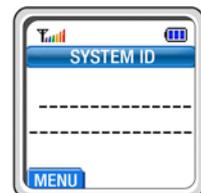
5) The terminal accesses the AP after restarted and the screen on the right is displayed.

6) Enter the IP address of the terminal to attempt calls and press the **[OK]** button.

7) Enter the MAC address of the terminal to attempt calls and press the **[OK]** button.

8) Set the other party's terminal to attempt calls in the same sequence as described above.

9) If the setting for the other party's terminal is completed, the traffic channel between two terminals is opened.

10) To view the information on terminal RSSI of the current call press the **[DOWN]** button of the navigation key.

11) To return to the previous screen, press the **[CLOSE]** button.

12) To attempt a new call, press the **[END]** button.

13) After pressing the **[END]** button, re-enter other party's IP and MAC addresses and press the **[OK]** button.

Resetting when a terminal is powered off

If a terminal is powered off, the above settings should be carried out again.

CHECK

Selection of AP Location

1) Place a tripod to the AP installation location given by the previous work and install a test AP.

2) Configure the test terminal as AT Call Test setting.

3) Move away from the AP, write down the SL value on a map.
   • After dropping the terminal to the body of the tester, read the SL value for 2~3 seconds in a standstill status at the normal call height.
   • The tester should hold the same posture to get the correct SL value.
   • Since the SL value can be lowered in actual calls because of a human body, the value read may be somewhat attenuated.

4) Draw a border line on the basis of the SL value to determine the level of voice quality(Good, Poor and Bad).

5) Determine the location of the AP to overlap its cell area with another AP's cell area in SL -55~-75 area.

Distance between APs

The distance between APs should be at least 5 m.

CHECK

2.2.5 Optimizing VoWLAN Service

The previous chapter described the way to select an AP's position.
Install APs to the selected position and allocate channels of each channel according to the channel design. If the system for actual use is installed and all terminals are registered, the installation is completed.(For the system setting and terminal registration, refer to Chapter 3).

After completing all settings, the site should be optimized to raise the actual VoWLAN service quality.

Since site characteristics are different at every installed site, the call quality should be raised to the maximum extent, considering the following items:

• Check if the site is installed to cover all areas to be requested by the user.

• Check if calls are normally maintained in handover by making mobile calls.

• Check the call quality.

• Check if call users are concentrated in a specific area.

To optimize the installation, refer to the following representative cases. In addition, refer to Q & A guide of Appendix A for other cases.

Solution when voice quality is not good because many terminals are used in a limited area.

To use more terminals in a limited area, the bandwidth should be increased to reduce wireless data transmission time. To raise terminal capacities, reduce AP's cell area, raise data rate and increase the number of APs separating channels can be considered.
If AP or a terminal's transmission power is lowered, adjoining APs with the same channel can be installed closely in the data transmission of the terminal and AP. When one AP is not capable of allocating all channels for the corresponding area, the way to widen the bandwidth is to distribute the connecting terminals by allocating APs of other channels to the service area. If the number of APs is increased, the possibility of a conflict occurs in the corresponding channel is increased and data rate is lowered according to the algorithm for terminal or AP. Therefore, data rate to transmit at the lowest speed may be limited to ensure the lowest bandwidth. Since the data rate can be set in **[Setting]** → **[Radio]** → **[Data Rate]** menu of AP, the lowest service bandwidth should be ensured by removing the lowest data rate from the previous data rate.

The bandwidth can be ensured by changing the type of voice Codec and the transmission frame. The use of G.729 enables to use more terminals than that of G.711. However, the voice quality is lowered in this case. In addition, to widen the bandwidth, you can reduce spare packets corresponding to RTP or wireless section by increasing the number of frames to transmit at a time. As usual, the packets can be increased in 20 ms, 40 ms or 60 ms. However, this method creates delay as much as the length of the voice transmission packet is increased. In addition, when packets are lost, more voice data are lost because the packet length is increased.

Solution when voice quality is not good during mobile calls (voice quality is poor and the changing of AP location is difficult at the point of handover)

The solutions when voice quality is poor at the point of handover are as follows:
The distance between the APs for handover is too far away, so the handover condition is not satisfied. In this case, it is recommended to make the distance between the APs narrow. If the method is not allowed, you can add an external antenna with big gain between the APs to increase the transmission distance.
In a case where the handover position is not far away but voice quality is not good, the checkpoints are as follows:
The handover parameters in the terminal to adjust the handover should be checked.
The above case may occur when the parameter settings are wrong or not adequate.
For the parameter settings, check the handover parameter item of the terminal. When the environment of the corresponding channel for the handover is not good, the handover message may not be transmitted to the channel. Check the channel environment of the corresponding AP and change the environment by allocating a adequate channel.

Solution to cover an outdoor area

SMT-R2000 and WBS24 do not support outdoor areas at present. Purchase and install the optional equipment to cover outdoor area.

Solution when you want to add APs but it is difficult to connect LAN cable.

APs have a repeater function called Wireless Distribution System(WDS). The WDS is a function to connect and serve wireless communication between APs. This function is suitable when it is difficult to install LAN cables or you want to use the wireless communication temporarily.

Since the WDS setting requires the use of same channels, the following items should be considered:

In 2.4 GHz configuration, the bandwidth may be reduced 50% by the communication between a terminal and an AP. The use of 5 GHz can prevent the reduction of 2.4 GHz bandwidth. However, it may be difficult to serve 5 GHz in European area complying with IEEE802.11h because it is difficult to set as the same channels.

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CHAPTER 3. Programming VoWLAN Service

3.1 Programming the System Database

To use SMT-R2000 and WIP-5000M terminals on the OfficeServ system, the following items should be programmed.

- System WLAN service type setting
- MCP setting
- MGI setting
- Terminal IP allocation
- WLAN Channel setting
- Terminal registration type setting
- Approval of terminal registration
- Setting of the number of terminals for simultaneous call per AP
- WLAN SWITCH setting
- Codec setting
- User ID setting

3.1.1 WLAN Service Type Setting

The WLAN service type setting on the system is to select the type of the wireless LAN service supported in the OfficeServ system. To set the desired service type, select the AP type to be installed from Select AP Type in MMC849. There are COMBO AP, BASIC AP and DUAL AP in the AP types. Select the DUAL AP to use SMT-R2000.

3.1.2 MCP Setting

Using MMC 830 the system IP address and network settings should be programmed.

3.1.3 MGI Setting

Using MMC 831 the system's MGI card/s should have their IP address and network settings programmed.

3.1.4 Terminal IP Address Allocation

An IP address must be allocated to the terminal(SMT-W5100 and WIP5000M). To set the IP address, use MMC848.

3.1.5 WLAN Channel Setting

Wireless channels scan only 3~4 pre-appointed channels in handover because scanning all channels takes a long time. A terminal receives the channel list entered in the system and scans only the channels in the list. Therefore, the installed APs should be selected as the channels entered in the system. WLAN channels are entered in MMC845 and channel 1, 6 and 11 or 1, 5, 9 and 13 are usually used. If no channel is used, enter '0'.

3.1.6 Terminal Registration Type Setting

STATIC WIP IP in MMC849, Disable or Enable can be selected.
The default value is 'Disable'. According to the registration procedure, the system allocates the IP address entered in the system to a terminal. If 'Enable' is set, one of IPs entered in the system is allocated to a terminal and registered by following the registration procedure. This method is used when two or more OfficeServ systems exist in the network with the same subnets or the network cannot perform broadcasting. In addition, this method is also used when another subnet handoff is supported by using a WLAN Switch.

3.1.7 Approval of Terminal Registration

For this setting, Disable or Enable can be selected in REGISTER VoWLAN of MMC489. The default value is 'Disable' and terminals cannot be registered. Only when 'Enable' is selected, terminals can be registered.

3.1.8 Setting the number of terminals for simultaneous call per AP

This setting is to select the number of terminals that can make simultaneous call at an AP. For this setting, the terminal numbers can be selected in MAX AP CH of MMC845. The default value is '0' and it means that the number of terminal calls is not limited. If eight or more terminals are selected, the degradation of service quality may be occurred in voice and data services.

3.1.9 WLAN SWITCH Setting

This setting is performed in the environment that WLAN SWITCH is used to configure the network and to receive services. For this setting, you can select Disable or Enable in WLAN SWITCH of MMC845. When WLAN SWITCH is used, 'Enable' is selected.
In this case, from system setting items, select STATIC WIP IP as 'Enable' and register the terminal as fixed IP type. For SMT-R2000, access via Web and select **[Security]** →
[Station Isolation].

3.1.10 Codec Setting

The voice Codec for VoIP terminal can be specified. The default voice Codec may vary according to the system types. The default Codec for a terminal can be selected in the Audio Codec menu of MMC835.

3.1.11 User ID Setting

During initial WiFi terminal registration, the user ID can be registered.
The default value is '1212'. However, if the user ID is allocated and registered as the extension number to be allocated to a terminal by using MMC846, the allocation of extension number to be registered.

3.2 Programming SMT-R2000

The basic information for SMT-R2000 should be entered before installation.
The following items should be specified after accessing the Web interface. In initial factory setup, the IP address for web access is '192.168.111.10', ID is 'admin' and Password is 'samsung'.

- Default Setting
- Ethernet Setting
- Wireless Setting
- Security Setting
- Cluster Setting
- Installation

3.2.1 Default Setting

In initial factory setup of SMT-R2000, the country code will be set.
If the time is obtained from NTP server, the standard time correction menu is also set.

After setting the country, enter SSID for wireless LAN. For APs to be used in the same network(OfficeServ system), the same values are entered. SSID is used as the System ID in terminal registration. The terminal handoff is performed via this SSID.

3.2.2 Ethernet Setting

In this setting, the wireless Ethernet information when using SMT-R2000 in the network is specified.
Set the Ethernet information in **[Setting]** → **[Ethernet Setting]** on the WEB screen.
Enter the followings:

- NAT: No Use
- Connection Type: Fixed IP
- Fixed IP Address
- Subnet Mask
- Default Gateway
- DNS name Servers

The AP mode should be Bridge mode to interwork with the OfficeServ system. Therefore, select 'No Use' for NAT. It is recommended to set as 'Fixed IP' to know the installation place and AP's IP. If Fixed IP is specified, enter Fixed IP address, Subnet Mask, Default Gateway and DNS name Server.

3.2.3 Cluster Setting (Optional)

The cluster function is the function for sharing the settings and to make several APs perform as a group and operate with the same settings. If an AP setting within a group is changed, the change is applied to all other APs, the administrator does not need to change all APs. To use the cluster function, click 'Starting Clustering' in **[Cluster]** → **[Access Point]** on the Web screen. Enter Location and Cluster Name in the clustering Option. Specify the APs tied into the same group as the same cluster name and enter the installation place to identify each AP or a unique name for the location.

Table 3.1   Setting Shared within the Cluster

WEB UI Menu		Item	Share
Basic Setting	-	Country Code	Yes
	-	Time Compensation	Yes
	-	SSID	Yes
	-	Password	Yes
User Management	-	User Accounts	Yes
Cluster	Channel Management	automatically re-assigning channels	Yes
Security	11a	Broadcast SSID	Yes
		Station Isolation	Yes
		static WEP	Yes
		802.1x	Yes
		WPA- Personal	Yes
		WPA- Enterprise	Yes
	11b	Broadcast SSID	Yes
		Station Isolation	Yes
		static WEP	Yes
		802.1x	Yes
		WPA- Personal	Yes
		WPA- Enterprise	Yes
Status	Events	Relay Log Enable/Disable	Yes
		Relay Host	Yes
		Relay Port	Yes

Table 3.1   Settings Shared within the Cluster (Continued)

WEB UI Menu		Item	Share
Manage	Ethernet Settings	-	No
	Wireless Settings	Radio1 channel	No
		Radio1 Internal SSID	Yes
		Radio1 Guest SSID	Yes
		Radio2 channel	No
		Radio2 Internal SSID	Yes
		Radio2 Guest SSID	Yes
	Radio1 & 2	Status(on/off)	Yes
		Antenna Selection	No
		External Antenna	No
		Beacon Interval	Yes
		DTIM Period	Yes
		Maximum Stations	Yes
		Transmit Power	No
		Rate Sets	Yes
		Broadcast/Multicast Rate Limiting	Yes
	VWN	Enable/Disable	No
		VLAN ID	No
		SSID	Yes
		Broadcast SSID	Yes
		Security	Yes
	WDS	-	No
	Mac filtering	Filter	Yes
		Terminal List	Yes
	Port Control	-	No
	Port Forwarding	-	No
	Load balancing	-	No
Service	QoS	Use/no use of WMM	Yes
		AP EDCA Parameter	Yes
		STA EDCA parameter	Yes
		Retry Count	Yes
		Port Priority	Yes
	SNMP	-	No
	Time	Network Time Protocol	Yes
		NTP Server	Yes

Caution for using Channel Management

If [Cluster] – [Channel Management] function is enabled, channel is automatically changed. In case of changing of channel during a call, call may be released. In case of using VoWLAN, it is recommended not to use Channel Management.

3.2.4 Wireless Setting

In this setting, the wireless Ethernet information using SMT-R2000 on the network is specified.
Set the wireless information in **[Setting]** → **[Ethernet Setting]** on the WEB screen.
Enter the followings:

- Mode
- Channel
- SSID

AP wireless mode setting is required to interwork with the OfficeServ system.
Radio Interface 1 can be set for 802.11a. Enter the channel and the SSID to be used in 802.11a. Radio Interface 2 can be set for 802.11b/g. Enter the channel and the SSID to be used in 802.11b/g. The channel of Radio 2 is selected from the channels entered in the System WLAN Channel list(MMC 845). If a channel that does not exist in the system is set, a terminal cannot find the channel and, therefore, the terminal cannot access normally.
SSID is entered as the same values to receive the handover service between APs.

3.2.5 Security Setting

In this setting, wireless security mode for SMT-R2000 is specified.
Select a security mode in **[Security]** → **[11b/g Security Setting]** on the Web screen and enter additional information for each mode. SMT-R2000 supports the following security modes: None, Static WEP, IEEE802.1x, WPA Personal and WPA Enterprise.
If WIP-5000M is used, only None or Static WEP mode is available. For SMT-W5100, None, Static WEP and WPA Personal modes are available.

3.2.6 Installation

After SMT-R2000 settings are completed, install the SMT-R2000 in the selected place.
The SMT-R2000 should be installed in the place where seamless handover is allowed.

3.2.7 External Antenna Setting

For installation of external antenna, refer to troubleshooting questions as follow.:

- Q: How is the External Antenna connected to the SMT-R2000?
- Q: Is it available to provide the service indoors and outdoors by using the External Antenna in the SMT-R2000?
- Q: Which External Antenna can be connected to the SMT-R2000?
- Q: How is the External Antenna installed in the SMT-R2000?

3.3 Programming WIP-5000M

After WIP-5000M or SMT-W5100 terminals are registered to the system, they can be used in the OfficeServ system wireless LAN. This section describes how to register and release.

3.3.1 Registration

The procedure to register WIP-5000M terminals to the system is as follows:

1) Check if the system programming items in Section 3.1 'System DB Setting' are correctly set.
2) Register a terminal via the terminal registration menu in WIP-5000M. For the registration procedure, refer to 'WIP-5000M Users Manual'.
3) Enter the setting values correctly in the WIP-5000M registration procedure. In particular, User ID and Password should be equal to the values in the system. If the registration fails, check if the system DB settings.
4) If the terminal is successfully registered, an extension number is assigned to the terminal.

3.3.2 Additional Setting

3.3.2.1 Changing Handover Parameters

WIP-5000M(hereinafter, terminal) provides the function to change handover parameters.

> **CHECK**
>
> WIP-5000M and SMT-W5100 are based on Communication Quality(CQ) and Signal Level(SL), respectively.

Check the handover parameter values in the Hidden menu of the terminal.

1. Moving to the Hidden Menu

1) Press **[Menu]** ➔ **[Hold]** ➔ **[*]** ➔ **[#]** on the initial screen of the terminal.

2) Select 'Set H/O Param' in the Hidden menu.

---

2. Changing Handover parameters

The 'CQ' value of the 'Hidden Menu → 5: Display RSSI' menu shows the current CQ level of the terminal.

Change the value of Thresh Hold, Delta Value, Duration Time, View Parameter.

- **Thresh Hold**
  Thresh Hold indicates the CQ level value when the terminal starts the scan operation for handover. If the terminal CQ level drops below the Thresh Hold level, the terminal starts the scanning operation.
  - Initial Value: 55
  - Range: 0~99

- **Delta Value**
  Delta Value indicates the difference between the signal level of an AP pertaining to a terminal and the CQ level of adjoining AP. If the CQ level of an AP around the terminal is higher than the CQ level of the AP that the current terminal belongs to and the difference is bigger than the preset Delta Value, the terminal carries out the handover.(At this time, The CQ level of the terminal should be below the Thresh Hold level.
  - Initial Value: 9
  - Range: 0~99

- **Duration Time**
  Duration Time indicates the time that a terminal maintains the handover conditions(Thresh Hold and Delta Value) Only when Thresh Hold and Delta Value are maintained for more than the specified Duration time, the terminal carries out the handover.
  - Initial Value: 2(second)
  - Range: 0~99

- **View Parameter**
  View Parameter shows the current handover parameter values.

3.3.3 Release

If a new terminal needs to be registered because your WIP-5000M terminal is lost or damaged, the registration of the old terminal should be removed.
The way to release the WIP-5000M is as follows:

Release in the System

If the WIP-5000M in use is within the range of wireless service area and its registration needs to be released, set as Normal mode by using System MMC. If the registered terminal is not within the service area or the use of the terminal is impossible, set as Forced mode by using System MMC and delete only the terminal's DB in the system.

Release in WIP-5000M

You can delete terminal registration DB by using the WIP-5000M within the service area of the system's wireless LAN. For detailed release procedure, refer to 'WIP-5000M User's Manual'.

3.4 Programming SMT-W5100

3.4.1 Registration

The way to register SMT-W5100 terminals to the system DB is the same as '3.3.1 Registration'. For detailed information, refer to SMT-W5100 User's Manual.

3.4.2 Additional Setting

3.4.2.1 Packetization Time

SMT-W5100 can adjust the RTP Packetization period.
If the terminal is registered to the system which has the 'System Interface' function,
A user can adjust the RTP Packetization period only by using System MMC
(refer to '3.4.3 Using the System interface function')

The procedure to set the RTP Packetization period is as follows:

1) The function to set the Packetization period is provided in the Hidden menu. Press the following keys to access the menu in turn: **[Menu] → [Hold] → [*]→ [#]**

2) Select **[Packet period]** on the Hidden menu.

3) Specify a desired packetization period(the default value is 40 ms).
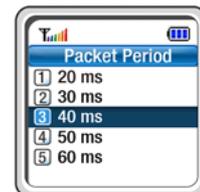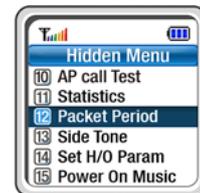
3.4.2.2 Changing Handover Parameters

SMT-W5100 can adjust the handover timing by changing the handover parameters depending an AP's Cell environment. The SMT-W5100(hereinafter, terminal) provides the function to change handover parameters.

The procedure to change the handover parameter values by using the Hidden menu of the terminal is as follows:

1. Moving to the Hidden Menu

1) Press **[Menu]** ➔ **[Hold]** ➔ **[*]** ➔ **[#]** on the initial screen of the terminal in turn.

2) Select 'Set H/O Param' in the Hidden menu.

2. Changing Handover parameters

The 'SL' value of the 'Hidden Menu ➔ 5: Display RSSI' menu shows the current Signal Level of the terminal.

Change the value of Thresh Hold, Delta Value, Scan Time, View Parameter.

- **Thresh Hold**
  Thresh Hold indicates the Signal level value that the terminal starts the scan operation for handover. If the terminal Signal level drops below the Thresh Hold level, the scan operation starts.
  - Initial Value: -70
  - Range: -99~0(In actual setting, enter the value after excluding '-'.)

- **Delta Value**
  Delta Value indicates the difference between the signal level of an AP pertaining to a terminal and the signal level of adjoining AP. If the signal level of the AP around the terminal is higher than the signal level of the AP that the current terminal belongs to and the difference is bigger than the preset Delta Value, the terminal carries out the handover.
  - Initial Value: 5
  - Range: 0~99

- **Scan Time**
  Scan Time indicates the time that a terminal scans for the handover.
  If the signal level is dropped below the signal level of the terminal, the terminal starts the scan operation. At this time, the operation is carried out at the interval of the specified scan time.
  - Initial Value: 1
  - Range: 0~99

- **View Parameter**
  View Parameter shows the current handover parameter values.

3.4.2.3 Side Tone

Side Tone indicates the phenomenon of the caller's own sound or surrounding noise enters into the caller's telephone transmitter, and is echoed via the caller's telephone receiver.
A user can consider this to be a fault when the user cannot hear its own sound or surrounding noise via the phone. In addition, excessive Side Tone enables the user to hear its own voice. SMT-W5100 provides a function to adjust the Side Tone.
If the terminal is registered to the system which has the 'System Interface' function,
A user can adjust the Side Tone only by using System MMC
(refer to '3.4.3 Using the System interface function')

To adjust the Side Tone, select the Side Tone menu from the Hidden menu(**[Menu]** → **[HOLD]** → **[*]** → **[#]**). The Side Tone can be selected from -24 dBm to 0 dBm and the default value is -24 dBm.

3.4.3 Using the System interface function.

To use the system interface function of SMT-5100M terminals on the OfficeServ system, the following items should be programmed.

- Setting the Rx volume value. (MMC 114)
A user can adjust the Handset/Headset/Speaker Rx volume level for each terminal by using MMC 114. If users change the Rx volume level during conversation, the changed Rx volume level is also set to the System MMC 114.

(Handset/Headset volume range: level 1 ~ 14,   Speaker volume : level 1 ~ 5)
(default : Handset/Headset volume : level 6,   Speaker volume : level 4)

- Setting the Tx volume value. (MMC 807)
A user can adjust the Handset/Headset/Speaker Tx volume level for all terminals registered to the system by using MMC 807.
 Selecting WIP from VOL.CONTROL item in MMC 807, Handset/Headset/Speaker Tx volume value can be set.

(Handset/Headset/Speaker volume range: level 1 ~ 8)
(default : Handset/Headset/Speaker volume : level 5)

- **Setting the RTP packetization time. (MMC 841)**

    A user can adjust the RTP packetization time for all terminals registered to the system by using MMC 841.

    Selecting M-FRAME from WIP DSP PARA item in MMC 841, the RTP packetization time can be set.

    (range : 20 ms ~ 60 ms)
    (default : 40 ms)

- **Setting the Side tone (MMC 807)**

    A user can adjust the Side tone for all terminals registered to the system by using MMC 807.

    Selecting WIP from VOL.CONTROL item in MMC 807, the side tone value can be set.

    (range : level 1 ~ 7)
    (default : level 1)

- **Setting the H/O parameter (MMC 846)**

    A user can adjust the H/O parameter (Thresh Hold/Delta Value/Scan Time) for each terminal by using MMC 846.

    The terminal provides the function to change handover parameters and the modified values of the H/O parameter are also set to the System MMC 846.

    (Thresh Hold : 0 ~ 99, Delta Value : 0 ~ 99, Scan Time : 0 ~ 99)
    (default : Thresh Hold : 70, Delta Value : 5, Scan Time : 1)

- **Setting the Echo cancellation (MMC 841)**

    A user can adjust the Echo cancellation for all terminals registered to the system by using MMC 841.

    Selecting ECHOCNCL from WIP DSP PARA item in MMC 841, the Echo cancellation setting value (Enable / Disable) can be set.

    (default : Enable)

3.4.4 Release

The procedure to release SMT-W5100 is the same as that of WIP-5000M(see 3.3.1.2 Release). For detailed release procedure, refer to 'SMT-W5100 User's Manual'.

3.5 Programming non SIP Mode.
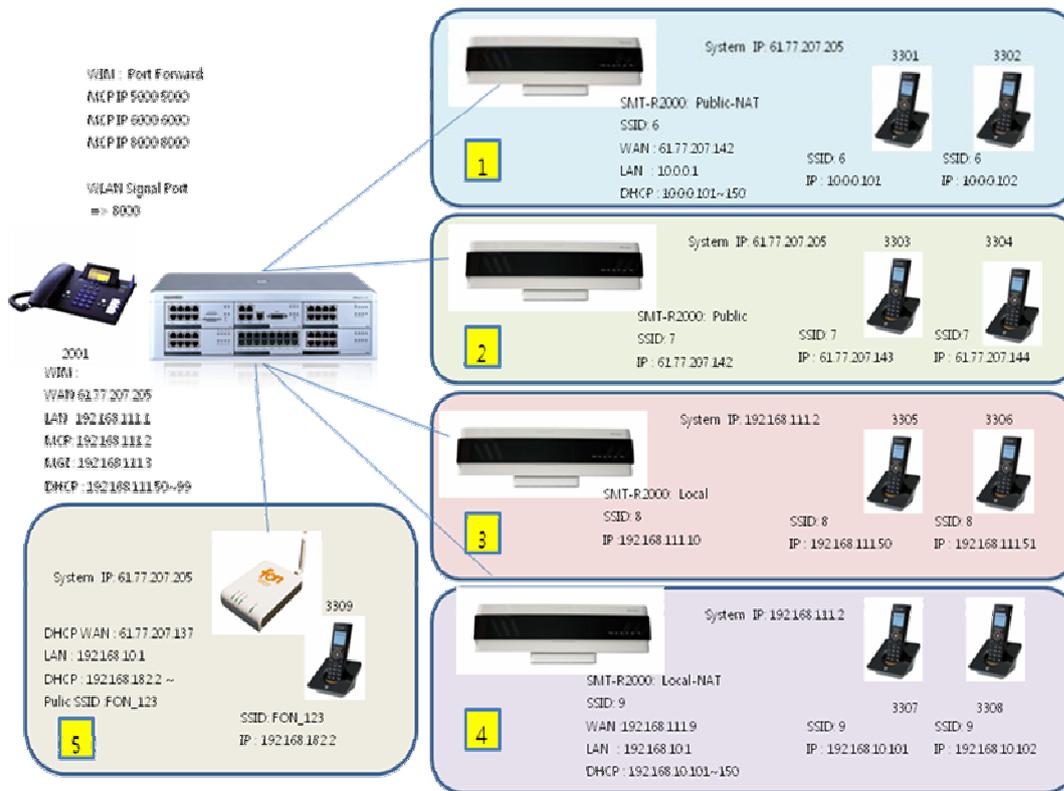
3.5.1 Programming the OfficeServ System Database

To use SMT-R2000 and SMT-5100M terminals on the OfficeServ system, the following items should be programmed.

- • **Setting MCP IP Address (MMC 830)**
- • **Setting MGI IP Address (MMC 831)**
- • **Setting WLAN Access Point Type (MMC 849)**
- • **Setting Terminal registration type (MMC 849)**
- • **Approval of terminal registration (MMC 849)**
- • **Setting Delete SIP (MMC 845)**
- • **Setting of the number of terminals for simultaneous call per AP (MMC 845)**
- • **Setting WLAN SWITCH (MMC 845)**
- • **Setting Codec (MMC 845)**
- • **Setting User ID (MMC 846)**
- • **Setting WIM Port Fordward**

3.5.1.1 Setting MCP IP Address (MMC 830)

Using MMC 830 the system IP address and network settings should be programmed.

SYSTEM IP TYPE : Specifies if the system will be routing data over a public or private network.

SYSTEM PUBLIC IP : The MCP will originate communications to IP phones and VoIP connections outside the local network using this IP address.
Communications to/from this IP will require involvement of the MGI card.
The system identifies communications to/from this address as 'public'.
This allows devices, on remote networks/subnets, to establish communications with the system, without exposing the LAN. See 'SYSTEM IP TYPE'.

The SMT-R2000 is a commercial style AP and is connected to the building LAN via an Ethernet connection. The IP address, Netmask and Gateway address assigned to the Phone system should be entered via MMC 830.

  (ex: SYSTEM IP: 192.168.111.2 , SYSTEM Netmask: 255.255.255.0, SYSTEM Gateway: 192.168.111.1, SYSTEM IP Type:Private w Public , SYSTEM Public IP: 61.77.207.205)

NOTE

MCP PARAMETERS
- IP ADDRESS, GATEWAY, and SUB MASK—any changes to these parameters will not be applied until the MCP card is reset.
- When changing any IP address/value, three digits must be entered for each (octet) field. For example, 192.168.1.10 should be entered as 192 168 001 010.

3.5.1.2 Setting MGI IP Address (MMC 831)

Using MMC 831 the system's MGI card/s should have their IP address and network settings programmed.
IP TYPE : Specifies if the system will be routing data over a public or private network.
PUBLIC IP:
The MGI will originate communications, to IP phones and VoIP connections outside the local network, using this IP address. If this IP address sets 0.0.0.0, 255.255.255.255 or default value then this MGI card uses private IP only. See System IP Type on MMC 830.

(ex: IP: 192.168.111.3, Netmask: 255.255.255.0 Gateway: 192.168.111.1
IP TYPE: Private w Public , Public IP: 61.77.207.205)

> **MGI PARAMETERS**
>
> - IP ADDRESS, GATEWAY, and SUB MASK—any changes to these parameters
>   will not be applied until the MGI card is reset.
>
> - When changing any IP address/value, three digits must be entered for each
>   (octet) field. For example, 192.168.1.10 should be entered as 192 168 001 010.

3.5.1.3 Setting WLAN Access Point Type (MMC 849)

The WLAN service type setting on the system is to select the type of the wireless LAN service supported in the OfficeServ system. To set the desired service type, select the AP type to be installed from Select AP Type in MMC849. There are COMBO AP and DUAL AP in the AP types. Select the DUAL AP to use SMT-R2000.

When this AP type is selected the system will force a reboot, and default ALL other WLAN settings. Therefore this step must be performed first. Note: the default password for this MMC is 0000.

3.5.1.4 Setting Terminal Registration Type (MMC 849)

STATIC WIP IP in MMC849, Disable or Enable can be selected.
The default value is 'Disable'. According to the registration procedure, the system allocates the IP address entered in the system to a terminal (MMC848).
 If 'Enable' is set, Fix IP or one of IP pool in Standard DHCP Server is allocated to a terminal and registered by following the registration procedure.
This method is used when two or more OfficeServ systems exist in the network with the same subnets or the network cannot perform broadcasting.
this method is also used when Standard DHCP Server is used.
this method is also used when NAT AP (Access point : Home Router) is used.
In addition, this method is also used when another subnet handoff is supported by using a WLAN Switch.
(ex: STATIC WIP IP : enable)

Note: The value of STATIC WIP IP must be set 'Enable' for non SIP mode.

3.5.1.5 Approval of Terminal Registration (MMC 849)

For this setting, Disable or Enable can be selected in REGISTER VoWLAN of MMC489. The default value is 'Disable' and terminals cannot be registered. Only when 'Enable' is selected, terminals can be registered.

(ex: REGISTER VoWLAN: enable)

3.5.1.6 Setting DELETE SIP (MMC 845)

> **DELETE SIP PARAMETER**
>
> - If the S/W version of Officeserv is above V4.30a, don't have to set this parameter.
> - This menu is removed from MMC 845 above S/W version V4.30a of the Officeserv System.

During initial Wifi terminal registration, the value is setting registered method.
The default value is 'disable'.
'Disable' is selected, when Registered method is used SIP protocol.
'Enable' is selected, when Registered method is used non SIP protocol (Samsung property protocol).
non SIP method is also used when NAT AP (Access point : Home Router)
In this case, from system setting items, select STATIC WIP IP(MMC 849) as 'Enable' and register the terminal as non SIP mode and fixed IP or Standard DHCP Type.
Setting IP TYPE, PUBLIC IP (MMC 830 , MMC 831) as ' Public IP or Firewell '

(ex DELETE SIP : ENABLE)

3.5.1.7 Setting the number of terminals for simultaneous call per AP (MMC 845)

This setting is to select the number of terminals that can make simultaneous call at an AP. For this setting, the terminal numbers can be selected in MAX AP CH of MMC845.
The default value is '0' and it means that the number of terminal calls is not limited. If eight or more terminals are selected, the degradation of service quality may be occur in voice and data services.

3.5.1.8 Setting WLAN SWITCH (MMC 845)

This setting is performed in the environment that WLAN SWITCH is used to configure the network and to receive services. For this setting, you can select Disable or Enable in WLAN SWITCH of MMC845. When WLAN SWITCH is used, 'Enable' is selected.

3.5.1.9 Setting Codec   (MMC 845)

The voice Codec for VoIP terminal can be specified. The default voice Codec may vary according to the system types. The Codec List for a terminal can be selected in Codec List Menu of MMC 845.

3.5.1.10 Setting User ID   (MMC 846)

During initial Wifi terminal registration, the user ID can be registered.
The default value is '1212'. However, if the user ID is allocated and registered as the

extension number to be allocated to a terminal by using MMC846, the allocation of extension number to be registered.

3.5.1.11 Setting WIM Port Forward

If   WIM card is installed in Officeserv System, Set the Port forwarding on the WIM card. WIFI Phone uses UDP Port 8000 as the Signal Port.
For more information about the WIM card setting, refer to the Officeserv System Admin. Guide.

<MMC Setting example for non SIP mode.>

MMC 830
SYSTEM IP: 192.168.111.2
SYSTEM Netmask: 255.255.255.0
SYSTEM Gateway: 192.168.111.1
SYSTEM IP Type: Private w Public
SYSTEM Public IP: 61.77.207.205

MMC 831
IP: 192.168.111.3
Netmask: 255.255.255.0
Gateway: 192.168.111.1
IP TYPE: Private w Public
Public IP: 61.77.207.205

MMC 849
Selet AP Type : Dual AP

SYSTEM   REBOOT

MMC 849
STATIC WIP IP : enable
REGISTER VoWLAN: enable

MMC 845
DELETE SIP : enable (If this parameter exists)
WLAN SWITCH: disable

3.5.2 Registration process.

3.5.2.1   Case 1. Registration of Public NAT location (HOME ZONE , HOT SPOT)

The SMT-W5100 is used when NAT AP (Access point : Home Router , Hot Spot)
Private IP address is assigned to SMT-W5100.

Registration process.

1) Press the [MENU] button in idle mode, and then select the [8]. System icon.
Enter the Password (0000) and select the Registration option.

2) Select the system number option.
   Ex) Select system 1

3) Select the system Registration protocol type option.
   Ex) Select non SIP MODE

4) this registers the phone using the IP addresses
   Ex) Select Standard DHCP

5) Select Using of FON AP
   Ex) Select Off

6) Enter System IP Address
   Ex) Enter 61.77.207.205

7) Enter SSID
   -    Select manual, enter SSID
        Press and hold the dial key to enter numeric digit
         Ex) Enter 6
   -    Select Auto. Select SSID
         Ex) Select 6
8) Enter the User ID. The default ID is 1212
        Ex) 3301

9) Enter the Password The default password is 0000
        Ex) 0000

10) Enable the WMM (WiFi MultiMedia) feature The default is ON

Ex) Select ON

11) Select the Encryption Mode

If the WEP Encryption mode has been selected,
select ASCII Mode or HEX Mode for the WEP Key.
If a WPA_PSK or WPA2_PSK key has been enabled,
select AES Mode or TKIP Mode to enter the Encryption Key

Ex) Enter the Encryption Key and press the [OK] button.
If no encryption key is used, leave this blank

3.5.2.2 Case 2. Registration of Public location

The SMT-W5100 is used when Bridge AP
Public IP address.is assigned to SMT-W5100

Registration process.

1) Press the [MENU] button in idle mode, and then select the [8]. System icon.
Enter the Password (0000) and select the Registration option.

2) Select the system number option.
Ex) Select system 1

3) Select the system Registration protocol type option.
Ex) Select non SIP MODE

4) this registers the phone using the IP addresses
Ex) Select Static IP Mode

5) Enter   Phone IP Address
Ex) Select 61.77.207.143

6) Enter System IP Address
Ex) Enter 61.77.207.205

7) Enter Phone Gateway
Ex) Enter 61.77.207.1

8) Enter Phone Netmask
Ex) Enter 255.255.255.0

9) Enter SSID

- Select manual, enter SSID
  Press and hold the dial key to enter numeric digit
  Ex) Enter 7
- Select Auto. Select SSID
  Ex) Select 7

10) Enter the User ID. The default ID is 1212
  Ex) 3303

11) Enter the Password The default password is 0000
  Ex) 0000

12) Enable the WMM (WiFi MultiMedia) feature The default is ON
  Ex) Select ON

13) Select the Encryption Mode
  If the WEP Encryption mode has been selected,
  select ASCII Mode or HEX Mode for the WEP Key.
  If a WPA_PSK or WPA2_PSK key has been enabled,
  select AES Mode or TKIP Mode to enter the Encryption Key

  Ex) Enter the Encryption Key and press the [OK] button.
  If no encryption key is used, leave this blank

3.5.2.3   Case 3. Registration of Local location (OFFICE Zone)

The SMT-W5100 is used when Bridge AP
Private IP address is assigned to SMT-W5100 .

Registration process.

1)   Press the [MENU] button in idle mode, and then select the [8]. System icon.
  Enter the Password (0000) and select the Registration option.

2)   Select the system number option.
  Ex) Select system 1

3)   Select the system Registration protocol type option.
  Ex) Select non SIP MODE

4)   this registers the phone using the IP addresses
  Ex) Select Standard DHCP

5) Select Using of FON AP
   Ex) Select Off

6) Enter System IP Address
   Ex) Enter 192.168.111.2 or 61.77.207.205

7) Enter SSID
   - Select manual, enter SSID
     Press and hold the dial key to enter numeric digit
     Ex) Enter 8
   - Select Auto. Select SSID
     Ex) Select 8
8) Enter the User ID. The default ID is 1212
     Ex) 3305

9) Enter the Password The default password is 0000
     Ex) 0000

10) Enable the WMM (WiFi MultiMedia) feature The default is ON
     Ex) Select ON

11) Select the Encryption Mode
     If the WEP Encryption mode has been selected,
     select ASCII Mode or HEX Mode for the WEP Key.
     If a WPA_PSK or WPA2_PSK key has been enabled,
     select AES Mode or TKIP Mode to enter the Encryption Key

     Ex) Enter the Encryption Key and press the [OK] button.
     If no encryption key is used, leave this blank

3.5.2.4   Case 4. Registration of Local NAT location (OFFICE Zone)

The SMT-W5100 is used when NAT AP
Private IP address is assigned to SMT-W5100

Registration process.

1) Press the [MENU] button in idle mode, and then select the [8]. System icon.
   Enter the Password (0000) and select the Registration option.

2) Select the system number option.
   Ex) Select system 1

3) Select the system Registration protocol type option.
   Ex) Select non SIP MODE

4) this registers the phone using the IP addresses
   Ex) Select Standard DHCP

5) Select Using of FON AP
   Ex) Select Off

6) Enter System IP Address
   Ex) Enter 192.168.111.2

7) Enter SSID

   - Select manual, enter SSID
     Press and hold the dial key to enter numeric digit
     Ex) Enter 9
   - Select Auto. Select SSID
     Ex) Select 9

8) Enter the User ID. The default ID is 1212
   Ex) 3307

9) Enter the Password The default password is 0000
   Ex) 0000

10) Enable the WMM (WiFi MultiMedia) feature The default is ON
    Ex) Select ON

11) Select the Encryption Mode
    If the WEP Encryption mode has been selected,
    select ASCII Mode or HEX Mode for the WEP Key.
    If a WPA_PSK or WPA2_PSK key has been enabled,
    select AES Mode or TKIP Mode to enter the Encryption Key

    Ex) Enter the Encryption Key and press the [OK] button.
    If no encryption key is used, leave this blank

3.5.2.5   Case 5. Registration of Using FON AP location

The SMT-W5100 is used when FON AP
Private IP address is assigned to SMT-W5100

Registration process.

1)   Press the [MENU] button in idle mode, and then select the [8]. System icon.
  Enter the Password (0000) and select the Registration option.

2)   Select the system number option.
   Ex) Select system 1

3)   Select the system Registration protocol type option.
   Ex) Select non SIP MODE

4)   this registers the phone using the IP addresses
   Ex) Select Standard DHCP

5)   Select Using of FON AP
   Ex) Select On

6)   Enter   FON ID
   Ex) Enter   ID

7)   Enter   FON PASSWORD
   Ex) Enter   PASSWORD

8)   Enter System IP Address
   Ex) Enter 61.77.207.205

9)   Enter SSID
   -   Select manual, enter SSID
      Press and hold the dial key to enter numeric digit
       Ex) Enter FON_123
   -   Select Auto. Select SSID
       Ex) Select FON_123

10) Enter the User ID. The default ID is 1212
       Ex) 3309

11) Enter the Password The default password is 0000

Ex) 0000

12) Enable the WMM (WiFi MultiMedia) feature The default is ON
Ex) Select ON

13) Press the [OK] button.

CHAPTER 4. Maintenance

This chapter describes how to monitor SMT-R2000/SMT-W5100 and upgrade SMT-R2000/WIP-5000M/SMT-W5100.

4.1 Monitoring

4.1.1 Monitoring SMT-R2000

4.1.1.1 Checking Event on WEB

You can check an event created in SMT-R2000 on **[Status]** → **[Event]** screen as shown in the figure below. Representatively, the screen shows if the terminal is normally connected or WPA key is exchanged.
The event creation time is displayed on the basis of Network Time Protocol(NTP). However, if the terminal did not receive the time in NTP, the terminal display the time calculated on the basis of the booting time of the SMT-R2000.

4.1.1.2 Checking Log

The Relay log function of SMT-R2000 is used to check the log. This function transmits the event created in SMT-R2000 to a specific PC(Relay Host). By using this function, you can check the events created on all SMT-R2000 with a PC. Since the events created in several APs can be checked in chronological order, this function is very useful to monitor all APs when a problem occurs.

1. SMT-R2000 Setting

1) Check 'Relay log' in **[Status]** → **[Events]**.
2) Enter the IP of a PC to the Relay Host.
3) Enter 514(default value. If a relay port is changed in Syslog Daemon, this value should be, also, changed) to the Relay Port.
4) Check the **[Update]** button.

```
View events generated by this access point

Options                                                    ☑ Relay Log
Persistence  ○ Enabled  ⦿ Disabled                        Relay Host 192.168.111.250
Severity   7 ▾                                             Relay Port 514
Depth    128
                    Update                                              Update
```

To view the message in detail, raise the Debug Level of SMT-R2000.

1) Access the Telnet server by using the corresponding SMT-R2000 IP.
   - ID: admin
   - Password: samsung

2) Run the following command:

```
>> set debug level [0~4]
>> save-running
>> reboot
```

2. PC Setting

1) Install Syslog Daemon. In this document, Syslog Daemon program for Windows is used.
2) Download the following two programs from a Web site, http://www.kiwisyslog.com/:
   Kiwi Syslog Daemon
   Kiwi Log Viewer
3) Install and execute Kiwi Syslog Daemon.
4) Specify a file path and a file name to store log in Kiwi Syslog Daemon.
5) Select **[File]** → **[Setup]**.

6) Select **[Rules]** → **[Actions]** → **[Log to file]**.
   The default value is as follows:
   C:\Program Files\Syslogd\Logs\SyslogCatchAll.txt

7) If you want to save logs to C:\log according to date and time, change
   'C:\log\Syslog%DateISO%TimeHH.txt' in 'Path and file name of log file'.
   (%DateISO and %TimeHH are Year-Month-date and time, respectively.)
   If you find a desire value from 'Insert AutoSplit value' and put the file name into the
   value, the macro format is displayed.

8) Click **[Apply]** → **[OK]**.

9) Kiwi Log Viewer is the program to view the log file stored in the above.

4.1.2 Monitoring SMT-W5100

The Relay log function of SMT-W5100 is used to check the log. This function transmits the log created in SMT-W5100 to a specific PC(Relay Host). By using this function, you can check the events created on each SMT-W5100 with a PC. This function is very useful for S/W developers to monitor SMT-W5100 when a problem occurs.
[This function is provided only above S/W version V01.07.01]

1. SMT-W5100 Setting   (by accessing the web page)

1) Access the Web page of SMT-W5100 (User ID : smtw5100, Password : smtw5100)

2) Select the [**Set Syslog**] on the left side of the WEB page.

3) Enter the IP of a PC to the Relay Host.
4) Enter 514(default value) to the Port number. If a relay port is changed in Syslog Daemon, this value should be also changed.
5) Select the Module that you want to monitor. (ex. MMI, SIP …)
6) Select the Debug level that you want to set. (ex. INFO, DATA ..)
7) Select **[ON]** in the Syslogd En/Dis Menu.
8) Check the **[SAVE]** button.
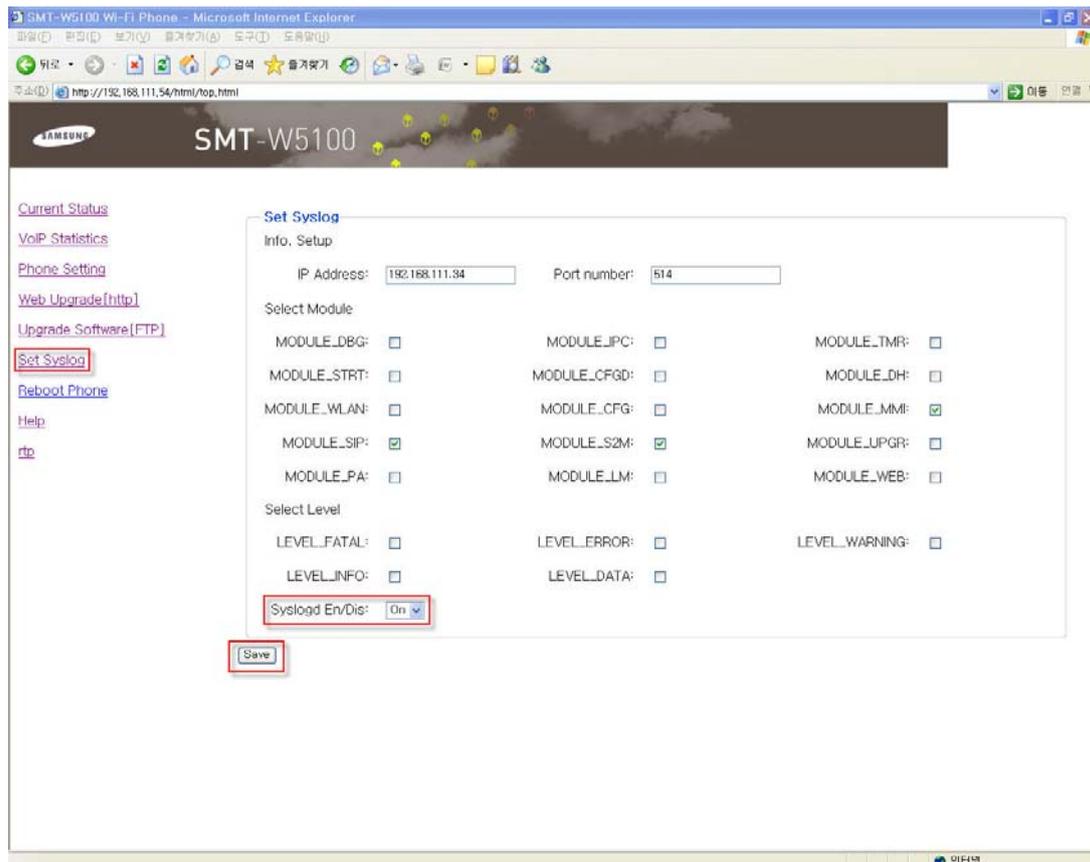
2. SMT-W5100 Setting   (by accessing hidden menu on the phone)

1) Access the hidden menu of SMT-W5100
   Enter the buttons of WIP-5000M in turn: **[Menu]** → **[HOLD]** → **[*]** → **[#]**
2) Select the [**Set Syslog**] at the end of the hidden menu.
3) Enter the IP address of a PC in **[1.Info. Setup]** → **[IP Address]**
4) Enter 514(default value) to the Port number in **[1.Info. Setup]** → **[Port number]**.
   If a relay port is changed in Syslog Daemon, this value should be also changed.
5) Select the Module that you want to monitor in **[2.Select Module]** Menu.
   (ex. MMI, SIP …)
6) Select the Debug level that you want to set in **[3.Select Level]** Menu.
   (ex. INFO, DATA ..)
7) Select **[ON]** in **[4.Syslogd En/Dis]** Menu.

3. PC Setting

1) Install Syslog Daemon. In this document, Syslog Daemon program for Windows is used.

2) Download the following two programs from a Web site, http://www.kiwisyslog.com/:
   Kiwi Syslog Daemon
   Kiwi Log Viewer

3) Install and execute Kiwi Syslog Daemon.

4) Specify a file path and a file name to store log in Kiwi Syslog Daemon.

5) Select **[File]** → **[Setup]**.

6) Select [Rules] → [Actions] → [Log to file].
   The default value is as follows:
   C:\Program Files\Syslogd\Logs\SyslogCatchAll.txt

7) If you want to save logs to C:\log according to date and time, change
   'C:\log\Syslog%DateISO%TimeHH.txt' in 'Path and file name of log file'.
   (%DateISO and %TimeHH are Year-Month-date and time, respectively.)
   If you find a desire value from 'Insert AutoSplit value' and put the file name into the value, the macro format is displayed.

8) Click [Apply] → [OK].

9) Kiwi Log Viewer is the program to view the log file stored in the above.

4.2 Upgrade

4.2.1 SMT-R2000 Upgrade

SMT-R2000 can be easily downloaded via WEB UI.

As shown in the figure below, a desired Firmware file can be found and upgraded from the **[Management]** → **[Upgrade]** screen. The Firmware file name should be ended to by 'upgrade.tar'.
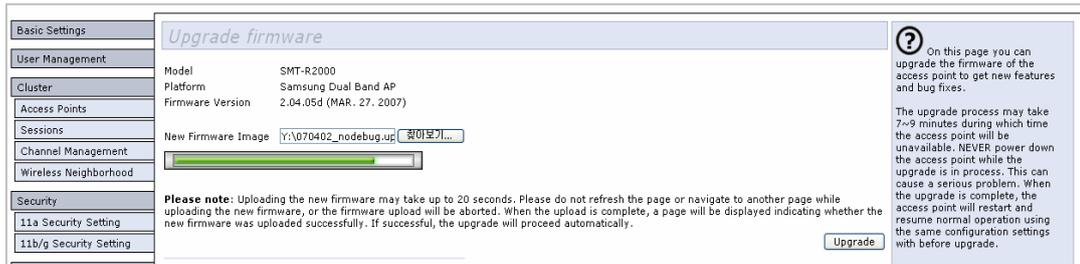
During the upgrade, a status bar appears to display the progress. The upgrade is completed after several minutes, a new version is stated in the Firmware version and a message showing that the upgrade is completed is displayed.

The db is not affected by the upgrade procedure.

4.2.2 WIP-5000M Upgrade

The WIP-5000M S/W area is divided into application area upgrade and downloader(boot) area and the upgrades of these two areas are done separately.
After checking the preparations for the upgrade of WIP-5000M S/W and examining how to upgrade the application area, let's check how to upgrade the S/W for downloader(Boot) area first.

Preparations for software Upgrade

- PC or notebook
- LAN cable
- WIP 5000M terminal
- S/W image(WIP 5000M S/W image)
- TFTP program(Example: WinTFTP Server 1.0)

Setting of TFTP Server Program Environment

1) Install and execute the WinTFTP Server program.
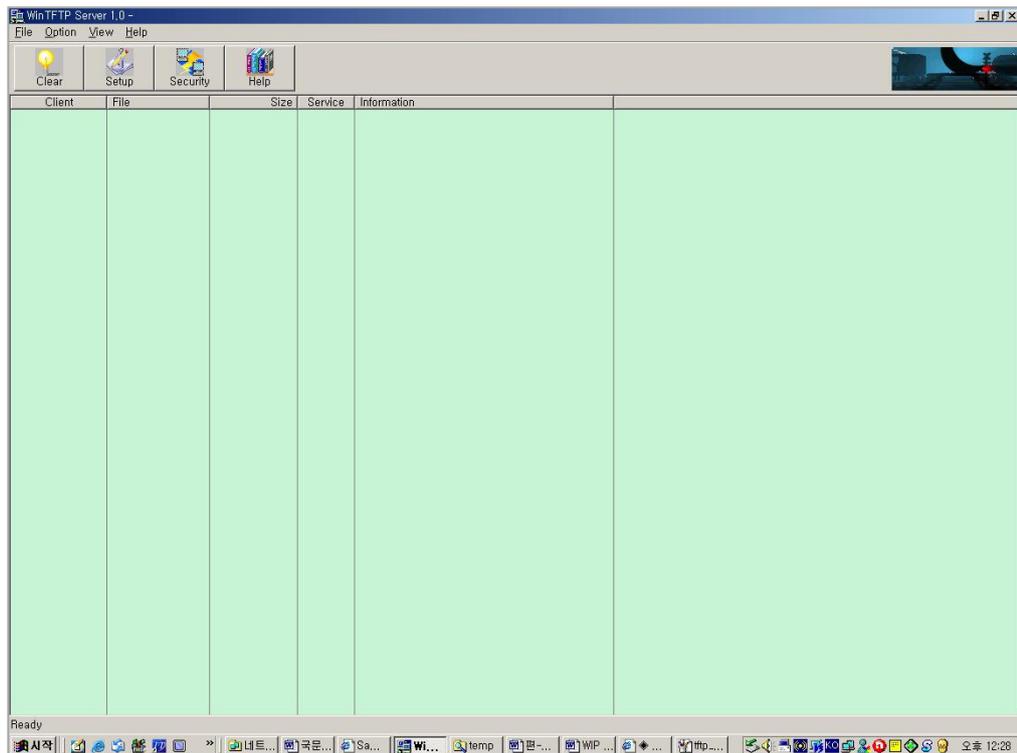
2) Move to the **[Setup]** menu and select the fold where the S/W image of the terminal to be upgraded is stored. Press the **[OK]** button, and the TFTP server goes into operation mode.(The WIP 5000M S/W image to be upgraded should be stored in the specified folder in advance.)
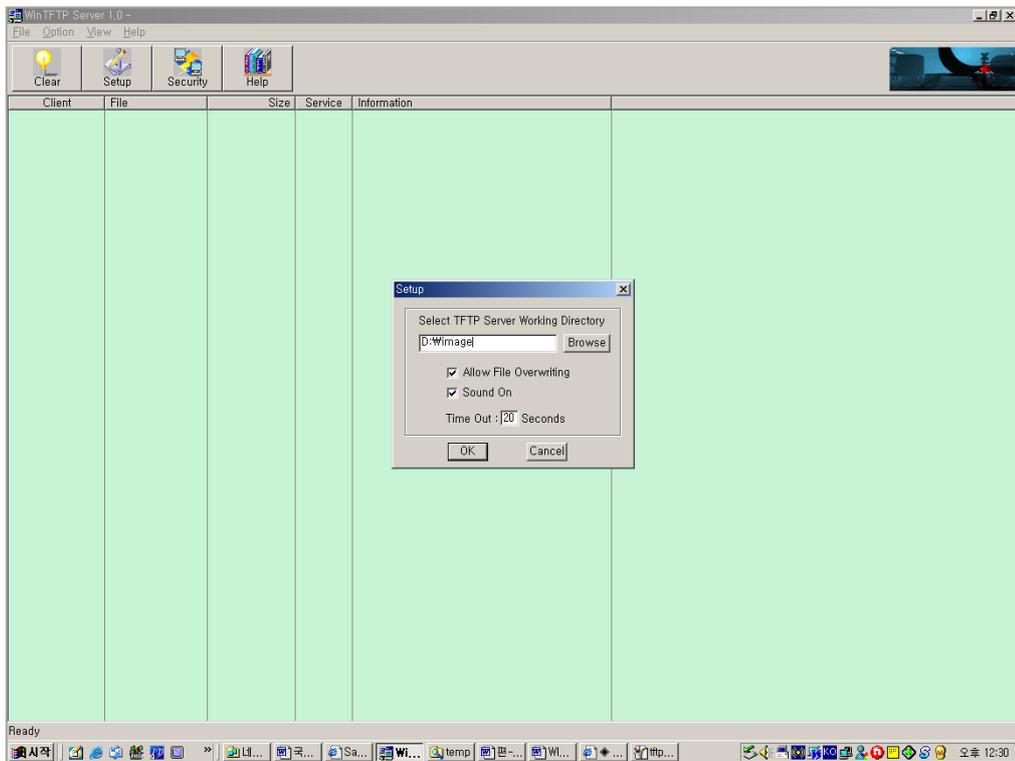
Checking the Connection with WIP-5000M

1) Check the IP address of WIP-5000M first. The IP address can be checked by using the Hidden menu of WIP-5000M. Enter the buttons of WIP-5000M in turn: **[Menu]** → **[HOLD]** → **[*]** → **[#]** → **[2].**
The IP address of WIP-5000M is displayed as shown in the right figure.

2) Open the Command window of your notebook and perform a ping test to the IP address of WIP-5000M.
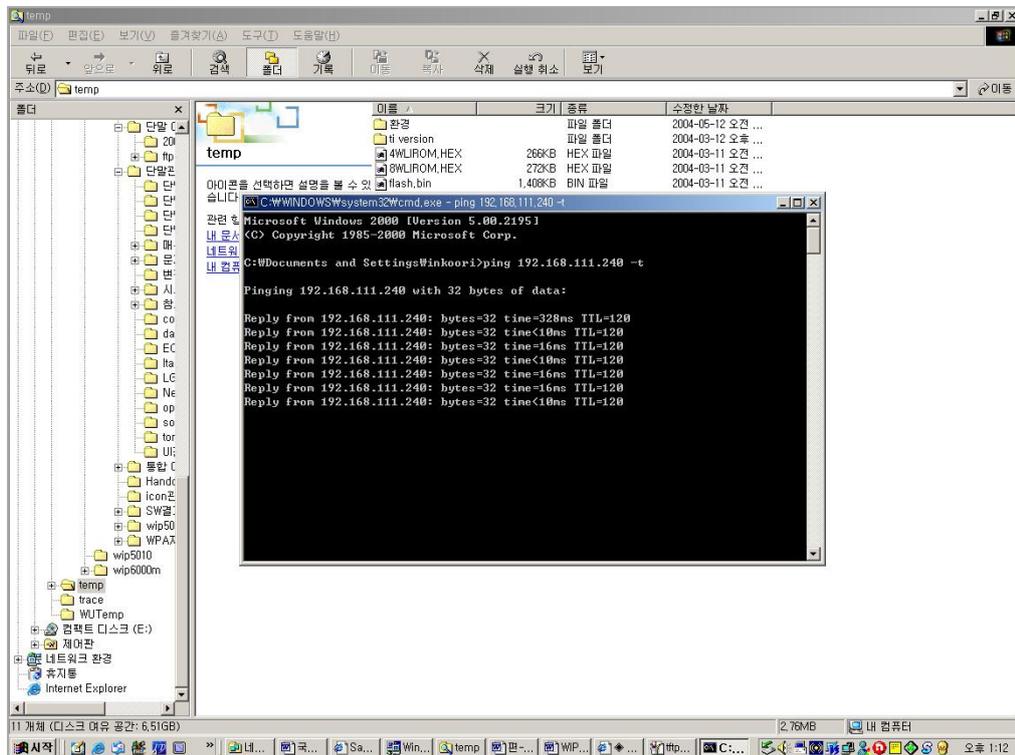
If the response for the ping test is received, WIP-5000M is connected and the upgrade can proceed.
(If no response is received, check if the LAN cable is correctly connected or the IP setting of the notebook is correct.)

Upgrading WIP-5000M S/W (Application S/W Area)

1) Execute Explorer program and enter the IP address of WIP-5000M in the address bar. If WIP-5000M is connected, the window below appears:
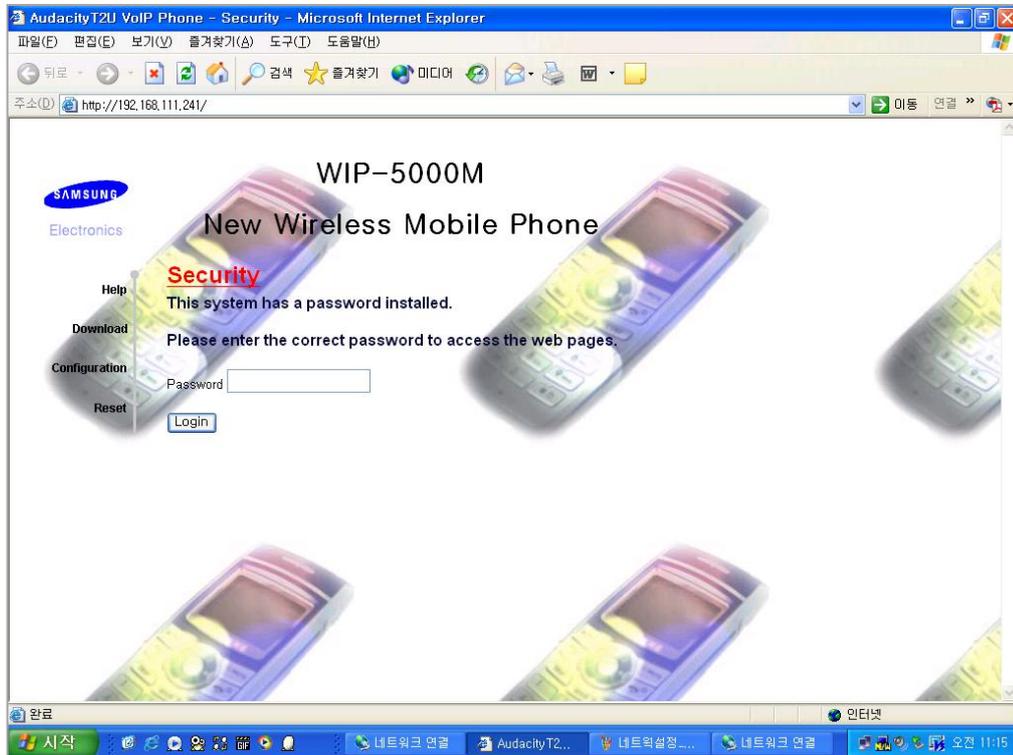
2) Enter the password of WIP-5000M in the password input box on the middle of the screen.(The default password is '1234').
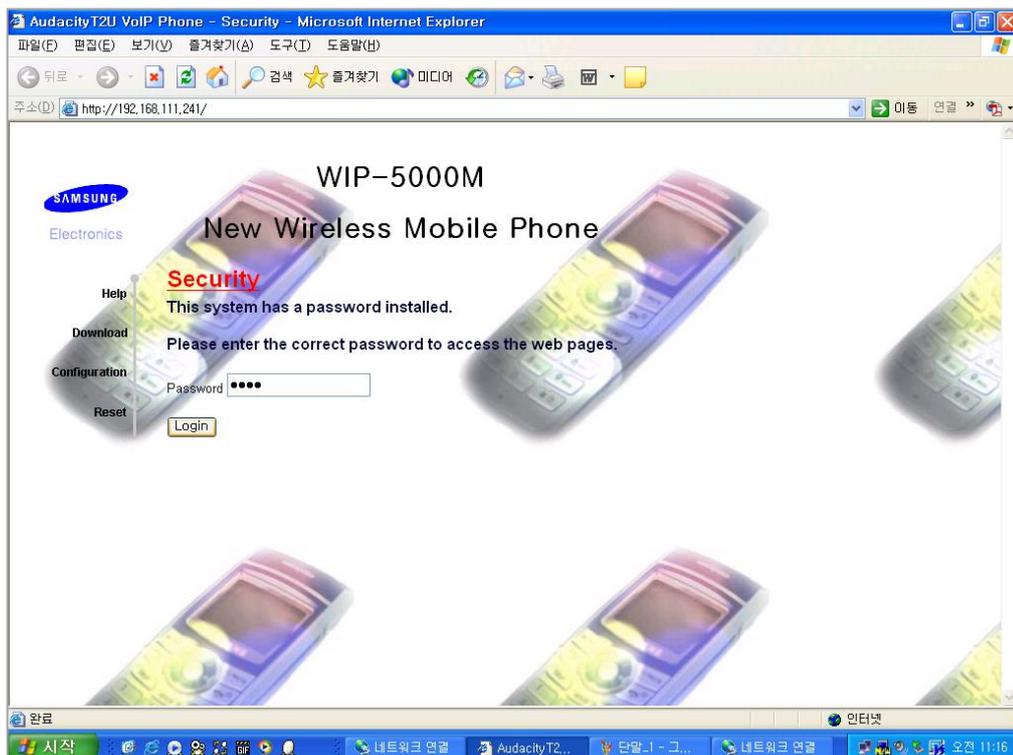
3) If the password is correct, the following window appears.(If the password is incorrect, the initial password input window re-appears.)

4) Click the **[Download]** menu from the left menu list. The window changes to the following window:
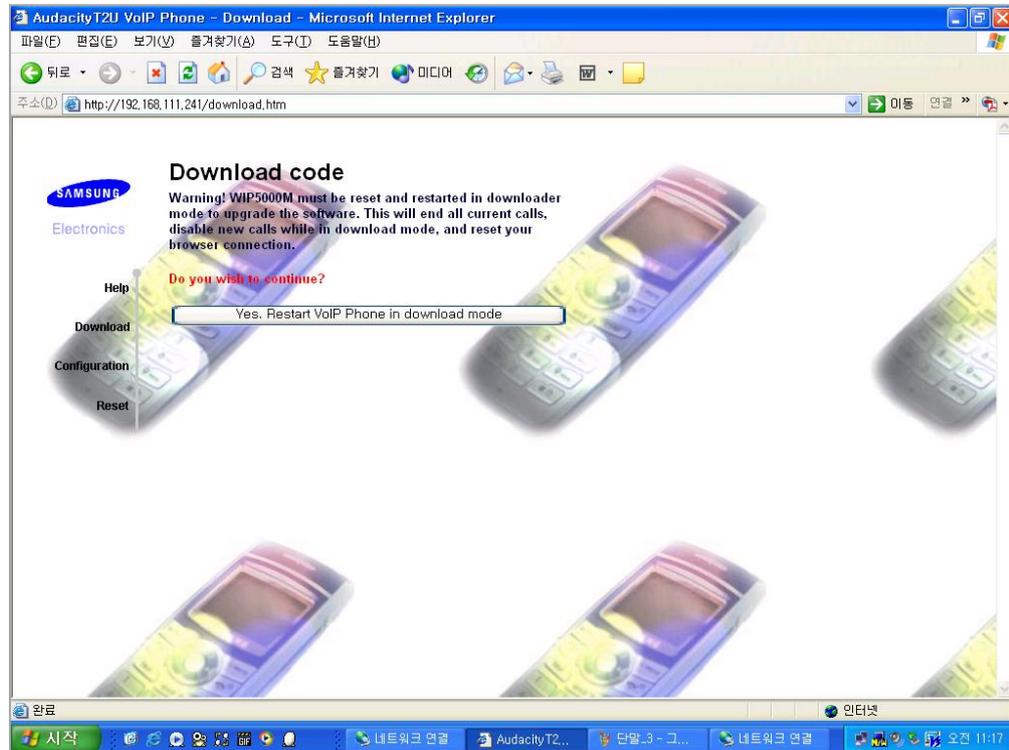
5) Click the **[Restart]** menu on the above figure, and WIP-5000M is restarted. And, now, S/W download is available.(WIP-5000M may be not restart and the screen may return to the original screen. In this happens, click the **[Restart]** menu again).

6) If WIP-5000M is in S/W Download mode, the letters '** Downloader **' and 'SAMSUNG' are displayed on the LCD of WIP-5000M. Then window with the initial access window appears on Explorer window.
Enter the password, '1234' in the Password input box again.
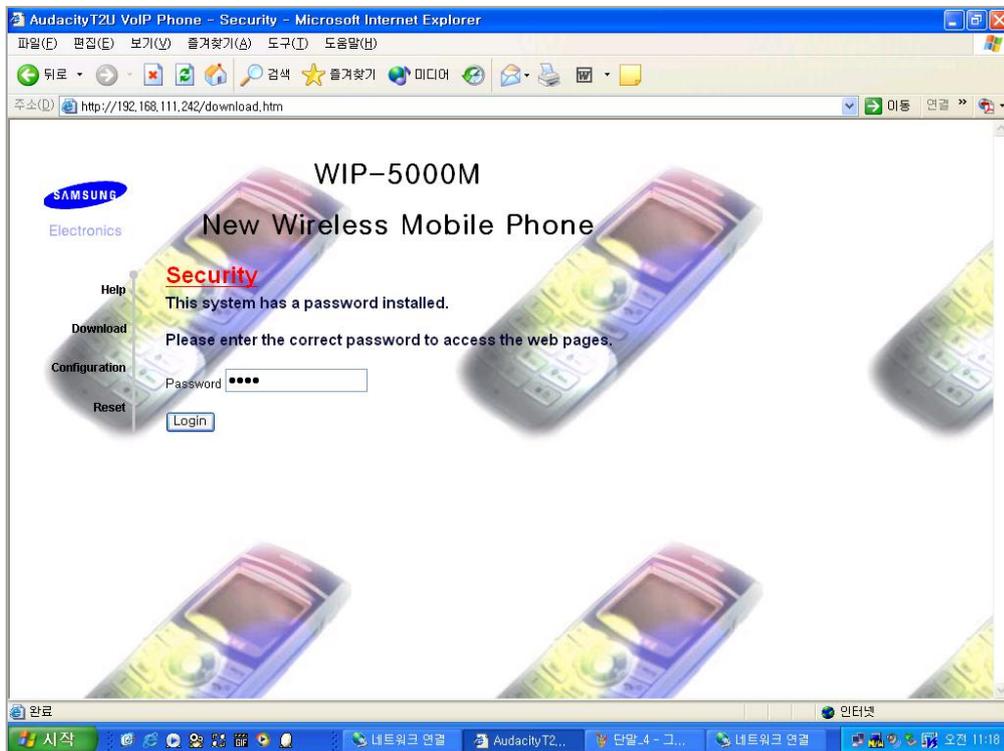
7) The access window appears again. Select the **[Download]** menu on the left side.

8) The boxes to enter the IP address of TFTP server and the name of the S/W image to be downloaded appear. Enter the IP address and a file name and click the **[Start Download]** button.
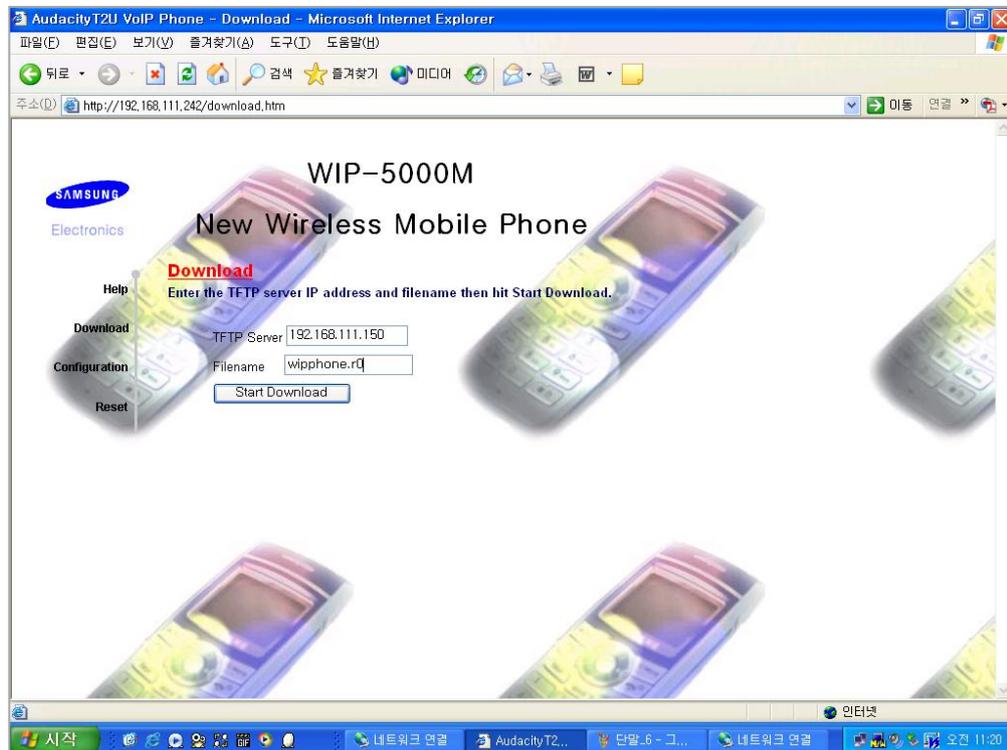
9) Enter the IP address specified in the notebook to the TFTP Server input box and the S/W image name to be downloaded to the file name input box. After that, click the red 'Start Download' button to start the image download.(At this time, the TFTP Server program displays the following window. In addition, you can see the file download on the on the LCD of WIP-5000M.)
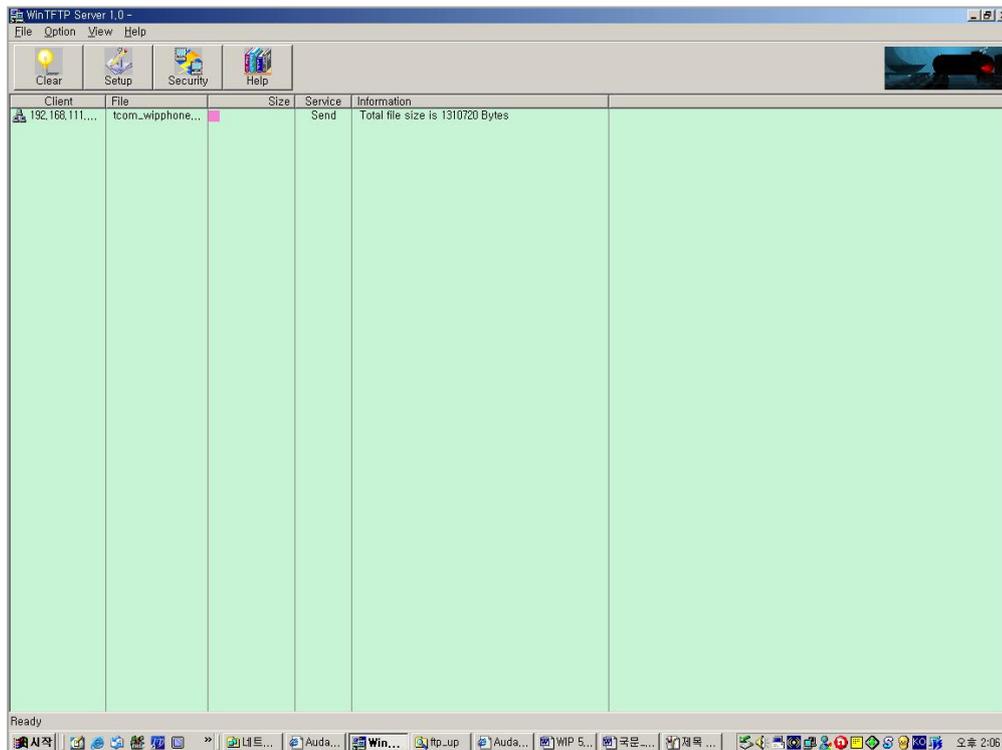
If the download does not start, check the following items:
- If the WinTFTP Server program is in use.
- If the IP address of the TFTP server(notebook) is correct.
- If the name of the image file to be downloaded is correct.
- If the image file to download exists in the folder specified in WinTFTP Server program.

After checking the above items, select the **[Download]** menu on Figure 7) and start the download again.

⚠️ **CAUTION**	**Maintaining the Power-on State While Downloading** Make sure that the power of the OfficeServ system or WIP-5000M is turned on while downloading. The WIP-5000M may be powered off while downloading because its battery is dead. If the WIP-5000M is powered off while downloading, the download may fail. Before starting the download, check the battery status of the WIP-5000M. If the remaining battery amount is not sufficient, carry out the download procedure whilst charging the WIP-5000M

10) When the download is completed the window is changed as shown in the figure below and letters, 'Download OK' are displayed on the LCD of WIP-5000M. After that, letters, '** Downloader **' and 'SAMSUNG', are displayed one after the other.

11) If you select the **[Reset]** menu from the left menus, the following window opens. Select 'Reset and execute main application', which is the last radio button, and click the **[Reset]** button.
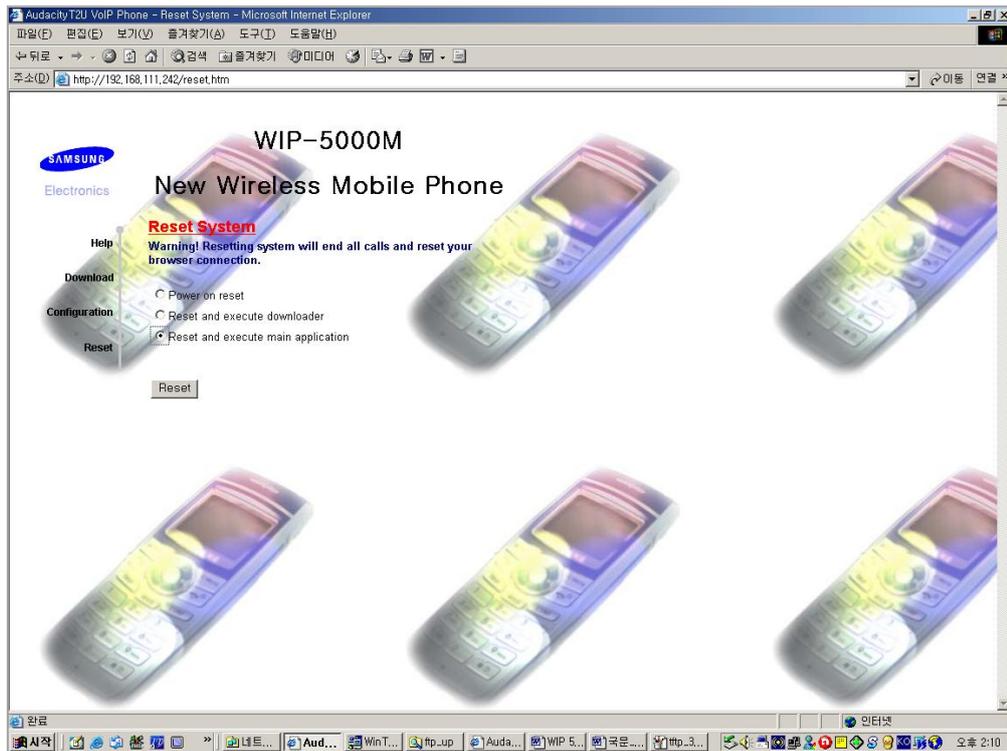
The S/W upgraded of WIP-5000M is complete.

Upgrading WIP-5000M Downloader (Boot) Image

The WIP-5000M downloader(boot) area is the area that contains the information on terminal's booting information. Be careful that, if the download fails, the terminal cannot recovered.

1) The preparations are the same as those for the Application Image upgrade. However, to prevent the terminal from being powered off during the upgrade, check if the remaining battery capacity is sufficient. If the remaining capacity is insufficient, start the download after putting the terminal into the charger.

2) The next steps are the same as those of the above 'Upgrading Application Image'(until Step 10). However, save the file name to be downloaded as the upgrade image file(upgrader.r0).

3) When the upgrade is completed, select 'Power on Reset', which is the first radio button, and click the **[Reset]** button.
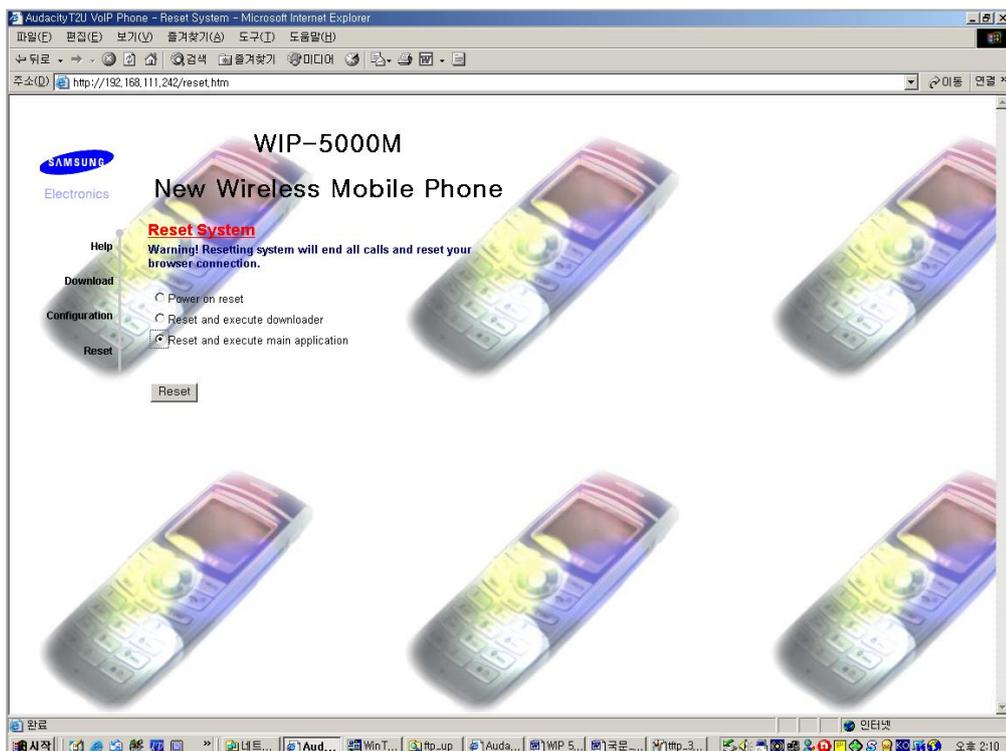
4) Decompress the compressed image in the terminal and store to the Flash ROM.
If this process is finished, the terminal display 'Complete' on the LCD and opens the initial download window.

5) If the downloader(boot) image is upgraded, the Application image is deleted and, therefore, the Application image should be upgraded again. At this time, since the terminal does not have the Application area, the upgrade should be attempted in the Engineer mode below.

WIP-5000M S/W Upgrade (Engineer Mode)

The Engineering mode is the way to upgrade WIP-5000M when the terminal is not registered in the system. Since, basically, the upgrade starts in power-off status, finish the terminal or separate/re-assemble the battery.

1) Press **[Finish]** + 5 keys at the same time and turn on the terminal.

2) Select **[2. Download Mode].**

3) Select **[1: Edit Ip].**

4) Enter IP
   - If the input IP address does not conflict or is not overlapped with the addresses of the other device, any address of the network addresses in the OfficeServ can be used.
   - For '.', enter by using the **[*]** button on the terminal.
   - Press the 'OK' button after entering the IP address to go to next.

5) Enter SSID.

6) Enter WEPKEY.

7) Select WEPKEY mode**.**

8) Completion
   - Enter the same values of SSID and WEP KEY as those of SSID and WEP KEY entered in the previous wireless LAN setting stage.
   - If WEP KEY has not been set, press the **[OK]** button to skip the stage.
   - The terminal is put into Download mode, the same screen as Step 8 is displayed.

Checking the connection with WIP-5000M

Open the command window of the notebook and perform the ping test to the IP address of WIN-5000M.

If the response for the ping test is received, WIP-5000M is connected.
(If no response is received, check if the LAN cable is correctly connected or the IP setting of the notebook is correct.)

Upgrade of WIP 5000M Application

If the link connection between the terminal and a Note PC is confirmed, execute Explorer program and attempt to browse by using the terminal IP. If the access is completed, perform the above procedure 'Upgrading WIP-5000M S/W' from step 6).

4.2.3 SMT-W5100 Upgrade

SMT-W5100 performs the S/W upgrade by using wireless LAN and the S/W upgrade requires an FTP Server program. Before starting the upgrade, store the S/W image to upgrade to the directory specified in FTP server and start the FTP server.

Preparations before Upgrading

1) Connect the LAN port of SMT-R2000 to the LAN port of a PC by using a cable. Otherwise, install a wireless LAN card to a PC and enter the SSID value of the LAN card consistent with the SSID value specified in SMT-R2000.
2) Set the PC network corresponding to the same subnet of the OfficeServ system connected to SMT-R2000(IP Address, Subnet Mask and Gateway).

Setting FTP Server Program

1) Install and execute the FTP Server program.
2) Specify the 'Home directory' of the FTP Server program.
    After specifying 'Home directory' and creating the sub-directory in the 'Home directory', create the folder name as 'SMT-W5100'. Save the S/W image for the upgrade to the 'Home directory'.
3) User ID and password do not need to be specified in the FTP server program.
4) Start the FTP server.

Upgrading SMT-W5100 software (Hidden Menu)

The S/W Upgrade menu is located in the Hidden menu.

1) To go to the Hidden menu, enter **[Menu]** ➔ **[HOLD]** ➔ **[*]**➔ **[#]** in turn.

2) In the Hidden menu mode, the following screen appears. Select **[8. S/W Upgrade]** for upgrade.

3) Select **[1. Info. Setup]** on the following screen.

4) If a terminal has been registered in the system, select **[1. Basic Setup]** on the following screen.

   If a terminal has not been registered in the system. Select **[2. High Setup].**

   If **High Setup** is selected, the following input procedure is added.(In this mode, wireless LAN security must be disabled for upgrade)

   • After entering the current SSID value, press the **[OK]** button to go to the next stage.

After entering the IP address that corresponds to the same subnet as the OfficeServ system connected to SMT-R2000 and has no confliction with the subnet, press the **[OK]** button to complete the input procedure of High Setup. After that, select Basic Setup and continue the following steps.

5) Enter the IP address of the FTP server. After that, press the **[OK]** button to go to the next stage.

6) After entering User ID specified in the FTP server, press the **[OK]** button to go to the next stage.
If User ID has not been specified in the FTP server, press the **[OK]** with no input to go to the next stage.

7) After entering Password specified in the FTP server, press the **[OK]** button to go to the next stage.
If Password has not been specified in the FTP server, press the **[OK]** with no input to go to the next stage.

8) Select a protocol for the upgrade.
After that, press the **[OK]** button to go to the next stage.

9) The following screen appears.
Press the **[OK]** button to finish the information setting for the SMT-W5100 S/W upgrade.

10) To view the entered information, select **[2. View Current]**.

11) If you select **[2. View Current]**, the following screen appears.

12) Select **[3. Upgrade]** to upgrade the S/W.

13) Select **[Yes]** to start the upgrade.

14) Do not turn off the power during the upgrade.

Upgrading SMT-W5100 software (Web page)

SMT-W5100 S/W can be upgraded by accessing Web page.
[This function is provided only above S/W version V01.07.01]

1) Execute Explorer program and enter the IP address of SMT-W5100 in the address bar.
   And enter the user ID and password of SMT-W5100.
   (User ID : smtw5100, Password : smtw5100)
   If SMT-W5100 is connected, the window below appears.
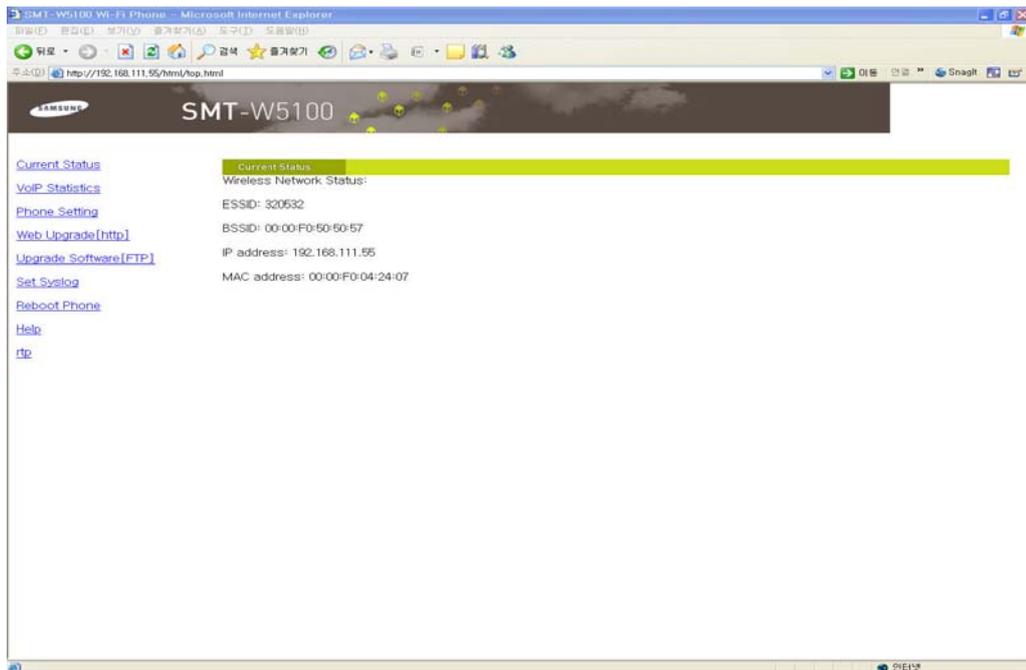
2) Click the "**Upgrade Software[FTP]**" menu on the left side of the WEB page.
   The window changes to the following window
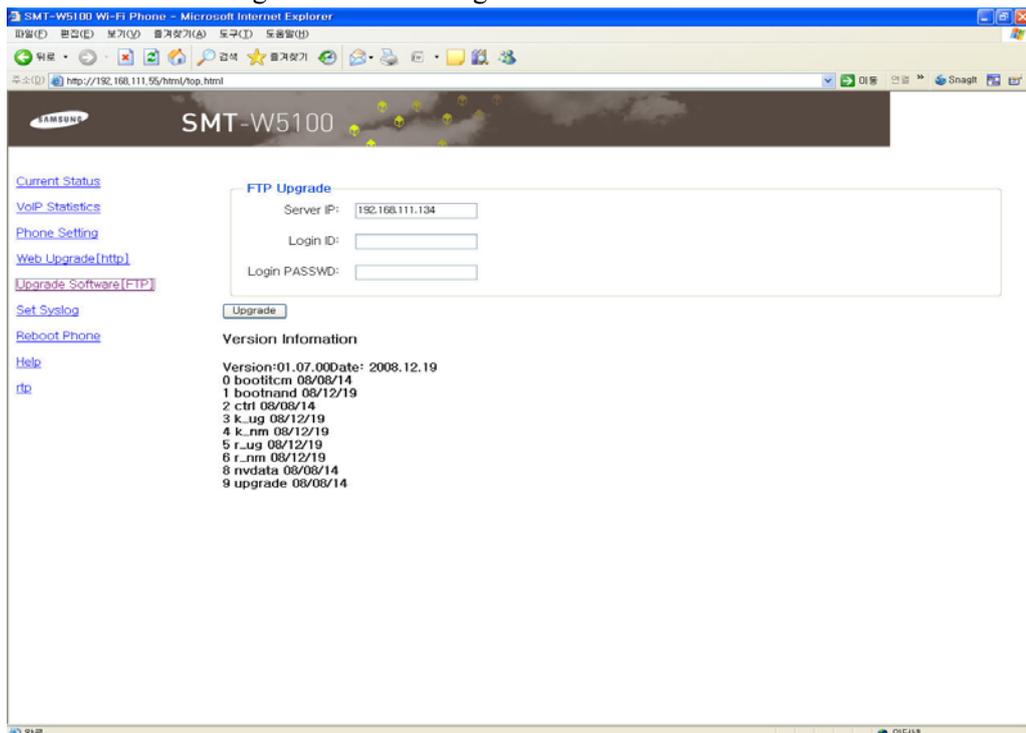
- Enter the IP address of the FTP server in the Server IP input box.
- Enter User ID specified in the FTP server in the Login ID input box.
- Enter password specified in the FTP server in the Login password input box.
- Click **[Upgrade]** button to start the upgrade.

3) While upgrading S/W, the window changes to the following window
   Do not turn off the power during the upgrade.
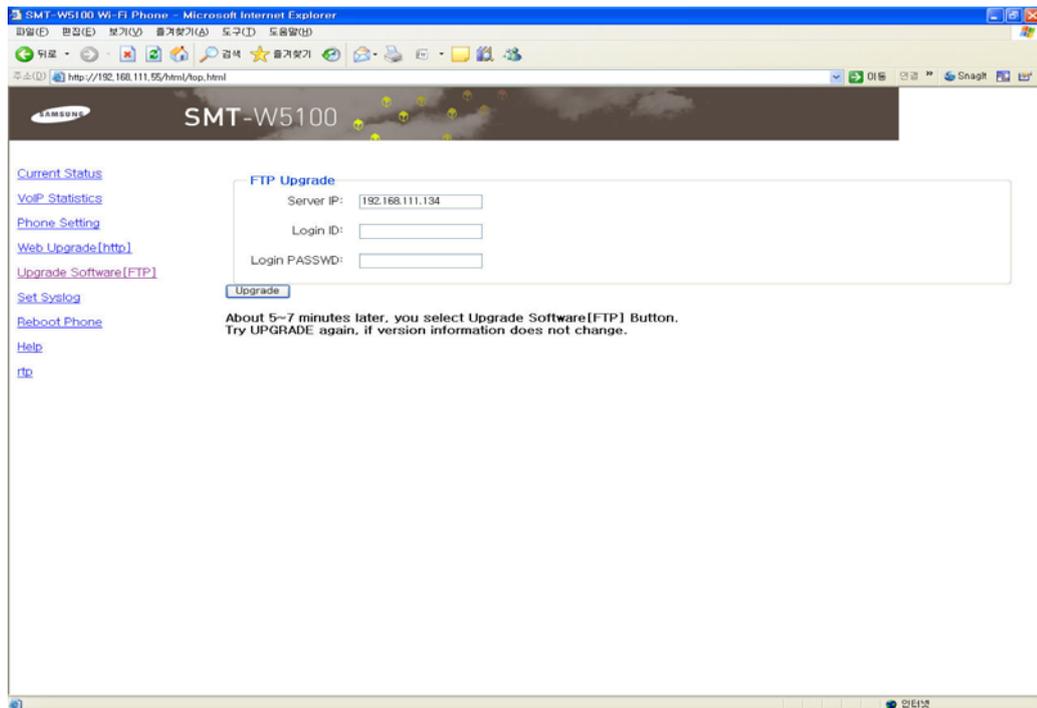
After S/W upgrade is completed, you need to check the S/W version information on the web page or hidden menu

ANNEX A. Troubleshooting

Q: Which type of the AP is used in the OfficeServ system?

There are three types of AP for the OfficeServ System.

- **WBS24 Combo**
  Only the wireless Voice service is provided in the environment where the Ethernet network is not established. The power for the AP can be provided without any special Power adaptor. To use this service, interworking with the WLI card provided by the system should be done.

- **WBS24 Basic**
  Use this in an environment where an Ethernet network is established. The user should configure the IP network settings of the MGI card and the system as the network which is identical with the WBS24.

- **SMT-R2000**
  The 2.4 GHz service and the 5 GHz service are supported simultaneously via the Dual Band AP.
  When interworking with the system, interworking with the LAN switch and the MGI card should be done similarly to the WBS24 Basic. However, do not configure the AP Network settings via the system settings unlike the WBS24 Basic, but configure the settings by accessing the web page of the AP directly via the wired LAN.

As above, the way of using and the purpose of the three APs are different, thus the purpose should be determined when installing it initially.

Q: Is it possible to use the two kinds of APs on the system?

You CANNOT mix the types of APs used on the same system.

APs of different types have different ways of operation. Thus, the user should determine how to install it in advance considering additional configurations. Especially, the WBS24 Basic and the SMT-R2000 seem to have similar configurations, but the procedures of setting the AP and the handover processes of the WIP-5000M terminal and the SMT-W5100 terminal are different. If two APs are installed and used in one place, One-way-speech can be generated since the terminal handover is not done properly due to the different ways of operating the handover between them.

As for the difference of the programming processes, the WBS24 Basic acquires all the information via the MMC procedure from the system, however in the SMT-R2000, settings should be done by accessing each AP.

Q: Is it possible to use WIP-5000M/SMT-W5100 in one system?

It depends on the type of the used AP, thus the description of each AP which is used is as follows.

- **WBS24 Combo**
  The WIP-5000M and the SMT-W5100 cannot be used simultaneously.
  The SMT-W5100 is designed not to support the WBS24 Combo initially. Thus, only the WIP-5000 can be used in the WBS24 Combo.

- **WBS24 Basic**
  Under restrictive conditions, the WIP-5000M and the SMT-W5100 can be used simultaneously.
  The WIP-5000M and the SMT-W5100 are designed to be used in the Ethernet environment. However, the handover methods are different between the WIP-5000M and the SMT-W5100, thus it is recommended not to use the SMT-W5100 in the WBS24 Basic environment.

- **SMT-R2000**
  The WIP-5000M and the SMT-W5100 can be used simultaneously. The WIP-5000M and the SMT-W5100 are designed to be used in the Ethernet environment. Especially, the SMT-R2000 is the AP which provides 802.11 g, thus when using the SMT-W5100 which supports 802.11 g, optimized capacity can be provided. The WIP-5000M can be used, but its handover method is different from the SMT-W5100, thus it is recommended not to use them together.

Q: What is the MMC sequence for programming?

1) MMC 849: Set the WLAN Service Type.
   When the settings are changed, the system information related to the wireless LAN is initialized, and the system is restarted.
2) MMC 830, MMC 831, MMC 835: Check or set the MCP/MGI network settings.
   When using the WBS24 Basic or the SMT-R2000, set the MMC 835 MGI codec type, etc.
3) MMC 845: The essential items to be entered for WBS24 Combo or WBS24Basic are SYSTEM ID, SYSTEM KEY, WBS NETWORK.
4) MMC 848: Enter the IP to be allocated to the terminal.
5) MMC 849: Select the AP and the IP setting type of the WiFi terminal. Except for the case where the Dual AP type is selected, designate the IP setting type of the AP.
6) MMC 849: Set whether to permit the registration or not.
7) Register the terminal.

Q: What is the purpose of the System ID of the MMC845 WLAN?

The system ID is applied to WBS24 Combo, Basic. On the wireless LAN, it is called SSID or ESSID, and by this ID, the terminal can access the AP. This terminal can perform the handover for the APs which have the same SSID.

Q: What is the purpose of the System Key of the MMC845 WLAN?

The system Key is applied to WBS24 Combo, Basic. This value is system ID used as the authentication parameter to classify the user when registering the terminal. The default value is '00000', and to operate the wireless LAN, the default value should be changed to another value(maximum 5 characters) in the MMC 845.

Q: What is the purpose of the SECOND IP in MMC845 WLAN?

The SECOND IP is applied only to WBS24 Combo, Basic. In the Combo, it is the Server IP used when the terminal performs calls. All the terminals registered in the Combo perform the call via this IP. In the Basic, when performing the handover, the terminal transmits the message informing of the handover to the WBS Basic.

Q: What is the purpose of the RF channel list in MMC845 WLAN?

The RF channel list is the channel information transmitted to the terminal from the system in order that the terminal can scan specific channels. Via this information, when searching the peripheral APs, the terminal does not search all the channels but scans only the channels in the channel list received from the system. When the channel list increases by one, the handover delay of approximately 50ms can be generated, thus it is recommended to design the channel by using the basic channels such as 1, 6, 11 or 1, 5, 9, 13.

Q: What is the purpose of the WLAN Switch in MMC845 WLAN?

Basically, the system does not perform the ARP Request for the wireless terminal, but updates the ARP Table by using the registration information of the terminal. In the wireless terminal, the Power Save mode exists, thus it takes approximately 2 seconds to respond to the ARP Request. To reduce this time, the ARP Table is updated by using the registration information of the terminal. However, when the switch dedicated for the wireless LAN exists in the existing network, or when the switch which has the function of the Proxy ARP exists, if this ARP Table is updated by this registration information of the terminal, the information is not updated in the MAC table inside the SWITCH. Due to this, the data are not routed properly, thus data is lost. To prevent this, the WLAN Switch item exists in order not to update the ARP Table.

If the configuration is as follows, enable the WLAN Switch.

- When the SWITCH(switch which performs the handover function of other subnet) dedicated for the wireless LAN exists in the network
- When the switch which has the function of the Proxy ARP exists
- The wireless terminal is registered on another subnet

Q: How does the user know if the wireless LAN switch is installed or not?

- Contact the network administrator.
- Acquire the response by performing ping for the terminals which are different in the network configuration. Check the ARP table by using the 'Arp –a' command, and check the IP and the MAC, and then if the IPs are different but the MACs are identical, or if the MAC of the device which is already informed and the MAC mapped to the IP are different, the WLAN Switch is MMC845 enabled.

Q: What is the purpose of the MAX AP CH in MMC845 WLAN?

The MAX AP CH is the item which appears when selecting Dual in MMC 849 if the SMT-R2000 is used as the AP Type. The MAX AP CH is to limit the number of the terminals which can make a call simultaneously in each AP when using the DUAL MODE AP(SMT-R2000). This is to prevent too many terminals from making a call simultaneously on one AP, in order to maintain the quality of the voice. To set the MAX AP CH, do not permit the call setting to be more than the designated number within the area of the same base station service. Then, the handover from other base stations should be supported, thus an appropriate value should be set.(There is no limitation for the default.)

Q: What kind of information can be seen in MMC846 WIP INFO.

Information such as the phone number allocated to the WLAN Phone, the registration status, the service status of the terminal, the IP address of the terminal, the MAC, the User ID and the Password can be acquired in the MMC846 WIP INFO. The information acquired from MMC846 WIP INFO is used as important information at the time of Call Signaling.

- REGISTERED: This shows the registration status of the terminal.
- LOCATED: This shows whether the power of the terminal is currently ON/OFF and whether the service is available or not.
    - Attach: The service of the terminal is available. This indicates that the terminal is connected an AP.
    - Detach: The power of the terminal is OFF or the link between the terminal and the AP is disconnected. When the call is received to this terminal, a Plug Out message is displayed.
- PHONE TYPE: This indicates the type of the terminal.
- WLI NUMBER: This indicates the WLI location of the AP where the terminal is connected. In case of the Combo WBS24, this is the number of 1 to 3. In case of the Basic WBS24, this is the number of 4.
- WBS NUMBER: This indicates the WBS24 location of the AP where the terminal is connected.
- Insert Digit Field: This allows the function of dialing the prefix of the designated digit when making a call if the CID call is used.

Via changes of the index information displayed in the WBS NUMBER, the information of the AP which is frequently used can be acquired. If many terminals are connected to one WBS24 Index, the call traffic of this area may by heavy, thus expansion of the AP may be considered.

By comparing the information such as the number of the registered terminal and the IP/MAC, you can see the status of the terminal.

Q: What is the purpose of MMC 849 REGISTER VoWLAN?

The MMC 849 REGISTER VoWLAN is the method of permitting or rejecting registration of wireless terminal(WIP-5000M/SMT-W5100) and the WBS24 Basic AP to the OfficeServ system.
It is especially useful for disabling further terminals being registered by users.

Q: What is the purpose of MMC 849 WIP REGIST CLEAR?

MMC 849 WIP REGIST CLEAR is the method of unregistering terminals. For unregistration, there are two modes: Forced mode and the Normal Mode. Forced mode is to delete the information of the terminal by force. This deletes the information of the registered terminal without respect to the power of the terminal(On/Off). If the power of the terminal is on, the registration information of not only the system, but also the terminal is unregistered. However, if the power is off, only the system deletes the information of this terminal.
If the terminal information is deleted only in the system, when the terminal which has the registration information is powered on again, the corresponding terminal displays the message indicating that the location registration has failed, and the service is not available. It is possible to unregister the terminal without using MMC 849. It is possible to perform unregistration by selecting the unregistration from the system setting menu of the terminal. This operates as forced mode of the system.

Failure of the location registration can be generated when an appropriate AP cannot be found or when the system does not operate or when the terminal information registered inside the system does not exist because the information of the terminal has been deleted by force.

Q: What is the purpose of MMC 849 STATIC WIP IP?

The MMC 849 STATIC WIP IP is the opposite of the terminal being allocated an IP address from the system db. When several OfficeServ Systems exist in one subnet, it is possible to use MMC 849 STATIC WIP IP function to register the terminal in different subnets. This should be determined according to which type is to be used and considering the network configuration and the system configuration before the terminal is registered initially by the administrator.
To use the terminal in other subnets, the WLAN SWITCH item of the MMC 845 should be enabled. When using the WLAN SWITCH, roaming between the subnets is supported. When not using the WLAN Switch, it operates normally only in the registered subnet.

Q: What is the purpose of MMC 849 STATIC WBS IP?

MMC 849 STATIC WBS IP: when several OfficeServ Systems exist in one subnet, it is possible to use this function to register the terminal in different subnets.

Q: How can the users set the STATIC WBS IP in WBS24?

An example of using the SIO(setting the static IP) is as follows.

- ID: wlan

- PW: wlan

```
-> co en
MAC address>apset
MAC address apset>ip1 <IP address which is to be used by the WBS24>
MAC address apset>subnet1 <Network Mask which is to be used by the
WBS24>
MAC address apset>gateway <Gateway address which is to be used by the
WBS24>
MAC address apset>systemip <System address where the WBS24 is to be
connected>
MAC address apset>dhcp 1
MAC address apset>save

dhcp 0,1,3
```

There are three types of acquiring the network information when the WBS24 is Basic.

- dhcp 0: All the network information is received from the system. This is the default setting value.

- dhcp 1: This enables to enter and save its own network information and the system IP, and the it is interworked with the system.

- dhcp 3: This enables to enter and save its own network information and the wireless information, this performs the role of the independent AP(Access Point) without respect to the system.

Q: What should be considered when installing the AP?

Refer to the AP manual.

- At what height should the AP be installed?
  If there is no obstacle, generally speaking the higher the AP is mounted the greater the coverage. However, it is recommended to install it on a wall rather than a ceiling. Generally, install it 30 cm below from the ceiling.

- In what direction should the AP be installed?
  The antenna built in the SMT-R2000 is the Omni antenna which is the Omni-directional(non-directional) antenna. It is recommended to install the AP so that the front panel of the AP is vertical from the ground. Using the Omni-directional antenna, the electric wave is transmitted to the front panel and the rear panel in a globe format.

- Where the AP should be installed?
  First, find the installation location of the AP by referring to '2.2.4 Selection of the AP Location'.
  - How far should the APs be from each other?
    At least 5m should be kept from each AP. Then, the RF channel should be allocated. For detailed information, refer to '2.2.3 WLAN Channel Design'. In addition, in case of the SMT-R2000, to install it so that roaming is available in the Data rate of 5.5Mbps. It is possible to view the data rate via the TEST mode of the SMT-W5100. Install it by referring to '2.2.2 Cell Capacity and Area Plan'.
  - What should be done when an obstacle exists at the time of installation?
    Wireless LAN uses a high frequency in the 2.4 GHz, 5 GHz bands, thus the linearity is excellent but the permeability is poor. Thus, if an obstacle exists, the strength of the signal decreases drastically. In this case, it is recommended to install the AP additionally in the area where the strength of the signal decreases due to the obstacle.
  - What is the distance between the AP and the Ethernet switch?
    The WBS24 Basic and the SMT-R2000 use the LAN standards, thus the distance between the Ethernet switch and the AP should not exceed 100m. If the distance exceeds 100m, transmission errors increase, thus it can restart in case of WBS24 Basic. In case of the SMT-R2000, the Power LED of the PoE seems to be normal, but abnormal operation can be generated.
    The terminal can operate abnormally due to the abnormal operation of the AP.
  - How many users can use one AP simultaneously?
    First, refer to '2.2.2 Cell Capacity and Area Plan'. In case of WBS24, the number of calls that can be made simultaneously is limited to 4 calls. Thus, the cell should be designed considering this number of calls. In addition, in the area where many users exist, several APs can use different Clear RF channels to increase the number of calls. However, when using the same frequency channel, the number of calls is recommended not to exceed 8. In case of the SMT- R2000, there is no limitation of the number of calls. However, in case of the WIP-5000M, the number of simultaneous calls is recommended not to exceed 8.
    In addition, it is recommended that the number of calls in one frequency channel does not exceed 12.

- How can the user install it on an existing network?
Refer to the check list of the appendix. Check the Broadcasting/Multicasting data of the existing network, and if 1% or more of the utilization is generated in the 100 M switch of 1Mbps or more, it is recommended to set the network by dividing it into the network for the voice and the network for the data. Basically, the WBS24 uses the 802.11b standard, thus the amount of data transmission is approximately 4 to 5 Mbps. Thus, if the wired network uses 1 Mbps or more of the Broadcasting/Multicasting data, the wireless bandwidth becomes half of 2 Mbps. This is because the WBS24 transmits Broadcasting/Multicasting as 2 Mbps, currently. The case of the SMT-R2000 is the same, but the option(Manage- Radio-Broadcast/Multicast Rate Limiting) which abandons the Broadcasting/Multicasting data exists among the options of the SMT-R2000. However, when using the 'Manage- Radio-Broadcast/Multicast Rate Limiting' option, Broadcasting/Multicasting which is transmitted from the terminal is also abandoned, thus One-way speech can be generated.

Q: What is the Power consumption of the SMT-R2000?

Max 200 mA is used based on 48 V, thus approximately 9.6Watt is consumed.

Q: How is the External Antenna connected to the SMT-R2000?

The connection diagram of the External Antenna is as follows.
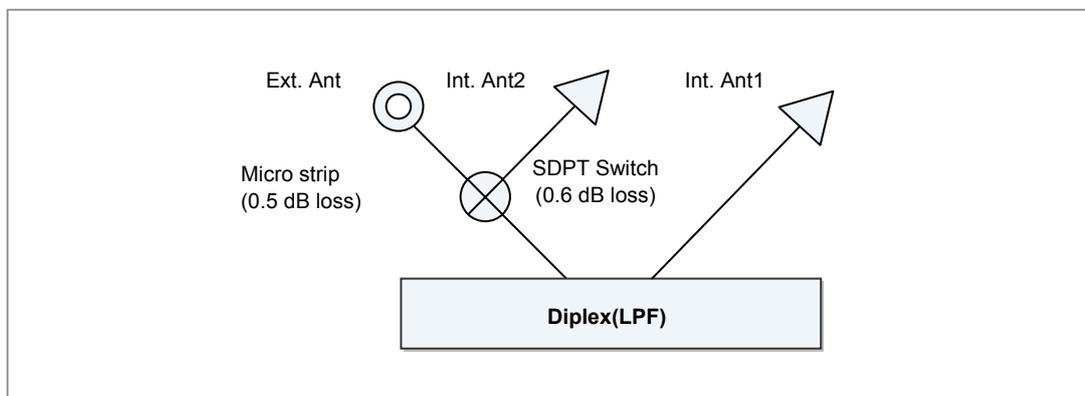
Based on the connection diagram, the Antenna port of the SMT-R2000 consists of 3 antenna ports, and the difference of the output of each port is as follows.

- Int. ANT Port 1: X

- Int. ANT Port 2: X-0.6 dB

- EXT ANT Port: X-1.1 dB(Micro strip loss + SDPT switch loss). The EXT ANT port has the output which is smaller than the internal antenna Port 1 by 1.1 dB.

The internal antenna has a Gain of 4 dBi, and when connecting this to the external antenna which has a specific gain, using an antenna that has a gain greater than 4 dBi + 1.1 dB = 5.1 dB is effective. In addition, if the length of the cable is approximately 1m, it is effective to use the External antenna which is 8 dBi or more including the Cable Loss.

- For America: Connect the antenna which has the connector of the RP-SMA male type to the External Antenna port(RP-SMA female) on the top left or connect it by using the cable.

- For others countries: Connect the antenna which has the connector of the SMA male type to the External Antenna port(SMA female) on the top left or connect it by using the cable.
    - If the connector type is not SMA(or RP-SMA), a proper adaptor should be used.
    - The loss of the Antenna Cable is different according to the type of the cable, but generally, the loss of 2 dBi or more is generated for 1m. Thus, the External antenna cable should be installed within 1m to acquire the External antenna gain.
    - Pay attention not to generate any curved part in the cable when connecting the Antenna Cable. If a curved part is generated once, approximately 2~3 dBi decreases.

Q: Is it possible to provide service indoors and outdoors by using an External Antenna in the SMT-R2000 ?
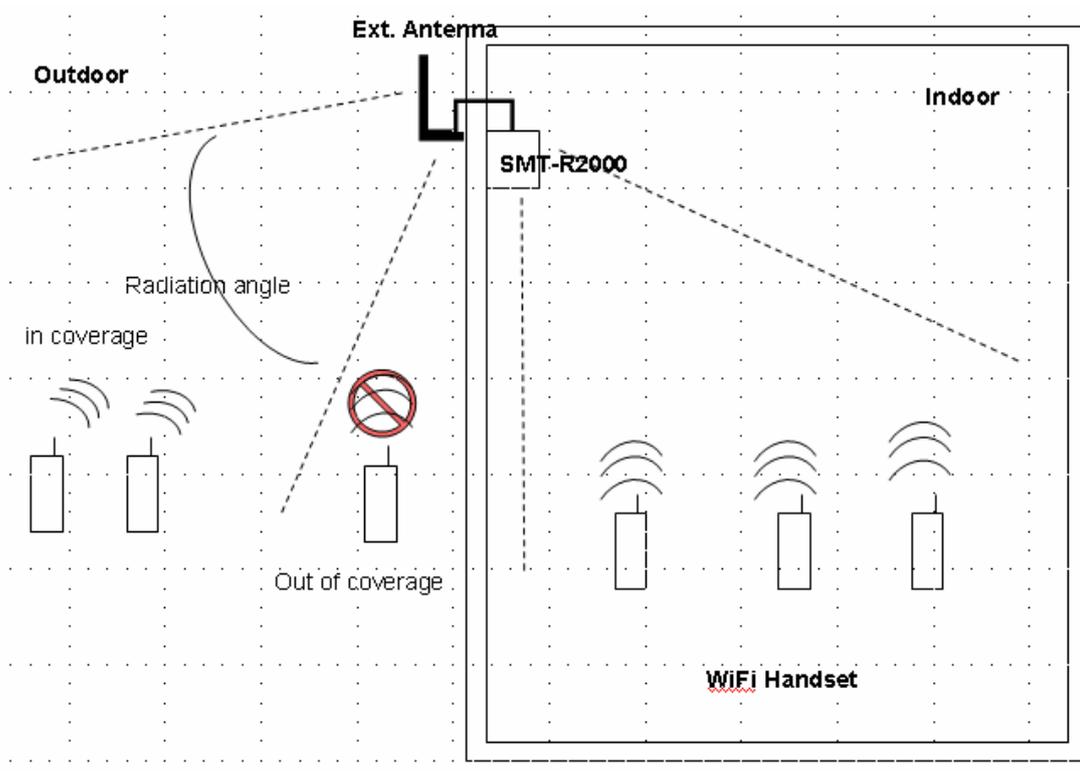
Select the Antenna selection of the SMT-R2000 as Diversity, and select External Antenna On, and the service is available as in the above figure.

However, as in the above figure, if the service is done when both of the indoor part and the outdoor part are blocked, the signal of the terminal user becomes unstable. For example, when the outdoor user terminal is being serviced in the Ext of the AP, a stable signal can be received, but if there is another user in the indoor part, the AP does not perform the service via the Ext. Antenna to perform the service via the Antenna, thus the outdoor user terminal cannot receive the signal normally. In this case, the voice quality can be poor or Call disconnection can be generated.

It is recommended to install the SMT-R2000 of indoor use, and set and use External Ant. Only for outdoor use. To use External Antenna only, select Antenna2(External) as the Antenna selection and select External Antenna On.

Q: Which External Antenna can be connected to the SMT-R2000?

If the connector of the antenna is SMA male(or RP-SMA male), all types of antennas can be connected.

- The antenna which is not the SMA type can be connected by using a proper adaptor.

- The antenna which has the impedance of 50 ohms should be used.

Q: How is the External Antenna installed in the SMT-R2000?

- Omni antenna: This is the non-directional antenna, thus this has the same characteristics with the Omni-directional antenna. However, this should be installed vertically from the ground.
  Ex) dipole antenna

- Directional antenna: This is the highly directional antenna, thus check the direction in the antenna data sheet and install it according to the direction of the WLAN reception area.
  Ex) patch, yagi, parabolic antenna

	SMA Connector	RP-SMA Connector
SMT-R2000 Connector	Female	Female
ANTENNA Connector	Male	Male

Q: What is the AP channel Plan?

The number of the channels that can be used can be different according to the country.
In the 2.4 GHz band, 1~11, 1~13 channels are used.

- When only the OfficeServ system is used, and there is no other wireless LAN devices
    - When the channel plan is 1, 6, 11,
      Enter only 1, 6, 11 in the RF channel list among the MMC845 WLAN items, and set other 3 items as 0.
    - When the channel plan is 1, 5, 9, 13,
      Enter only 1, 5, 9, 13 in the RF channel list among the MMC845 WLAN items, and set other 2 items as 0.
- If only the OfficeServ system is used, and other wireless LAN devices exist, It is recommended to separate the channels of the AP for the data and the AP for the voice. It is recommended to set the same channel for the data and allocate other 2 or 3 channels for the voice.
    - When the channel plan is 1, 6, 11,
      Set the data as No. 1 and use No. 6 and 11 for the voice. In this case, enter only 6, 11 in the RF channel list among the MMC845 WLAN items and set other 4 items as 0.
    - When the channel plan is 1, 5, 9, 13,
      Set the data as No. 1 and use No. 5, 9 and 13 for the voice. In this case, enter only 5, 9, 13 in the RF channel list among the MMC845 WLAN items and set other 3 items as 0.

- When the AP for data supports 802.11 g,
This is the case when the 802.11g AP exists in the site where WIP-5000M is used.
If data of the 802.11 g standard of 54~9 Mbps, the terminals of 802.11b cannot recognize them as data, but considers them as simple noises. Due to this, the terminals try to transmit the data and accordingly, an error is generated. To prevent this, Protection mode exists. This should be set. Among the setting items, find and set 802.11 b/g mix mode or Protection mode enable(CTS). The setting can be different according to each AP, thus for the detailed information, refer to the manual of the corresponding AP.

Q: The WBS24 is repeatedly restarted during the installation.

WBS24: if information is not received from the system or a wrong setting value is received, the WBS24 is restarted within 2 to 4 minutes.

- WBS24 Combo
  - If the SYSTEM ID and the SYSTEM KEY are the default values: The WBS24 Power is off.
  - If the channel information is 0: The WBS24 Power is turned on and off repeatedly.
  - If the line is connected abnormally: The WBS24 Power is off or it is turned on and off repeatedly.

- WBS24 Basic
  - If the SYSTEM ID is the default value: The WBS24 Power is turned on and off repeatedly.
  - If the channel information is 0: The WBS24 Power is turned on and off repeatedly.
  - This is the case when the network information is different from the subnet, the gateway of the system IP.
  - This is the case when the MMC849 Register VoWLAN is disabled.
  - This is the case when the method of setting and registration is different from the static WBS of the MMC849.

- If the Network booting is set in default, and the DHCP server exists in the network, the WBS24 can operate abnormally. To solve this problem, the console is needed.
After connecting the console, when pressing the Space bar in the console and simultaneously turning on the power in the WBS24, it is accessed as the Booting mode. Then, execute the following command. Enter 'configflash netboot no', then Network booting(Bootp/TFTP) is not performed, but booting is done as the flash image.

- If the flash image is damaged, When connecting the console, the 'Flash image booting fail' message is displayed.

Q: The WBS24 is sometimes restarting during operation.

Check the WBS24 restart in the MMC851 Alarm information. Check the Trace Data where the WBS24 restart information exists. Display the Trace Data by using the command as follows.

```
telnet 192.168.10.90
id: wlan
password: wlan
-> co en
192.168.10.90> apset
192.168.10.90 apset> history
```

- IP conflict
    - Do not activate the corresponding WBS24 and perform corresponding PING, then if there is a response, this is the IP conflict.
    - Change the IP.

- If the wired line connection is poor or loss is heavy
    - Change it to other WBS24, and check if the same phenomenon is generated at the same location.
    - Check(Reconnect) the WBS24 LAN Port and change it to other switch port.
    - In case of the line problem, install the line again.
    - 'System Request WBS24 Restart: abnormal' among the Trace Data is the System link test error. Restart the WBS24 in the system.
    - 'System No Status: WBS24 Restart' among the Trace Data is the System link test error. Restart the WBS24.

- This indicates that the wireless card is bad, or 'PCMCIA Reset' among the WBS24 Trace Data installed in the area where a lot of wireless data or terminals exist, indicates that the wireless card is bad, or this is the case when the wireless part is overloaded.

- When the PoE is used and the power supply is unstable. This indicates that there is no remaining data for the corresponding time among the Trace Data.

- H/W fault
  Replace the WBS24.

- 'System Request WBS24 Restart: normal': Request the restart to the MMC.

- 'System Request WBS24 Restart': Change the network information.

- 'System Restart WBS24 Restart': Restart the WBS24 by System Restart.

Q: WBS24 upgrade has failed.

1) In case of the WBS24, when performing the WEB UPGRADE without restarting it after tftp booting, WEB UPGRADE is not completed due to lack of memory and it is moved to the page for restoration. Then, if rebooting without restoration, the flash memory is damaged.
   - If the power is off when WEB UPGRADE is being done, the flash memory is damaged.
   - When restarting the system when WEB UPGRADE is being done, the flash memory is damaged.
   - When performing the UPGRADE if the AP is not available to be serviced, the flash memory is damaged.

2) Restoration is available via the TFTP method.
   a) First, connect the console cable.
      When pressing the space bar on the console window and simultaneously turning on the WBS24 power, it becomes the boot mode.
   b) Use the following command.

```
configflash netboot yes
configflash(netboot is set as Yes.)
reset(Wbs24 is to be restarted.)
```

   When executing the above command, the 'boot' message appears.

   C) Upgrade the file by using the TFTP/BOOTP program.
      When setting the upgrade, the WBS24 MAC ADDRESS appears in the boot message, and when inserting the MAC in the TFTP/BOOTP program, '-' should be used as 00-00-f0-xx-xx-xx.
      Select 'broadcast Replay to Bootp Request' as the bootp Reply Method.

   d) After the upgrade, execute the 'configflash netboot no' in the same way.

Q: SMT-R2000 upgrade has failed.

1) If it is the wired connection, check the wired connection status of the AP via PING.
2) If it is the wireless connection, perform Ping to check if the wireless connection AP is disconnected.
3) Check if the location of the AP File to be upgraded is correct in the PC.
4) Check if the PC is turned off during the upgrade.
5) Before upgrading, check if the AP operates normally and the AP is connected via PING, and check if the Web page operates normally.
6) If all the above things are normal, but upgrading is not done, replace the AP device.

Q: The PING request to the AP fails during operating the SMT-R2000.

1) Check if the capacity of the wired switch which provides the PoE is sufficient. The SMT-R2000 generally meets the IEEE802.3af Class3 standard, and it has the power consumption of 9.6 Watt as maximum 200 mA@48 Volt.
2) Check the connection status of the Ethernet Line connected to the AP.
3) When using the PoE switch, connect it to other normal port of the switch and check again.
4) Replace the Ethernet Line connected to the AP.
5) Check if the IP of the PC and the IP of the AP exist in the same subnet.
6) Check if the AP power is normal and the LED of the AP WAN/LAN port operates normally. If it operates abnormally(if the LED is turned off when connecting the Ethernet), check 1 to 3 above again.

Q: The PING request fails via wireless method.

1) Check if the capacity of the wired switch which provides the PoE is sufficient. The SMT-R2000 generally meets the IEEE802.3af Class3 standard, and it has the power consumption of 9.6 Watt as maximum 200 mA@48 Volt.
2) Check the connection status of the Ethernet Line connected to the AP.
3) When using the PoE switch, connect it to other normal port of the switch and check again.
4) Replace the Ethernet Line connected to the AP.
5) Check if the IP of the PC and the IP of the AP exist in the same subnet.
6) Check if the AP power is normal and the LED of the AP WAN/LAN port operates normally. If it operates abnormally(if the LED is turned off when connecting the Ethernet), check 1 to 3 above again.

Q: The LED seems to be abnormal during operating the SMT-R2000.

1) Check if the Power LED is turned on in the steady status. If it is not, in case of the PoE switch, check the power capacity of the Ethernet switch. Check if the AP meets the 802.3af Class 3(consumption of 9.6 Watt, 200 mA@48 v), and change the corresponding port to other Ethernet port and check its operation.
2) If the WAN/LAN LED is not turned on, check the connection status of the Ethernet cable. Change the connection port of the Ethernet switch and check if the port is faulty. In addition, replace the Ethernet Cable and check if the cable is faulty.
3) Perform Ping to the AP and check if it is connected. If it is not connected, check No.1 and No.2 above again.
4) If it operates abnormally after performing 1) to 3), replace the AP and check it again.

Q: The terminal is not registered.

1) Check the following MMC settings.
   - The system Ethernet IP should be allocated to the IP which is within the subnet to be used in MMC 830.(The values of the IP, the subnet mask and the Gateway should be checked.)
   - If the system IP setting is changed in the MMC 830, the system should be restarted to apply the changed information. Thus, after restarting, register the terminal again.
   - When using the WBS24 or the SMT-R2000, check if the settings of MGI IP/netmask/Gateway are allocated to the IP within the subnet to be used in MMC 831.
   - If the Register VoWLAN of the MMC849 is disabled, the system rejects the request of the terminal registration. After changing the VoWLAN setting to 'enable' and register it again.
   - If the registration method is set differently from the Static WIP setting of MMC849, the IP of the terminal is not set properly and accordingly cannot be registered. Register the terminal in the same way with the Static WIP setting of MMC849.
   - If the IP is not entered in MMC848, or all the entered IPs have been allocated, the IP of the terminal is not set properly and accordingly cannot be registered. Enter a new IP additionally and register it again.
   - If the Static WIP of MMC849 is disabled and the system IP and the subnet band of the MMC830 are different, register the terminal in the subnet which is the same with the system IP.
   - If the Static WIP of MMC849 is enabled and the network information has been incorrectly entered when registering the terminal, the registration message cannot be transmitted between the system and the terminal. Check the network information such as the system IP and the terminal IP again, and enter them correctly when registering the terminal.
   - If the ID which is different from the User ID of the MMC846 is entered, the system rejects the registration. Check the User ID of the MMC846 again, and enter it correctly when registering the terminal.
   - If the password which is different from the password of the MMC846 is entered, the system rejects the registration. Check the Password of the MMC846 again, and enter it correctly when registering the terminal.
   - If the System ID which is different from the System ID of the MMC845 is entered, the system rejects the registration.(The System ID of the system is used only when the AP is used as WBS24. If the AP is used as SMT-R2000, check if the SSID setting of the SMT-R2000 and the System ID setting of the terminal are same.) Check the System ID of the MMC846 again, and enter it correctly when registering the terminal.

- When registering the WEP KEY in MMC849, the WEP KEY settings of the terminal and the system are different, the system rejects the registration.(The WEP KEY of the system is used only when the AP is used as WBS24. If the AP is used as SMT-R2000, check if the security setting of the SMT-R2000 and the security setting of the terminal are same.) Check the WEP KEY of the MMC846 again, and enter it correctly when registering the terminal.
- It should be registered in the corresponding index(phone number) of the MMC844 as the mobile phone. The database is shared between the IP phone and the mobile phone, thus select the mobile phone.
- If two or more systems exist in the same subnet, the terminal cannot identify them separately at the time of the initial registration. Due to this, the terminal can be registered to a system other than the system where the terminal is to be registered initially. To prevent this, enable MMC849 Register VoWLAN of the system where to register, and disable MMC849 Register VoWLAN of other system.
  In addition, it is possible to register the system IP as the Static IP method in the terminal setting to prevent the problem.

2) If the strength of the terminal is not displayed in the terminal, this indicates that the terminal is not connected (associated) to the AP normally. In this case, check if the SSID(System ID) or the security mode is entered identically with the settings of the AP. In case of the WBS, check if the entered contents of the System ID and the WEP key of the MMC 845, and in case of the SMT-R2000, check the settings of the SSID and the security inside the Web page of the AP.

3) When the signal strength is displayed but the registration is fails
   - Check MMC849 Register VoWLAN enabled.
   - Check IP has been entered in the MMC848.
   - Check if it is registered in the corresponding index(phone number) of the MMC844 as the mobile phone.
   - It is possible to check the connection status between the AP and the system via the PING TEST. For each check if the delay is too great although the PING response is received based on the Check list.

4) If the errors related to the User ID and the Password is generated in the terminal, check the corresponding User ID and the Password in the MMC846. Otherwise, check if other OfficeServ system or other Office SOHO exists around it.

5) After selecting the Static IP and when registering the terminal as other number or other IP again, the information of the number which the existing terminal has should be deleted from the system and the terminal.

Q: How can the user delete the registration information of the terminal?

The system and the terminal have the registration information of the terminal respectively. This is required when using a new terminal after deleting the terminal information when not in use any more, or when the terminal cannot be used because it has been lost or damaged.

1) When not using the terminal, it is possible to delete the registration information by using the Normal mode in the MMC 849. Then, the power of the corresponding terminal should be turned on. In this case, all the registration information of the system and the terminal is deleted.

2) To delete the terminal information only in the system, it is possible to use Forced mode in MMC 849. Then, the information inside the terminal is not deleted.

3) To delete the registration information only in the terminal, it is available by using the Unregistration menu of the terminal.

Q: The message indicating the location registration has failed appears.

The message indicating the location registration has failed appears when communication with the system is lost.
In general cases, when turning the terminal power on/off near the WBS24 or the SMT-R2000 where the normal service is available, it is restored.

1) If the terminal is unregistered by force in MMC849, perform the initial registration process for the terminal again.(It is possible to check the registration information of the terminal in MMC846, and to check if it is registered or not according to whether MMC848 IP is allocated or not.

2) Check if the AP and the system are connected on the wired line.
It is possible to check the connection by a PING TEST for each of the APs and the system. If there is no PING response, refer to 'Q: The PING service to the AP fails during operating the SMT-R2000.' and 'Q: The PING service via wireless method.'

3) In case of the WBS24, if the SYSTEM ID(WEP KEY) setting is changed, perform the initial registration process again.

4) With the SMT-R2000, although the settings of the SSID and the Security have been changed, perform the initial registration process again or change the AP setting back again.

5) If the SYSTEM IP setting has been changed, reboot the system and perform the initial registration process again.

6) If the PCMMC information is incorrect, incorrect registration information can be updated. Unregister the corresponding terminal by force in the MMC849, delete the terminal information in the system, and delete the registration information of the terminal by starting the unregistration mode of the terminal.

7) Check if the initial registration information for the corresponding terminal exists in the system.(It is possible to check the registration information of the terminal by MMC 846 or MMC 848.).

Q: A call cannot be made via the terminal.

1) If a call cannot be made by all the terminals, this indicates that the MGI/MGI16/MGI64 has not been installed or the codec information used in MMC 835 is incorrect.
2) If all the information of the system or the terminal information has been deleted during using the terminal after registering the terminal normally and then the terminal has not been registered again, there is no information on the terminal, thus the call cannot be made.
   In this case, set the information for registering the terminal in the system, first.
   Then, perform unregistration in the terminal and perform the initial registration, or select the system number in **[Menu] → [System] → [System Setting]** and register it again. Refer to 'Q: The terminal is not registered.' and perform the procedure of registering the terminal.
3) If the encryption(WEP KEY) setting has been changed after the installation, perform the initial registration process again.
4) If MMC846 information has been changed during registering the terminal, clear this information and register it again.
5) If One-way speech is generated, upgrade the SYSTEM, the MGI, the WBS24, the SMT-R2000 and the version of the terminal to the latest versions.
6) Check if the AP and the system are connected on the wired line.
7) If the terminal is unregistered by force in the MMC849, perform the initial registration process again.(It is possible to check if the terminal registration information exists in the system or not by checking if the terminal is registered in MMC846 or by checking if MMC848 IP is allocated.)
8) If the IP of the system has been changed, perform the initial registration process again.

Q: Handover is not performing well.

• **WBS24:**
1) If MMC845 uses all of the 6 RF CH lists, handover can be slower. As for the channel setting, in case of the environment where the peripheral wireless is clear, it is recommended to use 1, 6, 11 or 1, 5, 9, 13.(Refer to the AP Channel Plan.)
2) In case of using the WLAN SWITCH, enable the WLAN SWITCH item in MMC845.

- **SMT-R2000:**
1) If the channel which is set in the SMT-R2000 does not belong to the MMC845 RF CH list, handover cannot be done. Check the channel of the SMT-R2000 again, and if it is not entered in the CH list, change it into one of the channels of the CH list.
2) This is the case when the IP of the SMT-R2000 has not been changed, thus all have been set identically.
   Change it into other IP address in **[Setting]** → **[Ethernet Setting]**.
3) This is the case when the subnet of the SMT-R2000 has been set differently.
   Check the subnet in **[Setting]** → **[Ethernet Setting]** and if it is different, change it identically.

The following points can affect handover.

- If the Roaming Threshold value among the Roaming conditions which are set in the terminal is too low or if the Roaming delta value among the Roaming conditions which are set in the terminal is too great, set the Threshold and the Delta value appropriately.

- If the cell distance between the APs is longer than the condition for roaming or if the service data rate which is set in the AP is much lower than the coverage, adjust the location of the AP or set the service data rate appropriately in order that roaming can be done.

- If there is too much interference due to many peripheral APs, when other devices using the same channel that is used by the VoWLAN are being used peripherally, check the wireless LAN environment again and change the channel allocated to the AP or adjust its location or restrict use of other wireless devices in order to improve the wireless LAN environment.

- If the 802.g only AP exists near the 802.11b AP, in case of 802.11g, the mode of the AP should be changed in order that it can operate as the 802.11g mixed mode or in Protective mode.

Q: The sound quality is poor.

1) Check the sound quality for each call.
   - If the sound quality of the WIP to WIP call is poor: Check the wireless environment or the network environment.
   - If the sound quality of the WIP to Digital Phone call is poor: Check the settings of the wired Ethernet or the MGI.

2) Checking the MGI.
   a) Check the corresponding MGI max jitter setting of the MMC 835.(Change it to 150 or more.)
   b) Check if the settings of the MGI and the Ethernet meet the standards required for the IP Phone and changes them.

3) Checking the wireless environment and the network environment.
Check the wireless/wired environment by using the wireless/wired scanning tool(omnipeek).

   a) Check the amount of multicasting/broadcasting data in the network.(If it is 1 M or more, divide the network into the WLAN VOIP network and a separate DATA network.

   b) If there are obstacles such as bricks, concrete, iron doors between the AP and the terminal, the wireless become poor. Considering this, adjust the cell plan again.

   c) If there is no obstacle between the AP and the terminal, check if there is any peripheral AP used for other AP or for data. If it exists,(referring to the AP Channel Plan) perform the channel setting again.

   d) If the length of the cable which connects the AP with the switch is 100 m or more, wired data loss can be generated, check this.

   e) Check if any other 2.4 GHz devices are in use. It is recommended that only Samsung appropriate terminals are used.

   f) If a micro oven is used, RF channel No. 6 should not be used.
   If it is possible, change in order that the No.1 RF or the No.11 or above RF can be allocated.

   g) Other AP can exist or the wireless environment can be poor in the channel which is being used, thus change the channel.

   h) If 802.11g only APs exist near the 802.11b AP → set the corresponding AP as the 802.11g mix or Protection mode.

   i) Check the number of terminals that is being used. The sound quality can be poor because there are too many terminals being used in the corresponding area.

   j) Adjust the Data Rate for transmission of the AP according to the corresponding number and the number of the APs and then set or install it again.

   k) Check the output size.

   l) Replace it with a normal AP and test it.

Q: Internet is not available.

1) Check the configuration of the network where the AP is connected. Check if Internet is available in this connected network. Check the LAN connection status.

2) Check the network IP, the Subnet Mask, the gateway and the DNS of the network configuration.

3) Perform PING tests to the gateway.(Perform ping to the IP of the AP.)
If PING is not possible, check if the wireless link is connected. Check if the encryption has been set, and if it has been set, enter the encryption key. Try PING again after checking the link connection.

4) If PING to AP is possible but PING to gateway is not possible, check if the gateway exists on the network. If the gateway exists but PING is not possible to the gateway, change the wired LAN cable to the AP change it.

5) Perform PING to the external IP.(If PING to the IP is possible, but PING to the WEB address is not possible, check the DNS setting.)

Q: The Internet speed is slow.

Measure the speed between the wired and the wireless by the speed measurement device(ex. Chariot).

- If the result of measuring wired to wired is less than 10 Mbps,
    - In case of the wired to 11g wireless LAN card, the wired speed ±15% is normal.
    - In case of the wired to 11g wireless LAN card, the wired speed ±15%, or 3~4 Mbps or more is normal.

- If the result of measuring wired to wired is 10 Mbps or more,
    - In case of the wired to 11b wireless LAN card, the wired speed ±15%, or 8~10 Mbps or more is normal.
    - In case of the wired to 11g wireless LAN card, the wired speed ±15%, or 3~4 Mbps or more is normal.

The above result of measuring the wired to wireless is based on the case when only one wireless terminal is connected. If the number of the terminals used in the measurement increases, the transmission speed decreases. The wired to wireless speed is equal to or less than the above normal standard, understand and improve the wireless status as follows.

1) If there are obstacles such as bricks, concrete, iron doors between the AP and the terminal, the wireless features become poor. Considering this, perform the cell plan again.

2) If there is no obstacle between the AP and the terminal, check if there is any peripheral AP used for other AP or for data. If it exists,(referring to the AP Channel Plan) perform the cell plan again.

3) If the length of the cable which connects the AP with the switch is 100m or more, wired data loss can be generated, thus check this.

4) Check if other 2.4 GHz is used other than the wireless LAN.(Bluetooth, micro oven, etc.)

5) Check the output size.

6) Change the corresponding channel.

7) If the 802.11g only AP exists near the 802.11b AP-set the corresponding AP as the 802.11g mix or the Protection mode.

8) Replace it with a normal AP and test it.

Q: One-way speech is generated when making a call via the terminal.

1) Check the version and settings of each device required for call.
   - WBS24 V1.40 version and former versions block the broadcasting data.
     The initial version of the terminal did not perform the ARP and updated the ARP Table by the data received from the system. However, this function has been deleted as other functions are added when upgrading the version of the terminal. Due to this, between the current version of the terminal and the 1.40 version and the former versions, one-way speech may occur. Thus, it should be upgraded to WBS24 V1.41.
   - The MGI should be upgraded to the latest version. Among the MGI versions, some version tries the ARP Request once and does not try it again. Thus this can generate one-way speech.
   - In case of the SMT-R2000, different IPs should be allocated to the APs, and they should exist in the same subnet. That is because the IAPP message(IEEE802.11f) cannot be exchanged normally if they exist in different subnets or the IP address is the same although there are in one subnet. The IAPP message is the broadcasting message informing other AP that one AP is connected to the terminal. Then, each AP which has received the IAPP message checks the IP address, and if it is not from its own IP address, the AP deletes the information of the corresponding terminal.
   - Among the options of the SMT-R2000, the option(Manage- Radio- Broadcast/Multicast Rate Limiting) which enables to abandon the broadcasting/multicasting data exists, and if this option is set, the broadcasting/multicasting from the terminal is abandoned too, thus only the ARP Request is transmitted and there is no response for the corresponding terminal. This can generate One-way. Increase this value appropriately or do not use this.
   - When the terminal receiving the call is ringing and the power of the terminal which has created the call goes off or the originating terminal is out of the service area, then if the called terminal receives the call, One-way speech can be generated.

2) Capture the packets by using a network analyzer such as Airopeek.
   - Check if only the ARP Request is transmitted and there is no response for the corresponding terminal.
   - Check if the RTP/RTCP data are exchanged mutually.
   - Check the RTP Codec information, and check if the Codec can be supported by the terminal or the MGI.
   - Check the source/destination MAC address of the data transmitted by the WBS24 Basic terminal.
   - If the data of which the RTP has been played in the network analysis tool such as Omnipeek are silent, check the card corresponding to the source or the device, and check if the mute function is being executed. If the mute function is not being executed, check the corresponding terminal or the MGI.

Q: The wireless signal is captured (📶) in the terminal, but the sign (📵) indicating that the call is not possible appears.

This phenomenon appears when the terminal is connected to the AP but the communication with the system is not possible. Check the following.

- When pressing the button of the terminal or trying to make a call, if the sign indicating that the call is not possible disappears and the call is made, this is the case when the terminal cannot be activated temporarily from the sleep status. If the version of the SMT-R2000 is 1.0.0, upgrade it as the latest version.(The latest version as of May, 2007: v2.05.00(APR. 18. 2007)) However, when upgrading from v1.0.0 to v2.xx.xx, the existing setting values are not saved, and it is changed to the default value. Thus, access 192.168.111.10 which is the basic IP of the AP, and set it again. In addition, the setting file(config.cbk) received from the v1.0.0 is not compatible, thus it should not be uploaded in the v2.xx.xx version.

- This can occur when the network connection is abnormal.(Check the power of the devices such as the system, the switch, the AP or the connection cable.)

- This is the case when the system is restarted or the power is off.)

- When the system has unregistered the corresponding terminal by force(at the MMC849): Delete the registration of the terminal and register it again.

- When the system has changed the DB of the terminal(ex PCMMC): Unregister the corresponding terminal by force at MMC 849 and register it again.

- When the User ID and the Password of the terminal registered in MMC846 have been changed when the terminal is turned off and then they have not been registered: Unregister the corresponding terminal by force at the MMC 849 and register it again.

- When performing unregistration only in the terminal after setting the Static IP and trying the registration of the terminal as the corresponding number: Unregister the corresponding terminal by force at MMC 849 and register it again.

- When using the WPA/WPA2 security in the v2.03.00 version of the SMT-R2000 or former versions, the version should be upgraded.(Upgrade the SMT-W5100 and the SMT-R2000 to the latest version.)

- In case of the SMT-R2000, although the settings of the SSID and the Security have been changed, perform the initial registration process again or change the AP setting back again.

Q: The user wishes to increase the number of the terminals which can be connected to the AP.

- **WBS24(Combo/Basic)**
  The number of the terminals that can make a call simultaneously is 4, and it cannot be changed.

- **SMT-R2000**
  The number of terminals limited in the system can be entered via MMC 845. However, to designate this number, the setting of the service data rate of the AP should be considered Except for adjusting the number, there is the method to adjust the data rate of the AP. It is possible to set the data rate by which the AP can transmit data, and according to this setting, the bandwidth which can be used is adjusted. However, as the number of the terminals increases and the wireless environment becomes poor, the data of the terminal and the AP are transmitted as the Data Rate of the minimum unit. The data rate of the SMT-R2000 can be adjusted in **[Manage]** → **[Radio]** of the WEB page. To increase the number of the terminals which can make the call simultaneously, delete the lowest data rate to increase the minimum rate which is supported. However, if the data rate becomes higher like this, the distance of the transmission becomes shorter, thus the appropriate data rate should be set considering the relationship between the distance of the transmission and the number of the used terminals. In some cases, the cell environment and the roaming parameter of the terminal should be adjusted together.

Q: Why does the SL/CQ value of the terminal change drastically according to the distance? or Why does the SL/CQ value become greater although the terminal moves further away?

Several data rates are supported according to each 802.11 standard as follows.

- 802.11g: 54, 48, 36, 24, 18, 12, 9, 6(Mbps)

- 802.11b: 11, 5.5, 2, 1(Mbps)

- Transmission output
  - 14 dBm in the 54 Mbps Mode
  - 15 dBm in the 48 Mbps Mode
  - 16 dBm in the 36 Mbps Mode
  - 17 dBm in 24, 18, 12, 9 Mbps modes
  - 18 dBm in other modes

- Reception sensitivity
  - -65 dBm or more in the 54 Mbps mode
  - -76 dBm or more in the 11 Mbps mode
  - -82 dBm or more in the 6 Mbps mode

As above, the transmission output and the reception sensitivity vary according to the data rate available. Due to this, the distance of the transmission becomes different according to each data rate. In other words, if the transmission rate is 54 Mbps, the transmitting party transmits the data as the transmission output of 14 dBm, and the receiving party can receive the data without errors only when the reception sensitivity is -65 dBm or more. However, if the transmission rate is 11Mbps, 17 dBm or more is appropriate for the output of the transmitting party and -72 dBm or more is appropriate for the receiving party. Thus the distance within which data exchange is available becomes greater.

The transmission rate is not fixed in default, but it is changeable according to the transmission status. Thus the transmission output becomes different accordingly.
The signal sensitivity of the terminal can be changed accordingly. Thus, even at the same location, if the transmission rate becomes lower, the transmission output becomes higher. Thus the signal sensitivity of the terminal can be higher.

The transmission output and the signal sensitivity which can be received can be used for your cell plan.

Q: The terminal cannot be connected after uploading the DB of the system.

- If the terminal cannot be registered after uploading the system DB, this can occur because the registration information of the system DB and the terminal is not the same. In other words, this can occur because the existing DB has been changed to the latest DB. In this case, unregister the corresponding terminal as the Force mode in the MMC849 by force and then re-register it.

- If the terminal is registered again, the number of the terminal can be changed occasionally. This is because it is changed to the value which is saved in the existing DB. In this case, update the system information or the corresponding DB.

- When registering the terminal again, occasionally it cannot be registered after the phrases such as 'Invalid User ID' or 'Invalid Password' appear. This is the case when you try to register other numbers, although the existing information of the terminal is registered in the system, or the User ID and the Password have been changed. Check if there is any terminal of which the MAC information is identical with the MAC information of the terminal which has been registered previously. If it exists, register it as the User ID and the Password of the corresponding terminal. Otherwise, change the User ID and the Password of the corresponding terminal to the information to be registered.

Q: How can the user save events generated in the SMT-R2000?

The setting of SMT-R2000 is performed as follows.

1) Setting the Log relay function
   the Log relay function is to transmit events generated in the SMT-R2000 to a specific
   PC. With this function, it is possible to view the events, which have been generated in
   all of the installed SMT-R2000.

2) Method of setting the Log relay
   a) Check **[Status]** → **[Events]** → Relay log.
   b) Relay Host: Enter the IP of the PC.
   c) Relay Port: 514(Use the default as it is.)
   d) Click Update.

3) Debug Level
   To view the message in detail, raise the Debug Level of the SMT-R2000.
   a) User Telnet to access SMT-R2000 IP.
   b) ID: admin, Password: samsung
   c) Execute the following command.

```
>> set debug level [0~4]
>> save-running
>> reboot
```

Configure the PC setting as follows.

1) Download the following two programs in the Web site http://www.kiwisyslog.com/.
   • Kiwi Syslog Daemon
   • Kiwi Log Viewer

2) Install and execute the Kiwi Syslog Daemon.

3) Set the path and the name of the log of the file to be saved in the Kiwi Syslog Daemon.
   a) File → Setup
   b) Rules-Actions → Log to file
      The default value is as follows.
      C:\Program Files\Syslogd\Logs\SyslogCatchAll.txt
   c) To save it according to the date and time in C:\log, change it to the following
      value. C:\log\Syslog%DateISO%TimeHH.txt(%DateISO is year-month-
      date, %TimeHH time.)
      Find the wanted value in the Insert Autosplit value and enter it in the file name
      field, the macro format appears.

d) Apply → OK
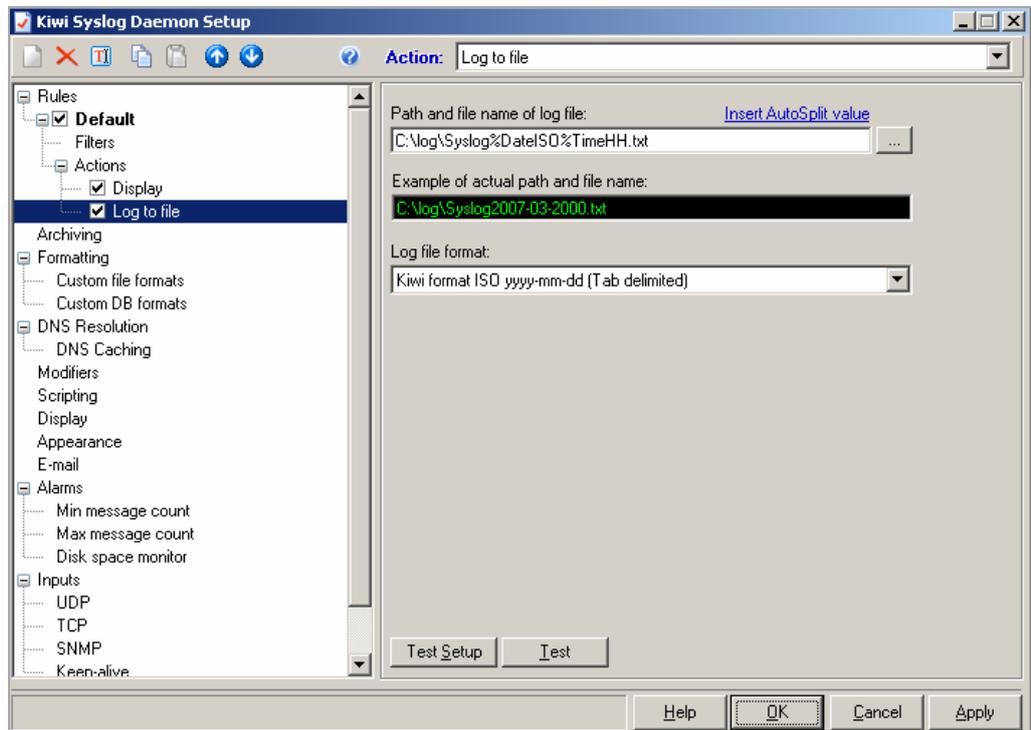
The Kiwi Log Viewer is the program to view the Log file saved as above.

Q: Life of the battery is short although the terminal is in the idle status?

In normal cases, the terminal supports 40 hours in the idle status near the AP. It supports approximately 4 hours talk time.

1) Check if the terminal is out of range.
    If it is out of range, the terminal repeatedly tries to be associated, thus the power consumption becomes higher.
2) Check if 'Beacon Interval = 100 msec, DTIM = 4' in the Radio setting of the AP.
    • If the DTIM is short, the cycle for activating the terminal becomes short, thus the power consumption becomes higher.
    • If the DTIM is too long, the packet transmitted to the terminal from the outside cannot be received properly.
3) Capture the wireless packet and check if the Multicast/Broadcast Packet is transmitted from the AP.
    The terminal consumes the power to receive the Multicast/Broadcast Packet in the idle status.

Q: The user cannot remember the IP address of the SMT-R2000.

1) Connect the cable for SIO of the SMT-R2000 with the SIO port and the COM port of the PC.

2) Execute the HyperTerminal program and set the connection. (BaudRate=115200, and for others, leave the default as it is.)

3) Log in by entering the ID and the PW.(Default ID: admin Password: samsung)

4) Check the IP address by the following command.

```
Samsung-AP# get management detail
Property    Value
----------------------------
vlan-id
interface   br0
static-ip   192.168.111.10    ( IP address of the AP
static-mask 255.255.255.0
ip          192.168.111.10
mask        255.255.255.0
mac         00:00:F0:50:50:50
dhcp-status down
```

5) To change the IP address and the subnet mask, do the following.

```
Samsung-AP# set management static-ip 192.168.111.11
dman: ################### IP address of br0: 192.168.111.11
Samsung-AP# set management static-mask 255.255.254.0
dman: ################### IP address of br0: 192.168.111.11
```

6) To change the gateway, do the following.

```
Samsung-AP# get static-ip-route detail
Property    Value
------------------------
destination 0.0.0.0
mask        0.0.0.0
gateway     192.168.111.1
Samsung-AP# set static-ip-route gateway 192.168.111.2
```

7) The changed setting value is applied immediately. However, to use the changed value after rebooting, execute the 'save-running' command.

```
Samsung-AP# save-running
```

If the user cannot remember the IP and the password for access, any kind of access is impossible, thus it should be initialized to the factory default. When pressing the RESET button on the front panel of the AP for 10 seconds, it is initialized to the factory default status. Then, access 192.168.111.10 which is the initial IP address and change the settings to use.

Q: It is not possible to upgrade the S/W of the SMT-R2000 by using the web page.

In the following cases, upgrade the s/w image of the AP on the bootloader by using the SIO cable.

•   When the AP cannot be booted normally

•   When upgrading by using the web it is not possible

The method of upgrading is as follows.
1)   Preparation: PC (TFTP server), LAN cable, SIO cable
2)   Save the s/w image of the AP in the PC. The required image files are zImage and jffs2.image.
3)   Execute the TFTP server and set the directory where the above two files are saved as the server directory.
4)   Connect the SIO port of the AP and the com port of the PC with the SIO cable.
5)   Connect the LAN port of the AP and the Ethernet port of the PC with the LAN cable. It should be connected to the LAN port other than the WAN port of the AP by all means.
6)   Execute the HyperTerminal program of the PC and set it to be connected to the com port.
     The Baud Rate of the AP is 115200.
7)   Turn on the power of the AP and check if the booting message appears on the hyper-terminal window.
8)   Press Ctrl+C during booting to move to the Redboot> status.

```
Samsung login: Ethernet eth0: MAC address f0:00:f0:50:50:50
IP: 192.168.111.10/255.255.255.0, Gateway: 192.168.111.1
Default server: 192.168.111.251

[ROM]SMT-R2000 release, version V0.7 - built 12:35:25, Mar 31 2006

Copyright(C) 2000, 2001, 2002, 2003, 2004 Red Hat, Inc.

Board: SMT-R2000
RAM: 0x80000400-0x81ff0400, [0x80000400-0x81fc1400] available
FLASH: 0xbe000000 - 0xbe7c0000, 64 blocks of 0x00020000 bytes each.
== Executing boot script in 2.000 seconds - enter ^C to abort
^C
RedBoot>
```

9) Change the IP address of the PC to the IP which corresponds to the default server among the above booting messages. The default value is 192.168.111.251.

10) Execute the following commands in sequence. This process is to download the s/w image from the TFTP server to use it for the Flash memory of the AP.

```
RedBoot>fis delete kernel
Delete image 'kernel' - continue(y/n)? y

RedBoot>load -r -v -b 0x80400000 zImage
RedBoot>fis create -b 0x80400000 -l 0xC0000 kernel

RedBoot>fis delete rootfs
Delete image 'rootfs' - continue(y/n)? y

RedBoot>load -r -v -b 0x80001000 jffs2.image
RedBoot>fis create -b 0x80001000 -l 0x680000 rootfs

RedBoot>r
```

11) After the AP is rebooted, check the version to check if upgrading has been completed.

Q: TFTP upgrade method.

In the following cases, upgrade the s/w image of the AP on the bootloader by using the SIO cable.

- When the AP cannot be booted normally
- When upgrading by using the web it is not possible

The method of upgrading is as follows.
1) Preparation: PC (TFTP server), LAN cable, SIO cable
2) Save the s/w image of the AP in the PC. The required image files are zImage and jffs2.image.
3) Execute the TFTP server and set the directory where the above two files are saved as the server directory.
4) Connect the SIO port of the AP and the com port of the PC with the SIO cable.
5) Connect the LAN port of the AP and the Ethernet port of the PC with the LAN cable. It should be connected to the LAN port other than the WAN port of the AP by all means.
6) Execute the HyperTerminal program of the PC and set it to be connected to the com port.
   The Baud Rate of the AP is 115200.
7) Turn on the power of the AP and check if the booting message appears on the hyper-terminal window.
8) Press Ctrl+C during booting to move to the Redboot> status.

```
Samsung login: Ethernet eth0: MAC address f0:00:f0:50:50:50
```

```
IP: 192.168.111.10/255.255.255.0, Gateway: 192.168.111.1
Default server: 192.168.111.251

[ROM]SMT-R2000 release, version V0.7 - built 12:35:25, Mar 31 2006

Copyright(C) 2000, 2001, 2002, 2003, 2004 Red Hat, Inc.

Board: SMT-R2000
RAM: 0x80000400-0x81ff0400, [0x80000400-0x81fc1400] available
FLASH: 0xbe000000 - 0xbe7c0000, 64 blocks of 0x00020000 bytes each.
== Executing boot script in 2.000 seconds - enter ^C to abort
^C
RedBoot>
```

9) Change the IP address of the PC to the IP which corresponds to the default server
    among the above booting messages. The default value is 192.168.111.251.

10) Execute the following commands in sequence. This process is to download the s/w
    image from the TFTP server to use it for the Flash memory of the AP.

```
RedBoot>fis unlock kernel
RedBoot>fis unlock rootfs
RedBoot>fis unlock config

RedBoot>fis delete kernel
Delete image 'kernel' - continue(y/n)? y

RedBoot>fis delete rootfs
Delete image 'rootfs' - continue(y/n)? y

RedBoot>fis delete config
Delete image 'config' - continue(y/n)? y

RedBoot>load -r -v -b 0x80400000 zImage
RedBoot>fis create -b 0x80400000 -l 0xC0000 kernel


RedBoot>load -r -v -b 0x80001000 jffs2.image
RedBoot>fis create -b 0x80001000 -l 0x660000 rootfs

RedBoot>load -r -v -b 0x80001000 jffs2.config
RedBoot>fis create -b 0x80001000 -l 0x660000 rootfs

RedBoot>r
```

11) After the AP is rebooted, check the version to check if upgrading has been completed.

Q: boot loader upgrade method.

upgrade the bootloader image of the AP on the bootloader by using the SIO cable.

The method of upgrading is as follows.

1) Preparation: PC (TFTP server), LAN cable, SIO cable
2) Save the s/w image of the AP in the PC. The required image files are redboot.elf and redboot.rom.
3) Execute the TFTP server and set the directory where the above two files are saved as the server directory.
4) Connect the SIO port of the AP and the com port of the PC with the SIO cable.
5) Connect the LAN port of the AP and the Ethernet port of the PC with the LAN cable. It should be connected to the LAN port other than the WAN port of the AP by all means.
6) Execute the HyperTerminal program of the PC and set it to be connected to the com port.
   The Baud Rate of the AP is 115200.
7) Turn on the power of the AP and check if the booting message appears on the hyper-terminal window.
8) Press Ctrl+C during booting to move to the Redboot> status.

```
Samsung login: Ethernet eth0: MAC address f0:00:f0:50:50:50
IP: 192.168.111.10/255.255.255.0, Gateway: 192.168.111.1
Default server: 192.168.111.251

[ROM]SMT-R2000 release, version V0.7 - built 12:35:25, Mar 31 2006

Copyright(C) 2000, 2001, 2002, 2003, 2004 Red Hat, Inc.

Board: SMT-R2000
RAM: 0x80000400-0x81ff0400, [0x80000400-0x81fc1400] available
FLASH: 0xbe000000 - 0xbe7c0000, 64 blocks of 0x00020000 bytes each.
== Executing boot script in 2.000 seconds - enter ^C to abort
^C
RedBoot>
```

9) Change the IP address of the PC to the IP which corresponds to the default server among the above booting messages. The default value is 192.168.111.251.

10) Execute the following commands in sequence. This process is to download the the bootloader image from the TFTP server to use it for the RAM memory of the AP.

11)) Execute the go command and check if the booting message appears on the hyper-terminal window.

12)   Press Ctrl+C during booting to move to the Redboot> status

```
RedBoot> load redboot.elf
Using default protocol (TFTP)
Entry point: 0x800100bc, address range: 0x80010000-0x8003d258
RedBoot> go

Ethernet eth0: MAC address 00:00:f0:22:69:8b
IP: 192.168.111.10/255.255.255.0, Gateway: 192.168.111.1
Default server: 192.168.111.251

[RAM]SMT-R2000 release, version V0.8 - built 10:58:51, Sep   4 2007

Copyright (C) 2000, 2001, 2002, 2003, 2004 Red Hat, Inc.

Board: SMT-R2000
RAM: 0x80010000-0x82000000, [0x80056420-0x81fd1000] available
FLASH: 0xbe000000 - 0xbe7c0000, 64 blocks of 0x00020000 bytes each.
== Executing boot script in 2.000 seconds - enter ^C to abort
^C
RedBoot>
```

13)   check if the [RAM]   message appears on the hyper-terminal window.

14) Execute the following commands in sequence. This process is to download the bootloader image from the TFTP server to use it for the Flash memory of the AP.

```
RedBoot> ip_address -l 192.168.111.10 -h 192.168.111.251
IP: 192.168.111.10/255.255.255.0, Gateway: 192.168.111.1
Default server: 192.168.111.251
RedBoot> load -r -b %{FREEMEMLO} redboot.rom
Using default protocol (TFTP)
Raw file loaded 0x80056800-0x80085027, assumed entry at 0x80056800
RedBoot> fis create -l 0x40000 -e 0xbfc00000 RedBoot
An image named 'RedBoot' exists - continue (y/n)? y
... Unlock from 0xbe000000-0xbe040000: ..
... Erase from 0xbe000000-0xbe040000: ..
... Program from 0x80056800-0x80085028 at 0xbe000000: ..
... Lock from 0xbe000000-0xbe040000: ..
... Unlock from 0xbe7a0000-0xbe7c0000: .
... Erase from 0xbe7a0000-0xbe7c0000: .
... Program from 0x81fe0000-0x82000000 at 0xbe7a0000: .
... Lock from 0xbe7a0000-0xbe7c0000: .
RedBoot>r
```

15) After the AP is rebooted, check if the booting message appears on the hyper-terminal window.

16)   Press Ctrl+C during booting to move to the Redboot> status

17)   check if the [ROM]   message appears on the hyper-terminal window.

Q:V2.06 - patch file upload Method.

using Telnet and FTP

       The method of upgrading is as follows.

1) Preparation: PC (FTP client), LAN cable, SIO cable
2) Save the s/w program of the AP in the PC. The required files are reflash, flash-program,and flash-upgrade

3) Connect SMT-R2000 using telnet.
4) Input ID,Password (root / samsung)
5) flash unlock
    Command : ./flash_unlock /dev/mtd0

```
telnet 192.168.111.10
Samsung-AP login: root
Password:samsung


BusyBox v1.00 (2005.09.08-08:03+0000) Built-in shell (ash)
Enter 'help' for a list of built-in commands.

# cd /tmp
# chmod 755 flash_unlock
# ./flash_unlock /dev/mtd0
#
```

6) Execute the FTP client and connect SMT-R2000 IP Address .
7) input ID and password : root /admin
8) change directory /usr/sbin
9) upload files(reflash, flash-program,and flash-upgrade)

```
ftp 192.168.111.10
Connected to 192.168.111.10.
220 Welcome to Simple-FTPd server.
User (192.168.111.10:(none)): root
331 Password required for user root.
Password:admin
230 User root logged in.
ftp> cd /usr/sbin
250 CWD command successful.
ftp> put reflash
200 PORT command successful.
150 FILE: reflash
226 Transfer complete.
ftp: 729 bytes sent in 0.00Seconds 729000.00Kbytes/sec.
```

```
ftp> put flash-program
200 PORT command successful.
150 FILE: flash-program
226 Transfer complete.
ftp: 1036 bytes sent in 0.00Seconds 1036000.00Kbytes/sec.
ftp> put flash-upgrade
200 PORT command successful.
150 FILE: flash-upgrade
226 Transfer complete.
ftp: 2079 bytes sent in 0.01Seconds 207.90Kbytes/sec.
ftp> bye
```

10) Start WEB upgrade.

Q: upgrade method with Flash locking status in Version 2.05

Two method

1. using SIO Cable

　1) Connect the SIO port of the AP and the com port of the PC with the SIO cable.
　Execute the HyperTerminal program of the PC and set it to be connected to the com port.
　The Baud Rate of the AP is 115200

　2) Turn on the power of the AP and check if the booting message appears on the hyper-terminal window.

　3) Press Ctrl+C during booting to move to the Redboot> status

　4) input unlock command
　　Command:
　　　> fis unlock kernel
　　　> fis unlock rootfs

```
Samsung login: Ethernet eth0: MAC address f0:00:f0:50:50:50
IP: 192.168.111.10/255.255.255.0, Gateway: 192.168.111.1
Default server: 192.168.111.251

[ROM]SMT-R2000 release, version V0.7 - built 12:35:25, Mar 31 2006

Copyright(C) 2000, 2001, 2002, 2003, 2004 Red Hat, Inc.

Board: SMT-R2000
RAM: 0x80000400-0x81ff0400, [0x80000400-0x81fc1400] available
FLASH: 0xbe000000 - 0xbe7c0000, 64 blocks of 0x00020000 bytes each.
== Executing boot script in 2.000 seconds - enter ^C to abort
^C
RedBoot> fis unlock kernel
... Unlock from 0xbe040000-0xbe100000: ......
RedBoot> fis unlock rootfs
... Unlock from 0xbe100000-
0xbe760000: .......................................
..........
RedBoot>
```

5) Start WEB upgrade.

2. using Telnet

   The method of upgrading is as follows.

   1) Preparation: PC (FTP client), LAN cable, SIO cable
   2) Save the s/w program of the AP in the PC. The required file is flash_unlock.
   3) Execute the FTP client and connect SMT-R2000 IP Address .
   4) input ID and password   : root /admin
   5) change directory   /tmp
   6) upload flash_unlock file

```
ftp 192.168.111.10
Connected to 192.168.111.10.
220 Welcome to Simple-FTPd server.
User (192.168.111.10:(none)): root
331 Password required for user root.
Password:admin
230 User root logged in.
ftp> cd /tmp
250 CWD command successful.
ftp> put flash_unlock
200 PORT command successful.
150 FILE: flash_unlock
226 Transfer complete.
ftp: 67224 bytes sent in 0.02Seconds 3361.20Kbytes/sec.
ftp> bye
```

   7) Connect   SMT-R2000 using telnet.
   8) Input ID,Password   (root / samsung)
   9) change directory.
         Command : cd /tmp
   10) change file property
         Command   : chmod 755 flash_unlock
   11) flash unlock
         Command : ./flash_unlock /dev/mtd0

```
telnet 192.168.111.10
Samsung-AP login: root
Password:samsung


BusyBox v1.00 (2005.09.08-08:03+0000) Built-in shell (ash)
Enter 'help' for a list of built-in commands.

# cd /tmp
# chmod 755 flash_unlock
# ./flash_unlock /dev/mtd0
```

```
#
```

11) Start WEB upgrade.

Q: Process of V2.08 upgrade.

The method of upgrading is as follows.

1. nomal case
    Case V2.00 ~ V2.05
        Upgrader ->   V.208
    Case V2.06
        patch file upload(Q:V2.06 - patch file upload Method) -> Upgrader ->   V.208
    Case V2.07
        Upgrader ->   V.208

2. abnormal case
    Case of flash lock in V2.00 ~ V2.05
    ➔ Q: upgrade method with Flash locking status in Version 2.05
    Case : V2.06 -> V2.07 (changed default set)-> upgrader -> V2.08
    ➔ Dosenot save Configuration
    Case : V2.06 -> V2.08 (2008.1.23)
    ➔ Disconnected Network
    ➔ Q: TFTP upgrade method.
    Case : V2.05 -> V2.08 (2008.1.23)
    ➔ Disconnected Network
    ➔ Q: TFTP upgrade method.
      Case : V2.06 -> V2.08 (2008.2.11)(changed default set)
      Case : V2.05 -> V2.08 (2008.2.11)(changed default set)
    ➔ Dosenot save Configuration
    ➔ Downgrade V2.05 -> upgrader -> V2.08

Q: VWN (Virtual Wireless Network) Settings

CASE 1: Two Separate Networks: WAN port for internal SSID and LAN port for guest SSID

Manage ⬅   Ethernet Settings
            Guest Access: Enable
            For Guest Access: LAN Port

It will be working like 2 APs. These virtual 2 APs cannot communicate with each other inside SMT-R2000.

AP1 (Internal): WAN Port with Internal SSID (a+ bg)

AP2 (Guest): LAN Port with Guest SSID (a + bg)

```
┌──────────────────────────────────────────────────────────────────────┐
│                                                                        │
│         ┌──────────┐                       ┌──────────┐                │
│         │   WAN    │                       │   LAN    │                │
│         │   Port   │                       │   Port   │                │
│         └──────────┘                       └──────────┘                │
│                                                                        │
│    ┌──────────┐  ┌──────────┐         ┌──────────┐  ┌──────────┐       │
│    │ Internal │  │ Internal │         │  Guest   │  │  Guest   │       │
│    │ 802.11a  │  │802.11b/g │         │ 802.11a  │  │802.11b/g │       │
│    └──────────┘  └──────────┘         └──────────┘  └──────────┘       │
│                                                                        │
└──────────────────────────────────────────────────────────────────────┘
```
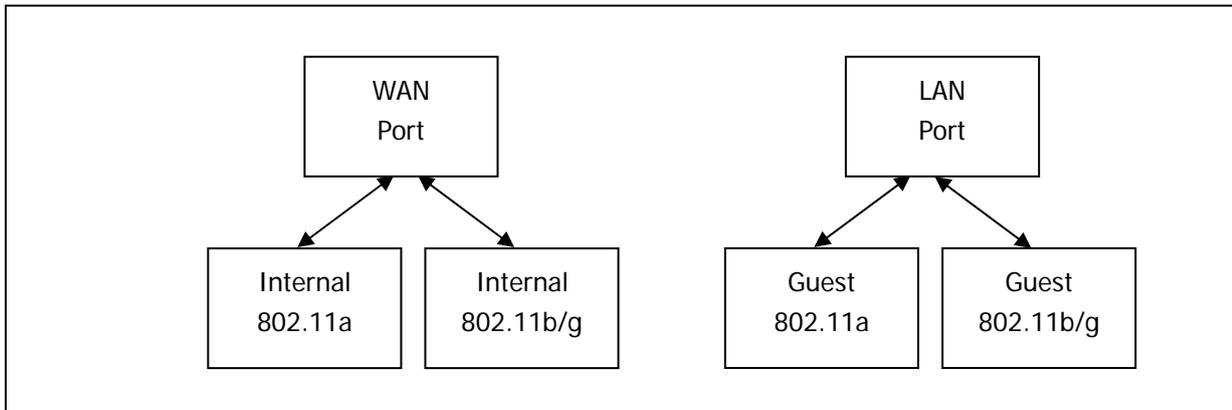
CASE 2: One Network (WAN port) with Guest SSID

Manage ←   Ethernet Settings
                Guest Access: Enable
                For Guest Access: VLAN WAN Port

AP1 (Internal): Internal SSID (a+ bg) to WAN PORT (Internal VLAN ID) and LAN Port
AP2 (Guest): Guest SSID (a + bg) to WAN PORT (Guest VLAN ID)
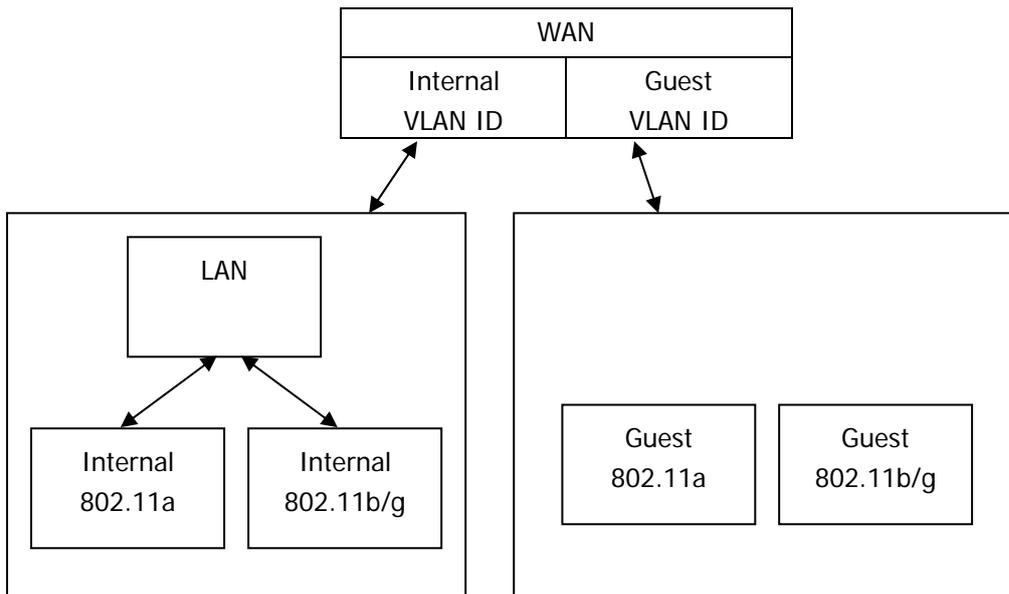
CASE 3: One Network with Multiple SSIDs (no guest SSID)

Manage ⬅ Wireless Settings

Virtual Wireless Networks: Disabled

VWN Enabled VLAN ID SSID: check box and enter the VLAN ID

One AP supports multiple SSIDs with different security policies.

AP1 (Internal): Internal SSID (a+ bg) to WAN port and LAN port.

All SSIDs will access to WAN port and LAN port but with different security policies.

LAN	WAN

Internal 802.11a	Internal 802.11b/g

VWN1 802.11a	VWN1 802.11b/g

VWN X 802.11a	VWNX 802.11b/g
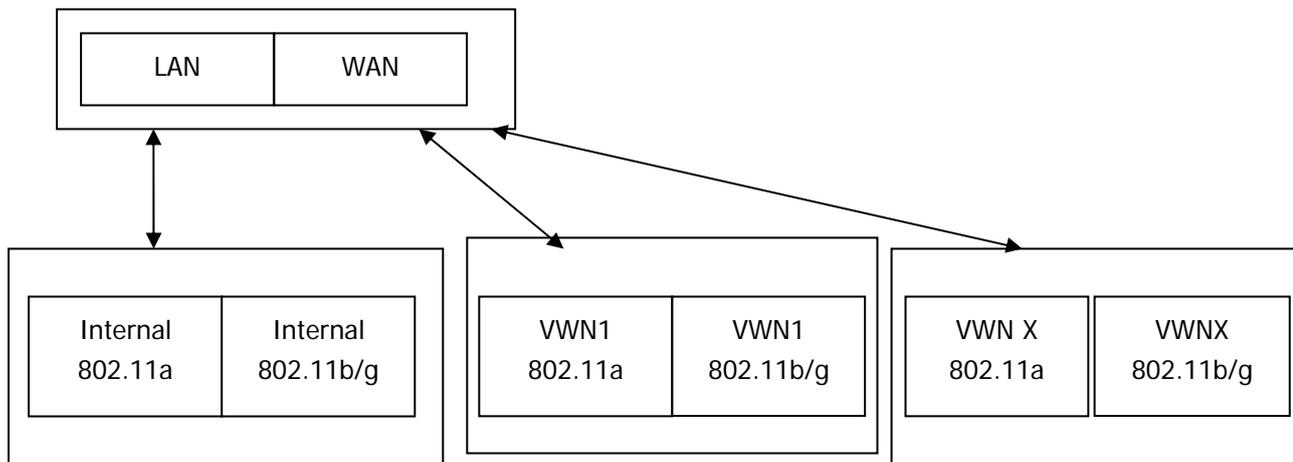
CASE 4: VWN to WAN port and VLAN to WAN and LAN port

Manage ⟵ Ethernet Settings

        Virtual Wireless Networks: Enabled

        (Using VLANs on Ethernet Port 1)

Manage ⟵ Wireless Settings

        Virtual Wireless Networks: Enabled

        VWN Enabled VLAN ID SSID: check box and enter the VLAN ID

AP1 (Internal):   Internal SSID (a+ bg) + LAN Port + WAN port (Internal VLAN ID)

AP2 (VWN1): VWN1 SSID (a + bg) + WAN port (VWN1 VLAN ID)

APx (VWNx): VWNx SSID (a + bg) + WAN port (VWNX VLAN ID)

WAN		
Internal VLAN ID	VWN1 VLAN ID	VWN X VLAN ID

LAN		VWN1	VWN1	VWN X	VWNX
Internal 802.11a	Internal 802.11b/g	VWN1 802.11a	VWN1 802.11b/g	VWN X 802.11a	VWNX 802.11b/g
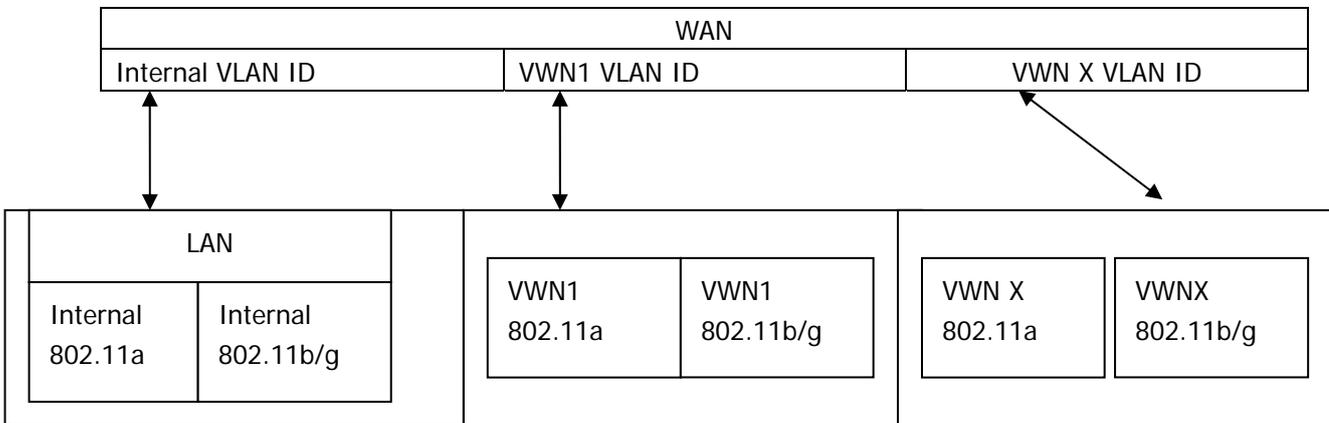
Q: can't charge terminal's battery although the terminal is on the charger.

Check the charging pin at the bottom of terminal and charger's pins.
The dust can block the charging.
So, Clean the terminal's charging pins and charger's pins.
In charging mode, battery Icon in terminal's LCD must move from one to three step.
(also you can charge the terminal through connecting the charging cable to terminal directly.)

ANNEX B. WLAN PRE-SALES CHECKLIST

Purpose

This is to support the sales process by acquiring sufficient information on the consumers' WLAN requirements and understanding the information on the consumers' current network additionally. IT IS IMPORTATNT THAT a site survey should be performed before the contract is made.

Contents

1. Consumer information
2. Voice information
3. Data information
4. Building information
5. System information to be installed
6. Expected number of the Installed APs

1. Consumer Information

Company name	
Site location	
Contact name	
Contact number	

2. Voice Information

Type of the TRK service to be used	
Quantity of the TRK service to be used	
Number of the users using the call service	
Number of the users using the call service simultaneously	

3. Data Information

Amount of required data on the wireless part or wireless(service type)	
Number of users to use the wireless data	
Amount of required data on the wired part(service Type)	
Number of users to use the wired data	
Data Rate service in the wired part	10 Mbps/100 Mbps/1 Gbps
Method of setting IP	Using the DHCP server/Using the Static IP
Method of operating the DHCP server	A special description on the DHCP server operation are required.
Is it possible to separate the Voice network from the existing data network?	Impossible/Possible

Currently Configured Network topology and Network IP Configuration
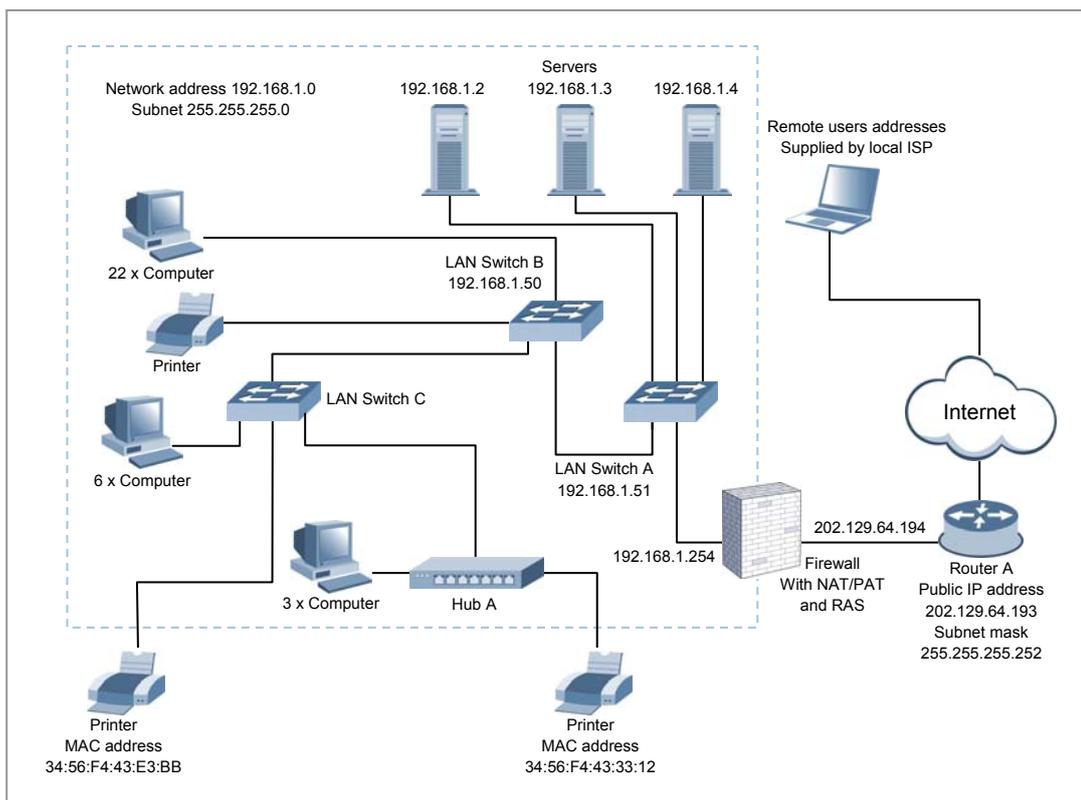
Ex)

4. Building Information and Service Area Information

Area of the building	
Number of floors	
Height between floors	
Description on the building structure and the service area	

Layout and description on each floor

Ex)

First floor
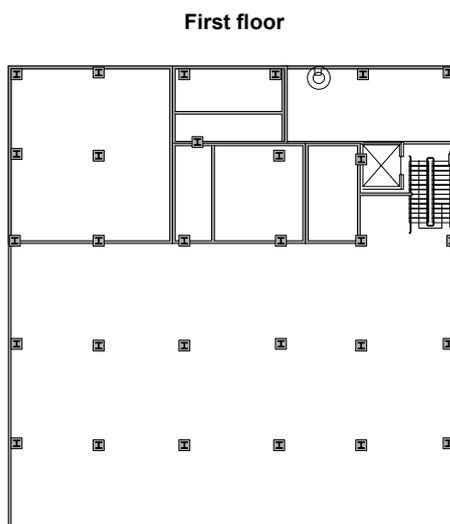
Floor	Description
Area	Width * length
Purpose of use	
User characteristics(Location frequently used)	
Service area indication	
Material and thickness of the outer wall	
Material and thickness of the inside wall	
Parts where metal material exists	
Types and material of the inside partition	
Location of the centre of the network connection(EPS)	
Material of the location where the AP can be installed	Ex) Steel-frame structure, cement…, wood…
Height where the AP can be installed	

5. Information on the System to be installed

Installed system	Description
Number of installed systems	
Information on the MCP Version of the installed system	
Number of MGI and the Version information	
AP Type	
Type of wireless terminals	
Number of wireless terminals	
IP phone version information	
Number of IP phone	
Whether to use Fixed IP Phone(WLAN Adaptor)	
Whether to use the WLAN Switch	

6. Understanding the expected number of Installed APs

Refer to '2.2 Cell Plan' and '2.2.2 Cell Plan Based on Cell Capacity and Area'.
The plan according to the capacity and the plan according to the area should be reviewed complementarily. In case of the actual installation, by using and checking the method of the site survey in 2.2 Cell Plan, the accurate amount to be used can be calculated. However, generally, when the area is small, the plan according to the capacity is performed, and when the area for the service is large, the plan according to the area is performed.
In case of the plan according to the capacity, check the number of the AP based on 4 units per AP.

- Estimating the number of the APs according to the capacity
  Number of APs = Number of simultaneous calls/Simultaneous calls per AP
  Ex) When the maximum number of the calls which are available simultaneously is 27(or the number of the terminals) and the number of the calls which are available simultaneously for one AP is 4, 27/4 = 5.7, thus 6 APs are required.

- Estimating the number of the APs according to the area
  Number of APs = Total service area/The coverage of one AP
  Ex) When the AP service coverage is 20m and the coverage to be serviced is 50×20 m, $50 \times 20/20 \times 20 \times 3.14 = 1000/1256 = 0.79$, namely, this is less than 1, thus this can be assumed as 1, but the radius of 20 m cannot cover 50 m. Accordingly, one should be installed additionally.

ANNEX C. Capacity for Each OfficeServ system

Items	OfficeServ 500					
	WBS24 Combo		WBS24 Basic		SMT-R2000	
	iDCS-M	iDCS-L	iDCS-M	iDCS-L	iDCS-M	iDSC-L
Available Max. No of WLI slots	1	3(1 per rack)	0	0	-	-
Max No of WLI slots	1	1 to 3 per rack	-	-	-	-
Max No of AP	8	24	40	80	Unlimited	Unlimited
Usable CODEC	G.729				G.729/G.711	
Max. no of Voice Channel	4	4	4	4	MMC 845 setting	
Max. no of user(Registered terminal)	32	64	32	64	32	64

Items	OfficeServ 7200					
	WBS24 Combo		WBS24 Basic		SMT-R2000	
	Basic Rack	Extension Rack	Basic Rack	Extension Rack	Basic Rack	Extension Rack
Available Max. No of WLI slots	3	3	0	0	-	-
Max No of WLI slots	1 to 5	1 to 5	-	-	-	-
Max No of AP	12	12	40	40	Unlimited	Unlimited
Usable CODEC	G.729				G.729/G.711	
Max. no of Voice Channel	4	4	4	4	MMC setting	
Max. no of user(Registered terminal)	32					

Items	Officeserv 7400					
	WBS24 Combo		**WBS24 Basic**		**SMT-R2000**	
	Basic Rack	**Extension Rack**	**Basic Rack**	**Extension Rack**	**Basic Rack**	**Extension Rack**
Available Max. No of WLI slots	3	3	0	0	-	-
Max No of WLI slots	Unlimited	Unlimited	-	-	-	-
Max No of AP	12	12	80	80	Unlimited	Unlimited
Usable CODEC	G.729				G.729/G.711	
Max. no of Voice Channel	4	4	4	4	MMC setting	
Max. no of user(Registered terminal)	128					

Items	Officeserv 7100	
	WBS24 Basic	**SMT-R2000**
	Basic Rack	**Basic Rack**
Available Max. No of WLI slots	0	-
Max No of WLI slots	-	-
Max No of AP	12	Unlimited
Usable CODEC	G.729	G.729/G.711
Max. no of Voice Channel	4	MMC setting
Max. no of user(Registered terminal)	32	

NOTE

Length of the cable

- SMT-R2000 or WBS24 Basic ⬅➡ System(Ethernet) : Maximum 100m (Ethernet cable)

- WBS24 Combo ⬅➡ System(WLI) : Maximum 600 m(0.64 twist line cable)/Maximum 400 m(0.40 twist line cable)

Max. no of Voice Channel

NOTE

When using SMT-R2000, you can set Max. no of Voice Channel in MMC 845. The default value is '0' and the number of channels is not limited. That means the available call channels are not limited in the system. However, the actual wireless bandwidth is limited, so calls are not possible without a limit. Therefore, as the number of calls is increased more than a certain level, the call quality is lowered and the calls exceeding the level may not be connected. To guarantee a certain level of the call quality, the administrator can limit the number of calls by entering an appropriate level value. For the appropriate value, refer to '2.2.2.1 Design by Cell Capacity'. A too small value cannot sufficiently allow the use of available wireless bandwidth, and too big value cannot guarantee the call quality.

The value of 'Max. No of user' indicates the maximum number of WiFi phones that can be registered. However, since this value is not assigned only for WiFi phones, the value may vary depending on the registration number of other terminals, such as ITP, SIP and UMS/IVR. For more detailed information, refer to the manuals for each OfficeServ system.

ANNEX D. WLAN Site Survey Form

Purpose

Use this when installing the system initially and use this when problems occur later or when maintenance is required. When the site is extended or when the installation is changed due to problems, do this again by updating existing information.

Contents

1. Consumer information
2. Voice information
3. Data information
4. Building information
5. System information to be installed
6. WLAN AP installation status
7. Result of sniffing the network

1. Consumer information

Company name	
Manager of the company	
Contact information for the company	
Site location	
Site work	
Cell planner	
Cell planner's contact information	

2. Voice information

Type of TRK service to be used	
Quantity of TRK service to be used	
MGI Slot Type	
Codec Type	
Number of ITP Phone users	
Number of WiFi Phone users	
WiFi phone type	
WiFi service type	11b only, 11 g
AP type	SMT-R2000/WBS24
Number of installed APs	
Number of calls requested simultaneously at the AP	
Security information for voice	Open, WEP, WPA⋯.

3. Data information

Amount of required data on the wired part	Checking the service bandwidth by using the Chariot
Type of wired data service	
Number of users using the wired data	
Type of wired support	10 Mbps/100 Mbps/1Gbps
Structure diagram of the wired network	Notes) Make this by referring to the following figure.
Wired switch type	
Wireless data service type	
Required amount of wireless data	Checking the service bandwidth by using the Chariot
Number of users using the wireless data	
Card type for the wireless data	11b only, 11g, 11a
Method of allocating the data terminal IP	DHCP/Static
Whether to separate the data network	Separate this from the voice network
Method of allocating the voice terminal IP	DHCP/Static
Whether to use the LIM	
Number of LIMs to be used	
Whether to use the PLIM	
Number of PLIMs to be used	
Using the 3rd party Ethernet switch	
3rd party Switch model	

Whether to use the WIM	
Whether to use the 3rd party router	
Whether to configure the VPN/Firewall	
Whether to use NAT/PT	
Whether to use DHCP	
List of the IP allocation	Make the list of the IP allocation separately and inform of that.
Details of supporting QoS in the data network	
Security information of the wireless data network	

Currently Configured Network topology and Network IP configuration
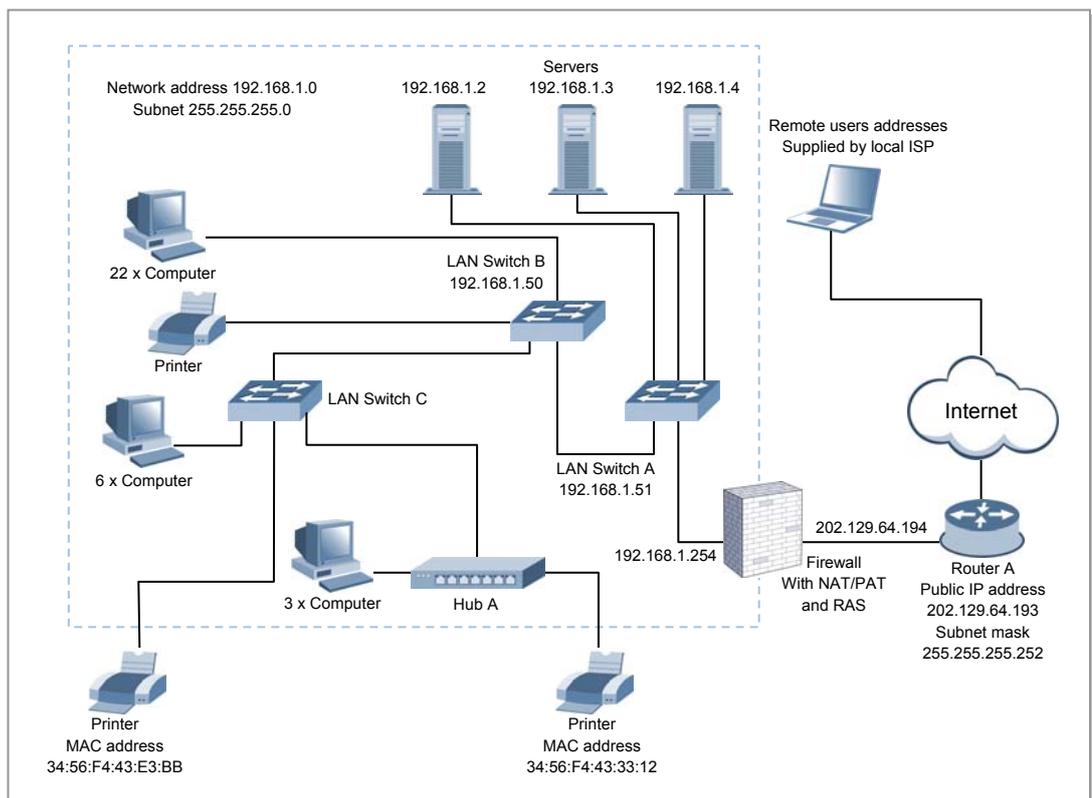
Ex)

4. Building information and Service Area Information

Area of the building	
Number of floors	
Height between floors	
Description on the building structure and the service area	

First floor
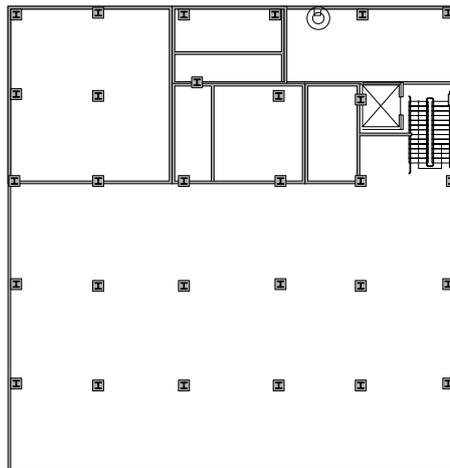
Floor Description	
Area	Width * length
Purpose of use	
User characteristics	
Service area indication	
Material and thickness of the outer wall	
Material and thickness of the inside wall	
Parts where metal material exists	
Types and material of the inside partition	
Location of the centre of the network connection(EPS)	

5.   System information to be installed

Installed system	
Number of the installed system	
MCP Version information of the installed system	
Number of the MGI and the version information	
Version of the AP	
Version of the wireless terminal	
IP phone version information	
Whether to use the Fixed IP Phone(WLAN Adaptor)	
Whether to use the WLAN Switch	

CHECK	**Mandatory attachment** Mandatory attachment is System information(DB)-PCMMC file or Web MMC DB file.

6. WLAN AP Installation Status

- Location of the installed AP and the RF Channel information/used service mode(802.11b/g/a)
- Indication of the coverage area/CQ or SL according to the data rate of the installed AP
- Network information of the installed AP(IP/MAC address)
- Service Security Mode(Using Open/WEP/WPA/WPA2/802.1x(Radius Server)) Ex)

KEYs	⬤ samsung Access point	⬭ 2 Mbps Bandwidth
	🔴 11 Mbps Bandwidth	⬭ 1 Mbps Bandwidth
	🟡 5 Mbps Bandwidth	🟣 11 ~54 Mbps Bandwidth or more

192.168.111.12
00.02.02.03.04.05
CH. 1(11b)

192.168.111.11
00.01.02.03.04.05
CH. 11(11b)

Batwatch Ltd
Newcastle-Upon-Tyne
Ground Floor Layout
(not 100% accurate)
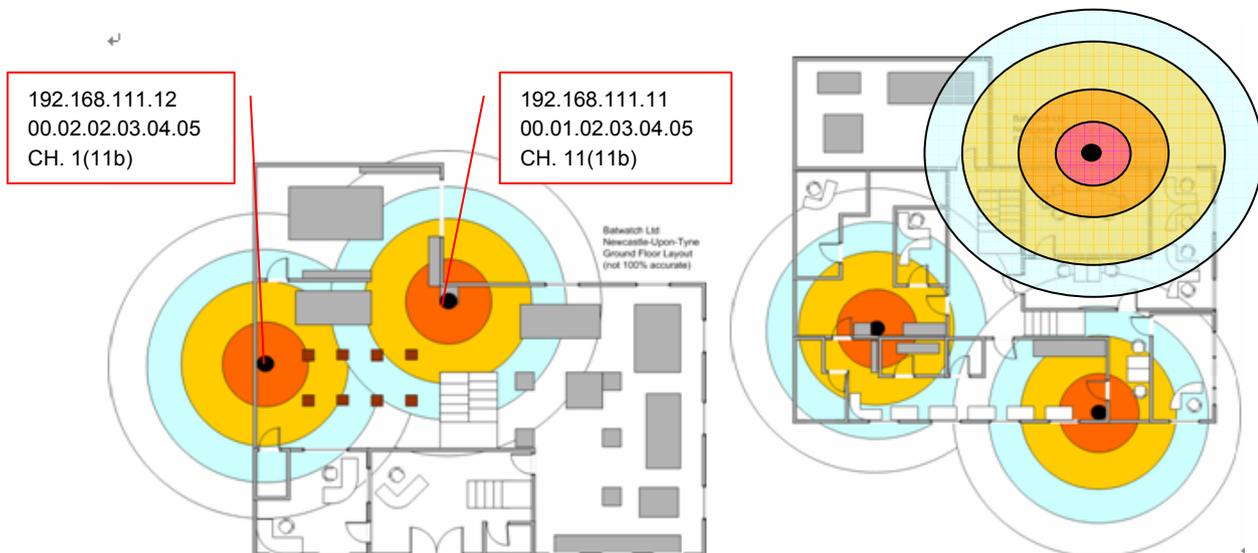
7. Attaching the results of 'Sniffing' the network

1) Bandwidth Measurement:

Site name	Measured Time	Total Bandwidth	Maximum	Minimum	Average
Office	10:00 busy hour				
	14:00 Busy Hour				
Warehouse	10:00 busy hour				
	14:00 Busy Hour				

a) Wired Bandwidth Measurement

Estimate the bandwidth which is being used on the wired network by using the tools such as a Sniffer or Ethereal.

• Calculate the bandwidth required for the VoIP service

The bandwidth required for one call according to each Codec is,

Link Header(14B) + IP header(20B) + UDP header(8B) + RTP header(12B) + payload, and the frame is configured. The numerical formula for this is as follows.

Bandwidth per 1 Call = {(54 + payload) * 8 * 1000 * 0.4}/Codec sampling period

The following table values can be acquired by the above formula.

Codec Multifram/Sampling period	Bandwidth(Kbps)
G.711 160 bytes/20 ms	85.6
G.711 320 bytes/40 ms	149.6
G.729 20 bytes/20 ms	29.6
G.729 30 bytes/30 ms	22.4
G.729 40 bytes/40 ms	18.8

b) Wireless Bandwidth Measurement

• Estimate the bandwidth which is being used on the wireless network by using tools such as the Airopeek or Ethereal.

• Estimate the bandwidth required for the VoIP service. Different types of approach are required for each types of the environment. Refer to the following description.

– When using only the WiFi terminal for the voice

– When using the WiFi terminal for the voice and the data

A. When using only the WiFi terminal for the voice		
Maximum number of the calls which the user wishes (number of the terminals)		
Type of service voice Codec	G.711 or G.729	The default is G.729, but it is selected according to the MMC 835 MGI codec type.
Type of service packetizing time	20 ms or 40 ms	If the packetizing time is long, when the loss is generated, the loss of a lot of data is generated. Thus, it is required to set appropriate time. (The default is 40 ms.)
What is the selection of the minimum service data rate of the AP Radio?	2 Mbps, 5 M	Refer to the page 12 and select the minimum data rate among the service data rates of the radio.

NOTE	When selecting the minimum data rate, if it is less than the maximum number of the calls which the user requests, it is possible that call drop is generate or the voice quality is degraded. The administrator should limit the number of the used terminals or raise the minimum data rate or change the codec and the packetizing time.

NOTE	If the minimum data rate is raised, the service coverage is reduced. (The Tx power is reduced based on the WiFi standard.)

B. When using general data together		
Maximum number of calls which the user wishes(number of the terminals)		
Type of service voice Codec	G.711 or G.729	The default is G.729, but it is selected according to the MMC 835 MGI codec type.
Type of service packetizing time	20 ms or 40 ms	If the Packetizing time is long, when the loss is generated, the loss of a lot of data is generated. Thus, it is required to set appropriate time.(The default is 40ms.)
Minimum service data rate of the AP Radio	2 Mbps, 5 M	Refer to the page 12 and select the minimum data rate among the support data rates of the radio.
When selecting the minimum data rate as above, measure the Data Bandwidth by using the wireless PC and the wired PC among the data services.		Use the tool such as the 'chariot' or the 'iperf'.

Formula for calculation which can be serviced

1. Which bandwidth is available for the voice service except for the above bandwidth for the data?
2. What is the bandwidth per call mentioned in the minimum Data rate, the Voice codec and the packetizing time selected by the administrator?
3. Is the quotient by dividing 1) by 2) greater than the maximum number of calls which the user requests?

NOTE

If the quotient of 3, is not greater than the maximum number of calls which the user requests.

1) Separate the voice service from the data service, or decrease the number of the terminals for the voice.
2) Raise the minimum data rate, or adjust the codec or the packetizing time to appropriate values.

If the data rate is raised, the service coverage is reduced, thus adjust the AP.

The following table displays the number of voice calls and the requested bandwidth value according to the Codec and the service data rate on the wireless LAN. These are the theoretical values and can be changeable according to the environment, thus use them only for reference.

NOTE

The values of the following table are based on the selected minimum data rate, and the total transmission bandwidth is also based on the corresponding data rate.

Client type		802.11b			802.11g			
Data rate		2 M	5.5 M	11 Mbps	6 M	12 M	24 M	54 M
G.711 20 ms	Bandwidth (Mbps)	0.31	0.47	0.62	0.31	0.41	0.56	0.77
	Number of the calls	5	8	10	16	22	27	31
G.711 40 ms	Bandwidth	0.21	0.28	0.35	0.21	0.26	0.32	0.41
	Number of the calls	8	14	18	24	36	48	58
G.729 20 ms	Bandwidth	0.23	0.38	0.56	0.24	0.33	0.49	0.72
	Number of the calls	7	10	11	21	28	31	33
G.729 40 ms	Bandwidth	0.12	0.27	0.28	0.13	0.22	0.25	0.36
	Number of the calls	14	15	22	40	43	62	66

2) Packet loss rate measurement:

Ping destination	Ping Sent	Ping Received	Loss	Average time	Maximum Time
MCP: 192.168.111.10					
MGI: 92.168.111.12					
AP1:					
AP2					

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ANNEX E. VoWLAN Check List

Purpose:

When problems occur on VoWLAN site, it is important to document each problem and any actions taken, along with the response to the se actions.

Contents:

1. Basic information
2. Site visit information
3. Entering the problem
4. Contents of checking the problem
5. Result of checking the wireless environment

1. Basic information

Write/update the information of the Appendix D. WLAN Site Survey form.
Enter the changed contents.(contents on the peripheral AP)

2. Visit information

Visitor	
Point of time when the problem occurs	
System version when the problem occurs	
AP and the terminal version when the problem occurs	
Date of the last visit	

3. Entering the problem

Index	Contents of the problem	Information on the problem suggestion (Phone number, Location, Version)	Location of the AP where the problem has occurred	Generation time And frequency	User's opinion

4. Contents of checking the problem

• Check the appendix A. Troubleshooting.(Yes/No)

• Check the service area again and when extending the service area or the capacity, check if the AP should be installed additionally.

• If voice and data are serviced together, when the used amount of Data Traffic cannot secure the bandwidth for voice requested in the Site survey, network separation should be considered.

    – Details of measures taken by visiting

Index	Details of measures taken by visiting	Result(Solved, unsolved, others)

5. Result of checking the wireless environment

Is a Microwave oven in use?	
Are Bluetooth devices inuse?	

Notes) The results that the surrounding wireless environment is scanned by using tools, such as WiSpy and OmniSpectrum should be noted..

Are other vendors APs inuse?	
Are other APs using same channels?	
Why are they using other vendors APs?	

6. Factor for final evaluation

Check Point	Appropriate Range	Measured value of the final site		Suitability Evaluation	Remarks
		10:00 Busy Hour	14:00 Busy Hour		
Packet Delay	Average 100msec or less Maximum 200msec less	Minimum: Maximum: Average:	Minimum: Maximum: Average:		
Packet Loss	Trunking: 3% or less When using the ITP: 0.1% or less When using the WiFi: 0.5% or less	Maximum: Average:	Maximum: Average:		
Wired Bandwidth	Preparing the bandwidth required for the maximum number of used calls : kbps	Total Bandwidth Capacity: Min. Bandwidth used: Max. Bandwidth used: Avg. Bandwidth used:	Total Bandwidth Capacity: Min. Bandwidth used: Max. Bandwidth used: Avg. Bandwidth used:		
Wireless Bandwidth	Preparing the bandwidth required for the maximum number of used calls : kbps	Total Bandwidth Capacity: Min. Bandwidth used: Max. Bandwidth used: Avg. Bandwidth used:	Total Bandwidth Capacity: Min. Bandwidth used: Max. Bandwidth used: Avg. Bandwidth used:		
QoS setting	QoS which is applicable				
Maximum capacity for calls	Checking the quantity of the MGI Card				
Result of roaming	99.5%	Calculating the call cut off rate during the 200 Roaming tests.			

Others: 1. The measured values for all the places where the K/P(Including the MGI) System and the WiFi are installed should be written.

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ANNEX F. TCP/UDP Ports Used by Samsung

When using the Samsung VoWLAN Solution, there are the Protocol Ports used only by Samsung. These are used for providing the Samsung Proprietary service.

UDP Port	Object	Description
7000	System (Server)	Allocating the IP to the terminal or the WBS via the PDHCP
7001	Terminal (Client)	
7003	WBS (Client)	
8000	System (Sever)	Transmitting the Samsung OfficeServ System PA message
8001	Terminal(Client)	
5060	Terminal (Client)	Transmitting the SIP message
5080	System(Server)	
8004	Terminal	Transmitting the RTP VoIP Media(G.711/G.729 Packet)
8005	Terminal	Transmitting the control frame to adjust the RTCP VoIP session
20000 ~ 20031	MGI	Even Ports : RTP Odd Ports : RTCP
10000	Sever to terminal/WBS	Used to check if it is used by Link control between the terminals or between the WBSs, or if it is out of service.
10001	Terminal to server	
2313	Between APs	Used when transmitting the IAPP message by broadcasting
3517	Between APs	Used when transmitting the IAPP message by multicasting

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ABBREVIATION

A

AC	Alternating Current
AP	Access Point
ARP	Address Resolution Protocol

C

CQ	Communication Quality

D

DHCP	Dynamic Host Configuration Protocol
DSSS	Direct Sequence Spread Spectrum

E

EIRP	Effective Isotropic Radiated Power

F

FHSS	Direct Sequence Spread Spectrum

I

ID	Identification
IP	Internet Protocol

L

LAN	Local Area Network

N

NAT	Network Address Translation
NL	Noise Level
NTP	Network Time Protocol

O

OSPF   Open Shortest Path First

P

PCMMC   PC based Man Machine Communication
PoE   Power over Ethernet

Q

QoS   Quality of Service

S

SL   Signal Level

V

VoWLAN   Voice over WLAN

W

WAN   Wide Area Network
WDS   Wireless Distribution System
WEP   Wired Equivalent Privacy
WLAN   Wireless LAN
WPA   Wi-Fi Protected Access

OfficeServ VoWLAN
Administration Guide