MobileAccessVE
Mixed-Band LTE 700 MHz
Instant Coverage Solution
User Manual

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Preface Material

Policy for Warrantee and Repair

MobileAccess tests and inspects all its products to verify their quality and reliability. MobileAccess uses every reasonable precaution to ensure that each unit meets their declared specifications before shipment. Customers should advise their incoming inspection, assembly, and test personnel about the precautions required in handling and testing our products. Many of these precautions can be found in this manual.
The products are covered by the following warranties:

General Warranty

MobileAccess warrants to the original purchaser all standard products sold by MobileAccess to be free of defects in material and workmanship for one (1) year from date of shipment from MobileAccess. During the warranty period, MobileAccess will repair or replace any product that MobileAccess proves to be defective. This warranty does not apply to any product that has been subject to alteration, abuse, improper installation or application, accident, electrical or environmental over-stress, negligence in use, storage, transportation or handling.

Specific Product Warranty Instructions

All MobileAccess products are warranted against defects in workmanship, materials and construction, and to no further extent. Any claim for repair or replacement of units found to be defective on incoming inspection by a customer must be made within (30) days of receipt of shipment, or within (30) days of discovery of a defect within the warranty period.

This warranty is the only warranty made by MobileAccess and is in lieu of all other warranties, expressed or implied. MobileAccess sales agents or representatives are not authorized to make commitments on warranty returns.

Returns

In the event that it is necessary to return any product against above warranty, the following procedure shall be followed:
1. Return authorization is to be received from MobileAccess prior to returning any unit. Advise MobileAccess of the model, serial number, and discrepancy. The unit may then be forwarded to MobileAccess, transportation prepaid. Devices returned collect or without authorization may not be accepted.
2. Prior to repair, MobileAccess will advise the customer of our test results and any charges for repairing customer-caused problems or out-of-warranty conditions etc.
3. Repaired products are warranted for the balance of the original warranty period, or at least 90 days from date of shipment.

Limitations of Liabilities

MobileAccess's liability on any claim, of any kind, including negligence for any loss or damage arising from, connected with, or resulting from the purchase order, contract, quotation, or from the performance or breach thereof, or from the design, manufacture, sale, delivery, installation, inspection, operation or use of any equipment covered by or furnished under this contact, shall in no case exceed the purchase price of the device which gives rise to the claim.

EXCEPT AS EXPRESSLY PROVIDED HEREIN, MOBILEACCESS MAKES NO WARRANTY, EXPRESSED OR IMPLIED, WITH RESPECT TO ANY GOODS, PARTS AND SERVICES PROVIDED IN CONNECTION WITH THIS AGREEMENT INCLUDING, BUT NOT LIMITED TO, THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. MOBILEACCESS SHALL NOT BE LIABLE FOR ANY OTHER DAMAGE INCLUDING, BUT NOT LIMITED TO, INDIRECT, SPECIAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF OR IN CONNECTION WITH FURNISHING OF GOODS, PARTS AND SERVICE HEREUNDER, OR THE PERFORMANCE, USE OF, OR INABILITY TO USE THE GOODS, PARTS AND SERVICE.

Reporting Defects

The units were inspected before shipment and found to be free of mechanical and electrical defects. Examine the units for any damage that may have been caused in transit. If damage is discovered, file a claim with the freight carrier immediately. Notify MobileAccess as soon as possible.
Note: Keep all packing material until you have completed the inspection

Safety Warnings

To comply with FCC RF exposure compliance requirement, adhere to the following warnings:

Warning! The Access Pod with its built-in antenna must be installed with a separation distance of at least 20cm from all persons and must not be located in conjunction with any other antenna.

Warning! The outside antenna must be installed with a separation of at least 20cm from all persons and must not be located in conjunction with any other antenna.

Warning! Use of this Access Pod with antennas other than those illustrated could be hazardous. Before using other
antennas, contact MobileAccess Support.

Caution: Double pole/neutral fusing (two fuses in the appliance inlet)

Approved Antennas for use with the MobileAccessVE Solution

The gain of external antennas connected to the VAPs should not exceed 10 dBi.

Compliance with RF Safety Requirements

MobileAccess products have no inherent significant RF radiation.
The RF level on the down link is very low at the downlink ports. Therefore, there is no dangerous RF radiation when the antenna is not connected.

Certification and Compliance to Standards

Category	Standards
Safety:	IEC 60950-1: 2003; UL-60950-1:2003; CAN/CSA – C22.2 No 60950-1-03
EMC:	47CFR 15.109 FCC Part 15
Radio:	FCC Part 27
ISO 9001	2000 and ISO 13485: 2003

About This Guide

This guide provides essential product functionality with all the information necessary for proper installation and configuration of the MobileAccessVE system.

List of Acronyms

Abbreviation	Description
LTE	Long Term Evolution
MB	Mixed-Band
MIMO	Multiple Input Multiple Output
PoE	Power Over Ethernet
PSE	Power Sourcing Equipment
SME	Small / Medium Enterprise
STP	Shielded Twisted Pair
UTP	Unshielded Twisted Pair
VAP	VE Access Pod
VCU	VE Control Unit

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1   Overview

The MobileAccessVE Mixed-Band LTE 700 MHz solution provides enhanced, cost effective, in-building LTE MIMO Upper C and/or Lower A, B, C coverage for any small-to-large sized enterprise environment. This solution is quickly and easily deployed using the existing Ethernet cabling infrastructure without affecting existing LAN services or performance.

The VE LTE Mixed-Band solution supports two LTE sub-bands, where the gain and power setting for each band is independently configured. The VE solution distributes the supported LTE MIMO 700MHz service (Upper C and/or Lower A,B,C bands) to VE Access Pods (VAPs) installed throughout the enterprise, which distribute the services via integrated internal antennas (or optional external antennas), and provide Ethernet connectivity (and PoE pass-through) to LAN terminals. MobileAccessVE seamlessly coexists with the Enterprise LAN and does not consume LAN capacity.

The VAPs are distributed on each floor and plug into existing standard Ethernet jacks. They are powered via PoE technology and managed via a VE Control Unit (VCU) located in the floor's IDF/Telco closet. *For site coverage that requires more than one VCU, several VCUs can be aggregated under a single Master VCU. The Master VCU provides the interface to the carrier's capacity sources and management.*

This enhanced LTE 700 MIMO coverage solution can be quickly and easily installed with minimal disturbance to the enterprise. In less than a few hours and with no additional cables being required, a scalable and flexible solution is provided at a significantly lower total installation cost.

The following figures illustrate *single-tier* and *multi-tier* VE installations.

In a single-tier installation the VCU is connected to both the service provider's equipment and the Ethernet switch, and distributes Ethernet and mobile services to up to 12 VAPs distributed over one more adjacent floors.
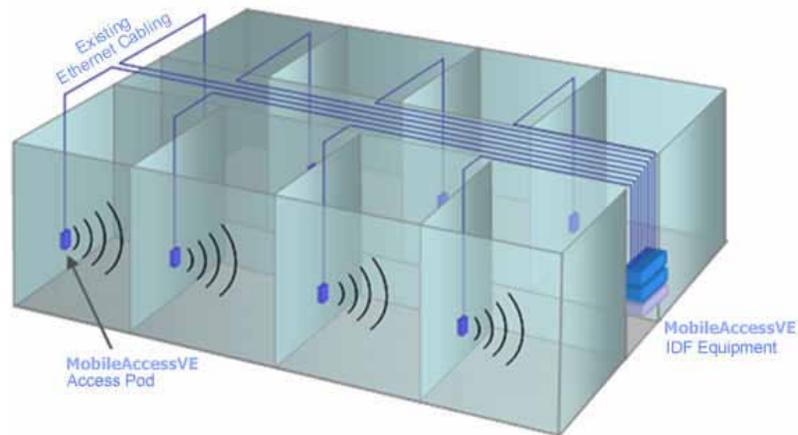
Figure 1-1. Single-Tier VE Installation

Multi-tier installation includes the Master VCU that supports up to 12 Slave VCUs. In this type of installation the provider's services are fed to the Master VCU through which the Slave VCUs are controlled and managed.
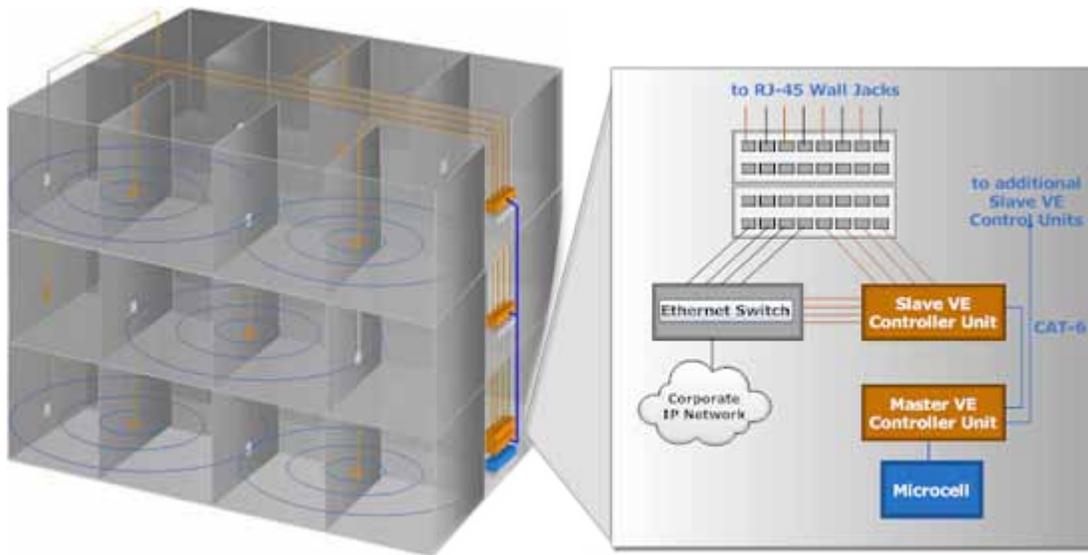
Figure 1-2. Multi-Tier VE Installation

1.1   Key Features and Capabilities

- Supports both LTE band SISO and MIMO configurations
- Supports the following LTE Band configurations:
    - Upper C; Upper C (MIMO)
    - Lower A,B,C; Lower A,B,C (MIMO)
    - Upper C; Lower A,B,C (SISO)
    - Lower A,B,C; Upper C (SISO)
- Individual gain and power settings for each band
- Simple installation - Deployed in only a few hours, with minimum disturbance to the enterprise.
- VAPs connect over existing CAT-5e/6 cabling infrastructure and existing Ethernet jacks.
- VAPs are remotely powered using Power-over-Ethernet (PoE). Local power is not required.
- Minimum macro-network impact with low power distributed coverage.
- Seamlessly coexists with the Enterprise LAN and does not consume LAN capacity.
- Connects to all types of capacity sources, including BTS, picocells, femtocells, and BDAs.
- VAPs can easily be relocated for coverage modifications as needed.
- Ease of expansion provides "pay as you grow" scalability.
- Support of connected IP devices (Wi-Fi APs, IP phones, etc.) with Ethernet/IP pass through and PoE maximizes placement flexibility.
- Remote end-to-end system monitoring, management, and configuration via a single connection to the master VCU using a standard web browser and SNMP.
- Base Line feature that clearly shows VAPs/VCUs where communication has been lost.

1.2   System Architecture

Main Elements - The MobileAccessVE solution is based on two elements: VAPs and VCUs:

· **VE Access Pod** (VAP) – VAPs are pluggable, wideband antennas distributed at strategic locations on the floor to provide Ethernet connection to an IP device and wireless coverage of the service via integrated internal or external antennas. The VAPs are powered by PoE from the VCU. Up to twelve VAPs can be connected to a single VCU using LAN cables (CAT-5e or higher).

· **VE Mixed-Band LTE Control Unit** (VCU) – Supports both Upper C and Lower A, B, C LTE 700MHz bands in various MIMO and SISO configurations. The VCU extends the wireless signal from the BTS/BDA (along with PoE) to hosted VAPs connected over the standard Ethernet infrastructure. VCUs can be installed in either a Standalone of Master/Slave topology:

Standalone installation – a single VCU installed in the IDF/Telco closet interfaces to the BTS/BDA source, feeds and manages up to 12 VAPs (usually on the same floor).

Master/Slave installation – used to expand site coverage from a single BTS/BDA source by enabling the connections of a number of Slave VCUs to a single Master VCU. The (designated) Master VCU is located in the main IDF/Telco closet, interfaces with the service provider's RF capacity sources and provides single source management for all the hosted elements. Each Slave VCU can host up to 12 VAPs where VAPs can also be connected to any free ports (not occupied by Slaves) available on the Master VCU. The Master and Slave VCUs are connected using *dedicated* CAT-6/7 cables. VCUs in Slave modes are automatically identified by the system according to their physical connections to the Master.

Note: When the total number of VAPs in the deployment exceeds 72, consult with MobileAccess support.

The following figure shows the Multi-tier VE LTE 700 MHz MIMO solution architecture.

Note: If the Master VCU supports VAPs (in addition to VCUs), the relevant Ethernet ports are also connected to an Ethernet switch.
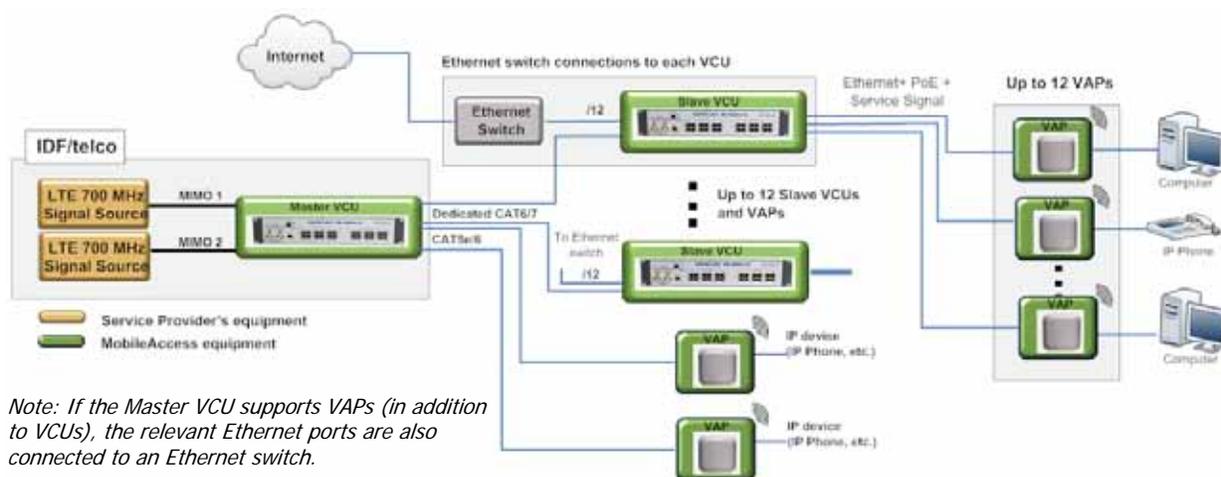
Figure 1-3. VE Multi-Tier Basic Architecture

The Master VCU distributes the wireless LTE 700MHz MIMO (or SISO) services from the service provider's equipment to the Slave VCUs. At the Slave VCUs, the wireless MIMO services are converged with Ethernet service and routed to the VAPs via the Ethernet LAN CAT-5e/6 cabling infrastructure.

The VAPs distribute the wireless LTE service via integrated internal antennas or (optional) external antennas and provide Ethernet/IP connectivity (and PoE pass-through) to the connected appliances such as WiFi APs and IP phones.

1.3   System Elements

This chapter describes the interfaces of the VE Control Units and Access Pods.

1.3.1   VE Control Unit (VCU)

While operating as a Master VCU:

- Interfaces to RF source(s) and to VCUs/VAPs.
- Converges Wireless services and distribution to Slave VCUs and VAPs
- Slave VCUs and VAP management and control.
- Remote management of the entire deployment.

While operating as a Slave VCU:

- Interfaces to Master VCU.
- Converges Wireless services, Ethernet and PoE and interfaces to VAPs.
- Management and control of connected VAPs.

1.3.1.1 VCU Front Panel

The front panel supports simplex and duplex interfaces to the wireless LTE MIMO service (two channels – corresponding to the two supported TDD MIMO channels) and includes interfaces to VAPs or Slave VCUs depending on the configuration.

The following provides the front panel ports.
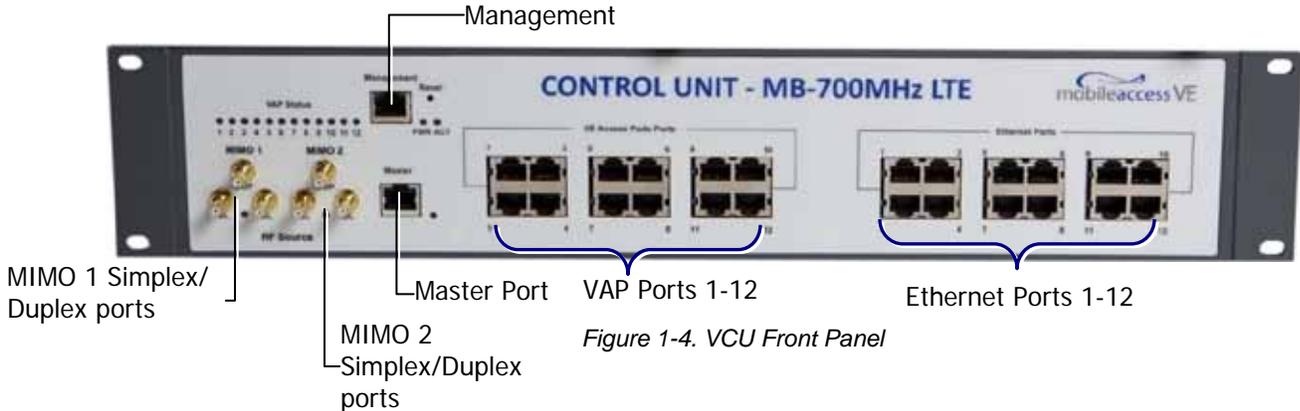
Figure 1-4. VCU Front Panel

Ports	Description
MIMO1 MIMO2	Simplex (UL/DL) and Duplex (DUP) RF connections (two FDD MIMO channels) to the service provider LTE Signal Source equipment. SMA type connectors. Coax cables. *Note: When supporting SISO service – only MIMO 1 connectors are relevant.*
Management	RJ45 web management connection.
VE Access Pod Ports 1-12	VAP/VCU port connections. For Master VCU – Connections to Slave VCUs or VAPs. For Slave VCU – Connections to VAPs.
Ethernet Ports 1-12	. Ethernet switch connections for Connected VAPs in either Master or Slave Configurations.
Master	Used for connecting a Slave VCU to the Master VCU in a multi-tier deployment (connects to one of the VAP ports of the Master VCU).
Reset	N/A in current version.

Table 1-1: VCU Ports Description

The following provides a description of the front panel LEDs.

LED	Description	
PWR	Indicates whether the VCU receives power:	
	Green	- Power OK
	Disabled	- No power received by VCU
ACT	VCU activity LED:	
	Solid Green	– During initialization
	Blinking Green	– Normal system operation
	Fast Blinking Green	– User activated *VCU Identify* on this VCU
VAP Status (One LED per Port)	Indicates the status of the *corresponding* unit (VAP or VCU)	
	Blinking Green	– Unit is initializing
	Solid Green	– Normal operation of unit
	Solid Orange	– Unit is faulty, or unmanaged. This can be due to mismatch type, VoIP phone, etc.
	Fast Blinking Green	– User invoked "Identify" command on the unit
	Off	– No VAP or VCU connected to this port.
MIMO (One LED per Channel)	Indicates the status of connected RF capacity source:	
	Green	– Master VCU only. Normal RF level
	Orange	– Master VCU only. RF level is either too low, too high, or service has been turned off by the user.
	Off	– VCU is Slave.
Master	Indicates the status of the connection to the Master VCU:	
	Off	– Master mode (not connected to VCU)
	Blinking Green	– During Attachment process with Master VCU
	Solid green	– Slave (IF-IF) mode and connected to Master

Table 1-2: VCU LEDs Description

1.3.1.2   VCU Rear Panel

The rear panel includes the following: power switch, AC input, AUX alarms, and service personnel connections.

Console Connector

AUX Alarms

Figure 1-5. VCU Rear Panel

PWR On/Off Switch
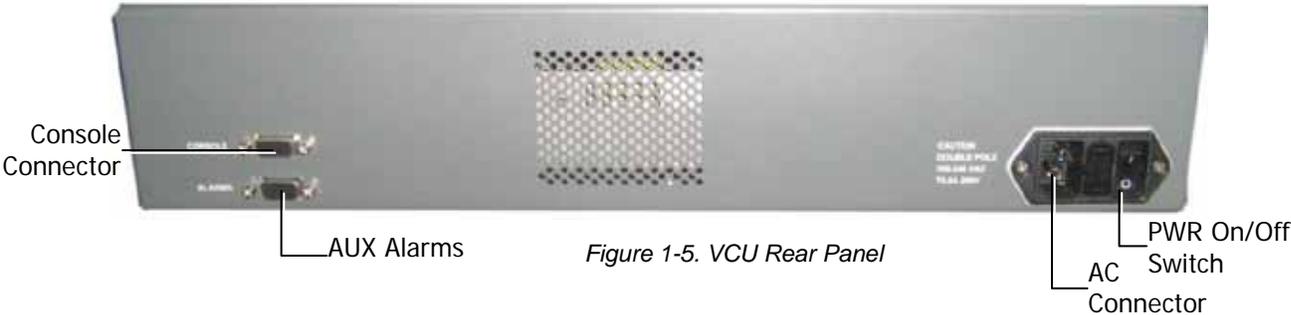
AC Connector

Connector	Description
Console	RS232 local connection for service personnel (D-Type 9)
Alarms	AUX alarms connections - see section 4.2.1.1. *In Master/Slave configuration - relevant only for Master VCU.*
Power Input	Standard 3-pins AC power connector equipped with an ON/OFF switch. 90-264V AC, 47-63 Hz AC; 350W power consumption maximum.

Table 1-3: VCU Rear Panel Description

1.3.2   VE Access Pod (VAP)

Each VAP supports:

- Two interfaces for external antennas. By default, the VAP is set to transmit through the internal horizontal polarized omni-directional antennas.

Note: Internal Vertical Polarized Omni Directional Antennas are not supported within this release.

- An Ethernet port for physical Ethernet connection to devices such as a computer, IP phone or WiFi Access Point.
- Two LED status indictors

The VAP is provided with a bracket for mounting on the wall or ceiling/lowered ceiling.

The following figure shows the VAP front and rear-underside views.

Blue LED (Activity and Identify)

Green Led (Power)
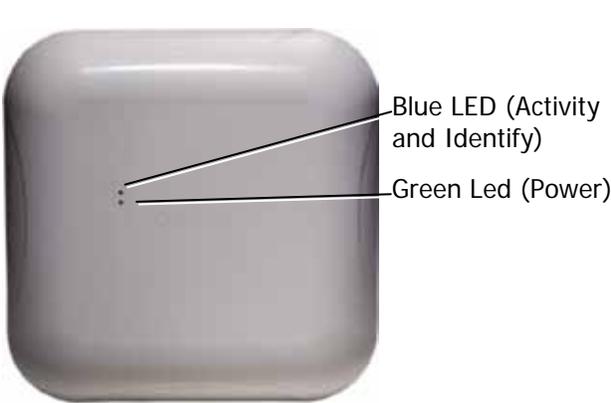
Figure 1-6: Front View of VAP

External Antenna SMA Connectors

RJ-45 Connector to VCU

RJ-45 Connector to LAN terminal (e.g. computer)
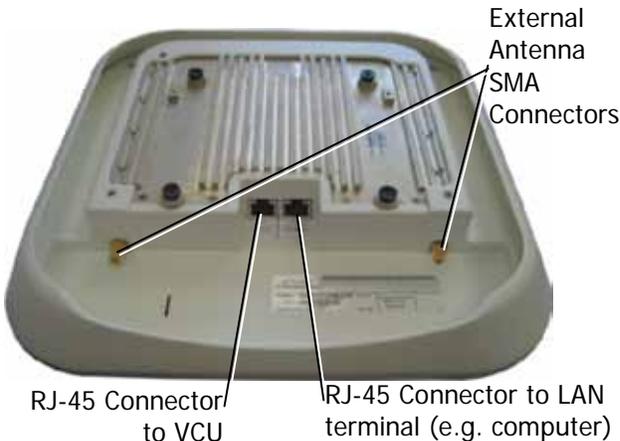
Figure 1-7: Rear-Underside View of VAP

LED	Description	
Power	Solid Green	- Power supplied to VAP
	Off	- No power supplied to VAP
Activity	Off	- No power supplied to VAP or Overall Status of VAP is faulty
	Blinking Blue	- Power on, VAP is initializing (connecting to VCU)
	Solid Blue	- Power on, unit operating normally
	Fast Blinking Blue	- User invoked "Identify" command on corresponding VAP

Table 1-4: VAP LEDs

1.4   System Monitoring and Management

The MobileAccessVE system (Master VCU, Slave VCUs, and VAPs) is centrally managed via a single Web connection to the Master VCU. The basic screen in the GUI is the **Config** tab, which enables the user to view the system topology and setup parameters, Control Units, and all Access Pods connected to the Control Units.

Note: When locally connecting to a specific Slave VCU, only the VAPs connected to this VCU can be monitored. However, when connected to the Master, the entire deployment can be monitored.

1.4.1   Integration with an External Fault Management System

The MobileAccessVE system can be seamlessly integrated into any existing Fault Management (FM) system that supports SNMP events. The Master VCU generates a SNMP event for each relevant system alarm and forwards this trap to the pre-configured IP address of the external Fault Management system.

2 Installation Workflow

The following figure summarizes the main steps of the installation procedure:

Installation Workflow

1. Infrastructure Preparation

Plan the floor coverage and VAP locations according to the type/density of the site.

↓

Check that Ethernet jacks are available in all planned VAP locations.

↓

Determine the communication rooms to which the VAP infrastructure is connected (locations for the Slave VCUs).

↓

Verify that all infrastructure requirements are met (includes verifying that the jacks are wired to the patch panel in the communication rooms).

2. Installation Procedure

Install the Master VCU in the IDF/telco shaft.

↓

Open a local session to the Master VCU and configure the system parameters (IP, and service parameters: Central Frequency , Max expected Pin).

↓

Install the RF signal sources, connect them to the master VCU (through passive interfaces) and check that the RF signals are received by the VCU (i.e. that the RF LEDs are green).

↓

Install the Slave VCUs and connect them to the Master VCU (verify that the VCU/VCH LED is green, and RF LEDs turned OFF).

↓

Connect the VCU *VAP* ports to the patch panel, and the Ethernet Switch to the VCU *Ethernet* ports.

↓

Install the VAPs and connect them to the Ethernet jacks. Connect the Ethernet appliance (if exists) to the VAP. Check that the VAP is operational (Blue LED lit). Check that Ethernet connection is OK.

↓

Perform a "walk test" and verify coverage around the floor.

↓

Met Coverage? → No → Change VAPs locations or add VAPs

↓ Yes

Complete

3 Infrastructure Requirements and Layout Planning

3.1 General Information on Location and Connections

- Service provider's RF equipment - macrocell, microcell, picocell, femtocell, BDA, etc. connects to the VCU through a passive interface.
- VCUs:
  - Master VCU installed at the main IDF/Telco cabinet and connected to all VCUs.
  - Slave VCUs installed at the IDF/Telco cabinet of each covered floor and connected to the Master VCU, the Ethernet switch, and the VAPs through the cabling patch panel.
- Wireless service signals from Master VCU to VCUs – Routed through dedicated Ethernet CAT-6/7 cabling.
- Wireless service signals from VCUs to the VAPs – Routed through existing Ethernet CAT-5e/6 cabling infrastructure.
- VAP location and mounting. Connection to existing Ethernet jack and external antennas.
- VAP power source - No power connections required. VAPs are power fed from VCU using PoE (Power over Ethernet) technology.
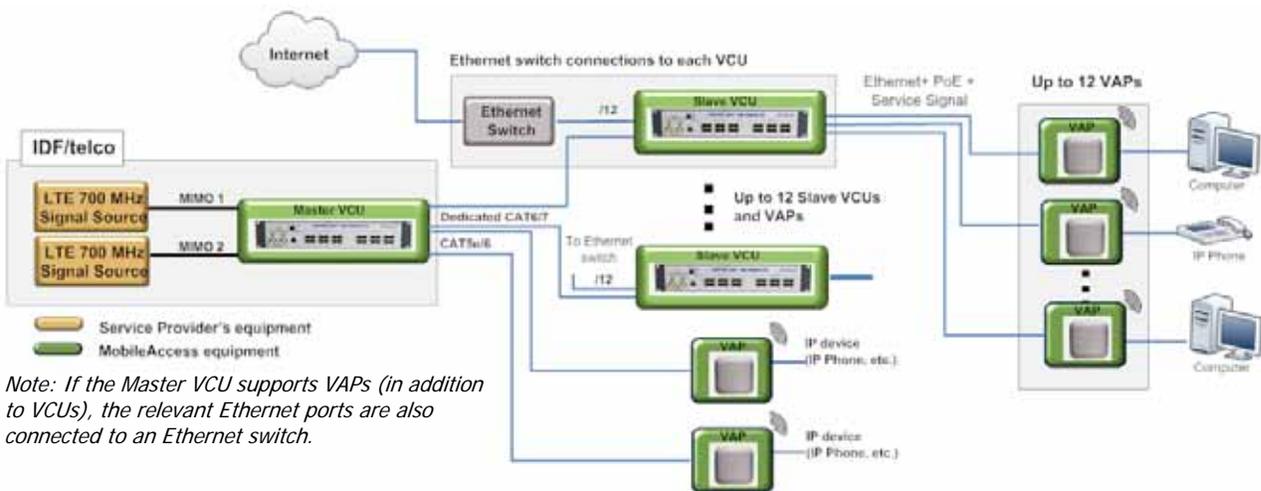

Figure 3-1. VE Multi-Tier Basic Architecture

Note: Connecting both VAPs and slave VCUs simultaneously to the master VCU is supported for VE networks running SW version 2.6 and above.

3.2   Infrastructure Requirements

Ethernet standards specify that the maximum distance between an Ethernet switch and an appliance (computer, WLAN AP etc) should not exceed 100m (300ft). Therefore, when VE shares the IT LAN, the maximum distance for a given cable run cannot be longer than 100m (300ft) between the Ethernet switch and appliance, including all patch cords (from switch to VCU, from VCU to patch panel, from RJ-45 outlet to VAP, and from VAP to appliance).

Typically the horizontal cabling system will be connected to patch-panels in the communication rooms. The entire cabling system, including the patch panels and patch cords, should adhere to the CAT-5e/6 standard. Specifically all pairs of the CAT-5e cable should be wired in the patch panels (and patch cords).

1. IDF/Telco closet space for one or more VCUs depending on the number and locations of the installed VCUs: (48.3cm x 51.3cm x 8.88cm) per VCU.

Note: When planning the IDF/Telco shaft, take the RF equipment (picocell/microcell or BDA) and the VCU into consideration.

---

2. 350 Watts of AC power to the VCU IDF/Telco closet.

3. Building infrastructure:

    · CAT-5e/6 cabling, UnShielded Twisted Pair (UTP)
    · 24 AWG minimum diameter for CAT-5e cabling
    · Dedicated CAT-6/7 STP cable from Master VCU to Slave VCUs with run lengths NOT exceeding 100m (300ft) and no shorter than 10m (33ft).
    · CAT-5e/6 UTP cable from VCU to each VAP with run lengths NOT exceeding 100m (300ft) and no shorter than 10m (33ft). VAPs can be connected over existing CAT-5e/6 cabling infrastructure and existing Ethernet jacks without affecting the LAN.

Note: Verify with the IT department that the existing cables can support the VE installation. If available, review the infrastructure documentation to determine cable types and lengths. If the infrastructure documentation is not available, attempt to visually identify the cable type. Depending on the cable vendor, the cable type may be listed on the cable sheath. It is recommended to use a Fluke cable tester to measure the cable length of the most remote VAPs.

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4. Master VCU Cable Connections:

    · 6 x QMA type, 50 ohm interfaces to carrier equipment
    · U12 x RJ-45 interfaces to Slave VCUs and/or VAPs
    · 12 x RJ-45 interfaces to Ethernet Switch for LAN service 1 x RJ-45 interface to Management
    · 1 x D-Type 9 pins RS-232 interface for local craft
    · 1 x D-Type 15 pins interface for External Alarms (dry contacts)

5. Slave VCU Cable Connections:

    · 1 x RJ-45 interface to Master VCU (Not used in small single-tier deployments)
    · 12 x RJ-45 interfaces to VAPs
    · 12 x RJ-45 interfaces to Ethernet Switch for LAN service
    · 1 x D-Type 9 pins RS-232 interface for local craft

3.3 Coverage and Installation Planning

Note: The following section provides information required for planning the VAP installation on a single floor. In a multi-tier installation, this procedure is performed for each individual floor.

The maximal coverage area of each VAP is affected by the density and type of environment being covered. Therefore, it is recommended to determine the location in two phases:

· Plan the *ideal* location of each VAP in order to achieve complete coverage of the floor.
· Select the *exact* location according to the location feasibility, where each VAP unit may be wall or desk mounted and an option for an external antenna is available.

The supplied services (wireless only or Ethernet and wireless) depend on the jack to which the VAP is connected:

· If the jack supports an active Ethernet connection, the VAP will distribute LAN traffic along with the wireless service (See section 4.3.)
· If the jack is not currently active (not connected to an Ethernet switch), the VAP will distribute only the wireless services.

This section provides information on coverage criteria in various types of environments (Open, Standard, Dense and Merged) and provides rules-of-thumb for various installations of the VAPs.

Note: Section 3.4 provides a detailed example of installation planning in various types of environment. It is recommended to review this example after reading this section.

3.3.1 Types of Environments

This section describes the different types of installation environments and provides guidelines for best coverage of each type of space.

The coverage guidelines in this section are conservative "rule of thumb" estimates of RF coverage per VAP, meant to be used in scenarios in which detailed designs are not performed. When the coverage layout is designed, the coverage per VAP is expected to increase by up to 33%. Coverage estimates in this section assume 25% overlap between the coverage areas of neighboring VAPs to ensure robust, full coverage throughout the enterprise with no "dead zones".

3.3.1.1   Standard Environment

A traditional office environment with offices, hallways and scattered cubicles.

Table 3-1: Standard Environment Installation Distances

Signal Propagation from VAP	56 feet (19 m)
Recommended Spacing between VAPs	112 feet (38 m)
Recommended Maximum distance of VAPs from outer walls	56 feet (19 m)
Coverage area per VAP	9,900 sqft (920 sqm)

3.3.1.2   Open Environment

An environment with minimal obstacles (e.g. walls). This type of space can be a large conference or meeting room, cubical areas, lobby, or atrium.

Table 3-2: Open Environment Installation Distances

Signal Propagation from VAP	64 feet (21 m)
Recommend spacing between VAPs	128 feet (42 m)
Recommended maximum distance of VAPs from outer walls	64 feet (21 m)
Coverage area per VAP	12,750 sqft (1,185 sqm)

3.3.1.3   Dense Environment:

A dense environment consists of a relatively large amount of walls, offices, equipment, tall file cabinets, bookshelves, and other items that could potentially impact the wireless signal.

Examples include dense offices, hospitals, and manufacturing spaces.

Table 3-3: Dense Environment Installation Distances

Signal Propagation from VAP	41 feet (13.5 m)
Recommended Spacing between VAPs	82 feet (27 m)
Recommended Maximum distance of VAPs from outer walls	41 feet (13.5 m)
Coverage area per VAP	5,300 sqft (495 sqm)

3.3.1.4   Combination of Environments

In areas with a combination of environments, place VAPs on the border between the different environment types slightly closer to the denser area.

For example, in a cubical area with the outside wall having offices, simply locate the VAPs a little *closer to the outside offices* to provide coverage through the office walls. (See VAPs 11 and 13 in the floor plan map in section 3.4.3.). To ensure maximal coverage, VAPs can be re-located or added. If a coverage gap is detected, the VAPs can be re-located until coverage gaps are filled.

3.4   Planning VAP Layout

The following section describes the steps of planning VAPs along the covered floor. At the end of this section an example of a planning map is provided.

Note**:** It is highly recommended to use a floor plan when planning the VAPs locations.

3.4.1   RF Coverage Factors

It is important to note the type of factors that can severely impact RF coverage, and should be avoided:

· **Metallic Structures** such as elevators, high file cabinets, and some moveable metallic partitions severely degrade RF signals. All efforts should be made to locate VAPs in front of, or above metallic objects (desks, filing cabinets) to allow the signal to propagate.
· **Wall Materials** such as concrete, tile, and cinderblock, as well as bathroom fixtures typically have fairly high signal attenuation and should be considered as dense spaces.
· **Types of Glass** that have metallic coatings can affect RF coverage, typically exterior or mirrored. However this issue is not normally encountered inside a building.

3.4.2   Mapping Locations

To map the VAP Locations

1. Map out the available Ethernet jack locations and mark all CAT-5e/6 drop locations on the floor plan map.

TIP**:** The size and number of the ceiling tiles can be used to measure distances.

2. Using the floor plan and the VAPs coverage guidelines as provided in section 3.4.3, mark approximately where you would like to place each VAP in the facility.

    VAPs may be added (or removed) at anytime for optimal coverage.

3. For each jack being used to connect a VAP, check if the jack is already connected to the Ethernet switch. .

4. Connect the Ethernet cables corresponding to the selected jacks according to section 4.3.

5. It is also recommended to check the area where each VAP will be installed to ensure the installation is feasible.

3.4.3   Optional Directional Antennas

Each VAP has integrated internal antennas that provide isotropic radiation (also include option for external antenna connectors). To prevent interference and improve coverage, connect directional antennas to VAPs installed near outer walls. The VAP antenna parameter must be set accordingly via the Web GUI when external antennas are being used(See section 8.3.)

3.4.4   Installation Plan Example

The Following figure shows a floor plan map with all required marks:
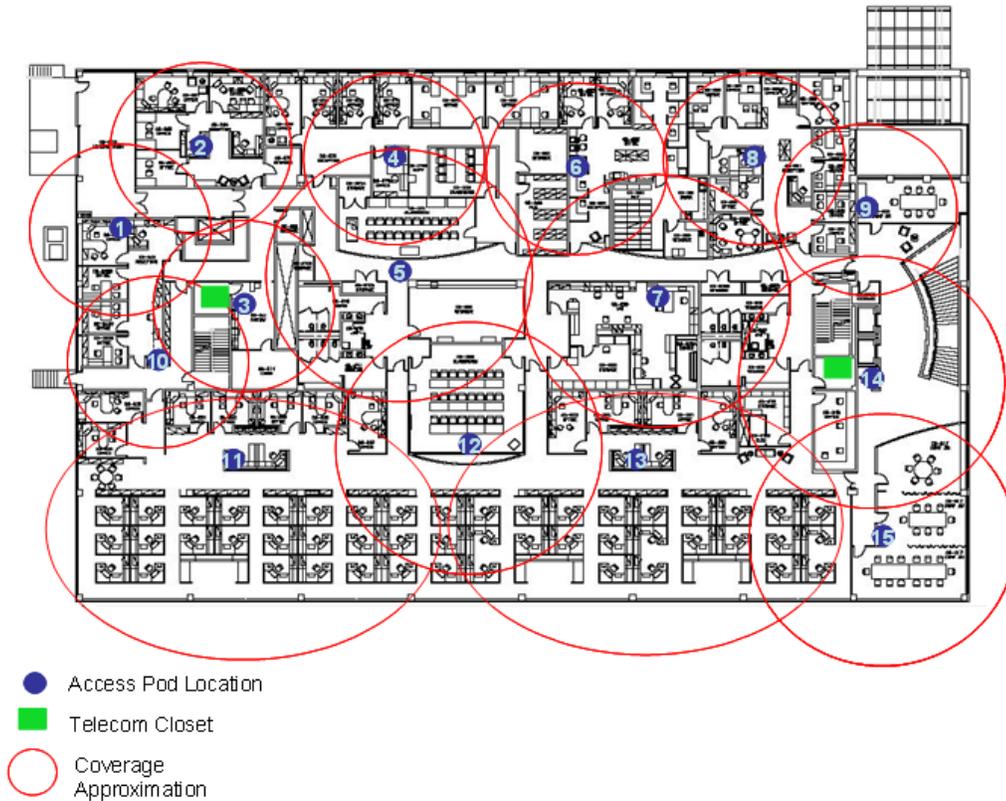
Figure 3-2. Floor Plan Example

Notes:

- The red VAP coverage circles have an approximate radius of 41, 56 and 64 foot (13.5, 19 and 21 meters) for the small, medium and large circles respectively (which are drawn according to the guidelines given in section 3.3.1.
- VAP 3 is surrounded by the bathroom and stairwell which are considered dense objects and would reduce coverage in that area by the other VAPs.
- VAP 5 is an example of a unit that provides good coverage down the hallways in an Open Environment.
- VAPs 11 and 13 are placed closer to the offices to provide better coverage to them, but on the open side will actually cover a much greater area. This is why the coverage is larger and shown here more as an oval than a circle.
- The area between VAPs 7 and 14 would probably be the lowest coverage spot in the building because of the bathrooms and stairwell on either side. If after the system is installed, this area is still a little low on coverage, a VAP can be added, but it may also be covered by VAP 14.

Note: The plan can be modified at any time by moving the units around or by adding units.

The following figure depicts an actual measured quantified coverage of a floor area planned according to the above rules.
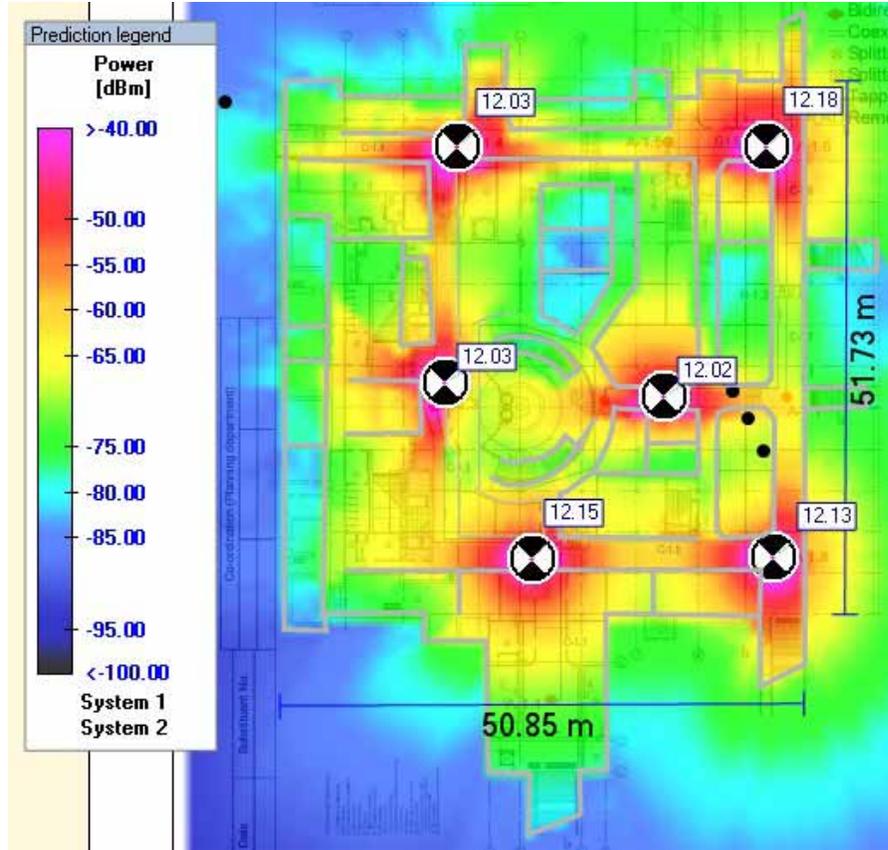
Figure 3-3. Distributed VAPs propagation, 12dBm output power @ 1.8 GHz

4 VCU Unit Installation and Provisioning

This chapter describes the installation and *basic configuration procedures* for VE Control Units (VCU) located on each floor.

In addition, this chapter describes the how to shift the relevant Ethernet connections required for the VAPs.

These steps should only be performed after planning the floor coverage and installation locations, as described in the previous sections.

4.1 VCU Kit Contents

The VE VCU Kit includes:

Table 4-1: VCU Kit

Description	Unit
VE LTE 700 MHz MIMO Control Unit (VCU) Kit	
Power Cord	
VE SW CD	
Local Configuration Cable (crossed RJ-45 cable)	
Brackets Used to secure the VCU to a 19″ rack (shipped assembled to the VCU)	

4.2   VCU Physical Installation

This section describes the physical installation and connections of the Master VCU, Slave VCUs and the VAP Ethernet connections to the relevant VCUs.

4.2.1   Master VCU Installation

The VE Control Unit can be installed as a Master VCU and control up to (12) Slave VCUs and VAPs and is installed in the main IDF/Telco closet. This section describes the Master VCU installation procedures.

Note: When Master VCU only supports Slave VCUs (no VAPs), the control units' **Ethernet Ports** are not relevant and are not in use.

---

1. Install the **Master VCU** in the main Telco closet. The Master VCU can be installed in a 19" rack, placed on a shelf, or secured using the supplied bracket.

2. Apply power to the Master VCU and verify that the **PWR** LED is lit. Also verify that the unit ACT LED completes initialization (blinking light) and shows a solid green light.

3. Connect (or request the service provider's service personnel to connect) the provider's **LTE signal source(s)** to the **Master VCU** front panel **UL/DL simplex** or **DUP** RF ports (through passive interface).

4. Power on the signal sources.

Note: The RF Source LED (See following figure) of the connected port on the Master VCU should be lit GREEN, indicating that the Master VCU senses the RF signal from the source at the expected level (according to Max Expected Pin). After connecting the capacity source, if the LED remains RED verify that the Max Expected Pin is configured properly and service is enabled.

---

5. To connect VCU Slaves to the Master VCU: connect the **Master VCU VAP ports** to the **Slave VCUs Master** ports via the patch-panel that feeds the dedicated STP CAT-6/7 cabling system.

6. To connect Auxiliary alarms (connector located on the controller rear panel), refer to section 4.2.1.1

7. According to VAPs layout plan (as explained in section 3.4.2) connect the Ethernet switch cables (See section 4.3 for more detailed explanation).

   · If the requested jack is already in use, disconnect it from the Ethernet switch and re-connect it to the corresponding **Ethernet** port in the Slave VCU front panel.

VAP Status LEDs (1-12) — ACT LED

RF ports   VAP Ports 1-4; 5-8; 7-12
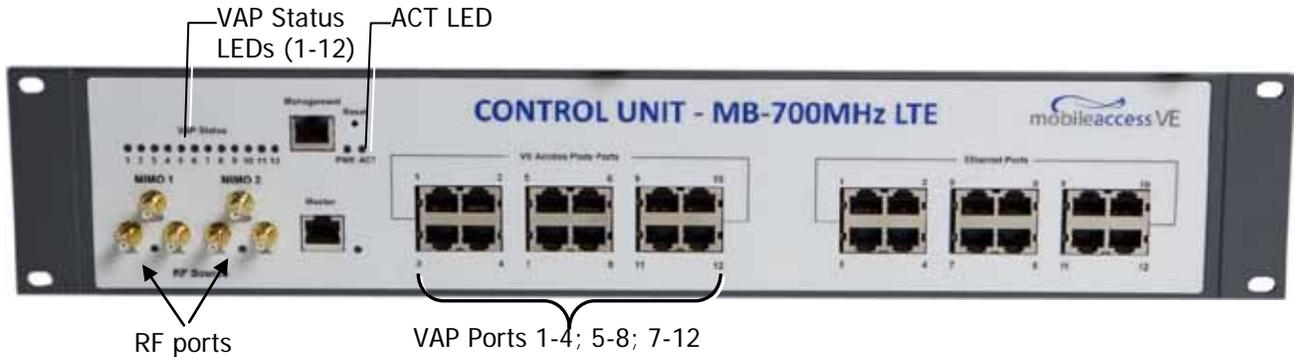
Note 1: After the Slave VCUs are connected (according to section 4.2.2), verify that that the Master VCU **VAP Status** LEDs which correspond to the connected Slave VCUs complete initialization (blinking light) and show a solid green light.

Note 2: When functioning as a Master VCU and supporting only Slaves (no VAPs), the control units' **Ethernet Ports** are not relevant. The Ethernet ports are only relevant when supporting mixed mode – Slave VCUs and VAPs

4.2.1.1   *Master/Stand-Alone VCU Alarm Output Connections*

Note: For Master/Slave VCU configuration, the Alarms are relevant only for the Master VCU.

The auxiliary connections are performed through the Master VCU rear panel **Alarms** port. See following figure.

The controller can provide Major and Minor Output Alarms. These alarms can be connected directly to either the auxiliary input of the Base Station or to any additional dry-contact application.


Alarms port for auxiliary connections

A Major Alarm is generated when there is an alarm condition in one or more VCUs, while a Minor Alarm is generated when there is an alarm condition in one or more of the VAPs.

Note: If only one alarm is required (Minor or Major) an external connection of a wire jumper between pins 8 and 13 is necessary (Normally closed).

Connect the relevant alarms according to the connector pinout below.
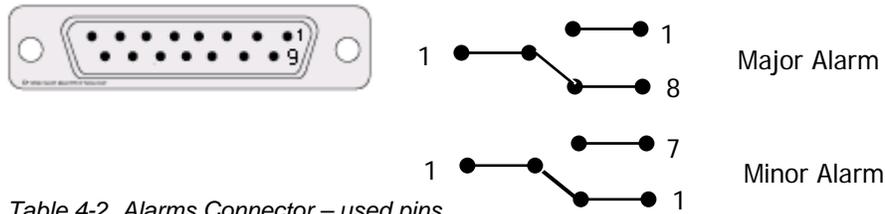
Table 4-2. Alarms Connector – used pins

8 – Major Error Signal (Normally closed)	7 – Minor Error Signal (Normally open)
11 – Major COM	12 – Minor COM
15 –Major Error Signal (Normally open)	13 – Minor Error Signal (Normally closed)

4.2.2   Slave VCU Installation

1. Install the Slave VE Control Unit (VCU) in the Telco closet corresponding to the floor being covered. The Slave VCU can be installed in the rack using the supplied bracket. Apply power to the Slave VCUs and note that the VCU **PWR** LED is lit. Note that the unit ACT LED completes initialization (solid light) and shows a blinking green light. See Figure *4-1*.
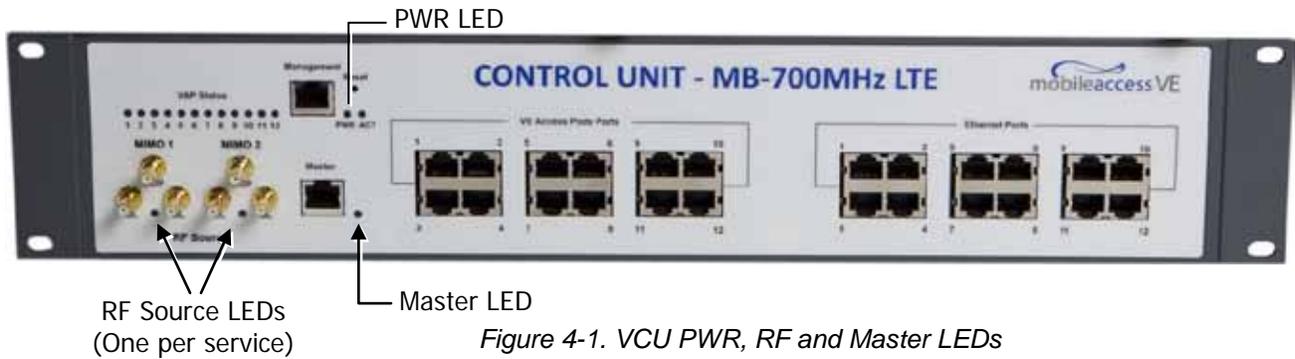
Figure 4-1. VCU PWR, RF and Master LEDs

2. Connect the Slave VCU front panel **Master** port to the Master VCU **VAP** port via the patch panel using dedicated STP CAT6 cables. Verify that the Master LED completes initialization (blinking light) and shows a solid green light. The (RF) MIMO LEDs (of both services) should turn OFF.

*When control unit functions as **Master VCU** the VCU VAP ports serve as Slave VCU connection ports*
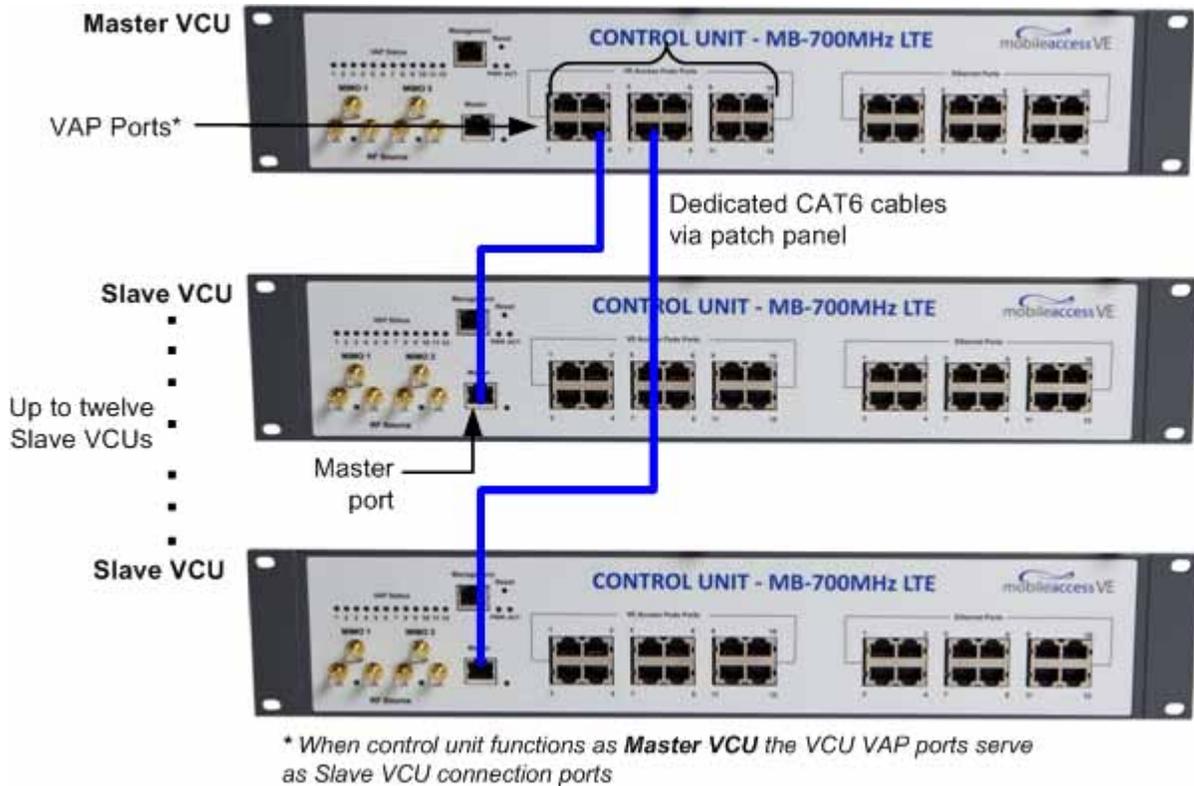
*Figure 4-2. Master and Slave VCU Connections*

3. Connect the Slave VCU **VAP** ports to the patch-panel that feeds the existing structured CAT-5e/6 cabling system.

4. According to VAPs layout plan (as explained in section 3.4.2) connect the Ethernet switch cables (See section 4.3 for more detailed explanation).

   · If the requested jack is already in use, disconnect it from the Ethernet switch and re-connect it to the corresponding **Ethernet** port in the Slave VCU front panel.

4.3 Ethernet Cable Connections to VAPs

This section describes the how to perform the relevant Ethernet LAN connections to the VAPs from the VCUs via the Ethernet switch (See section 4.3.1) and provides a description of the PoE transferred between the VCU and the VAPs (See section 4.3.2).

4.3.1   Shifting Relevant Ethernet LAN Connections

For VAPs installed on currently ACTIVE Ethernet ports, shift the relevant Ethernet LAN connections to the Ethernet ports on the Master or Slave VCU.
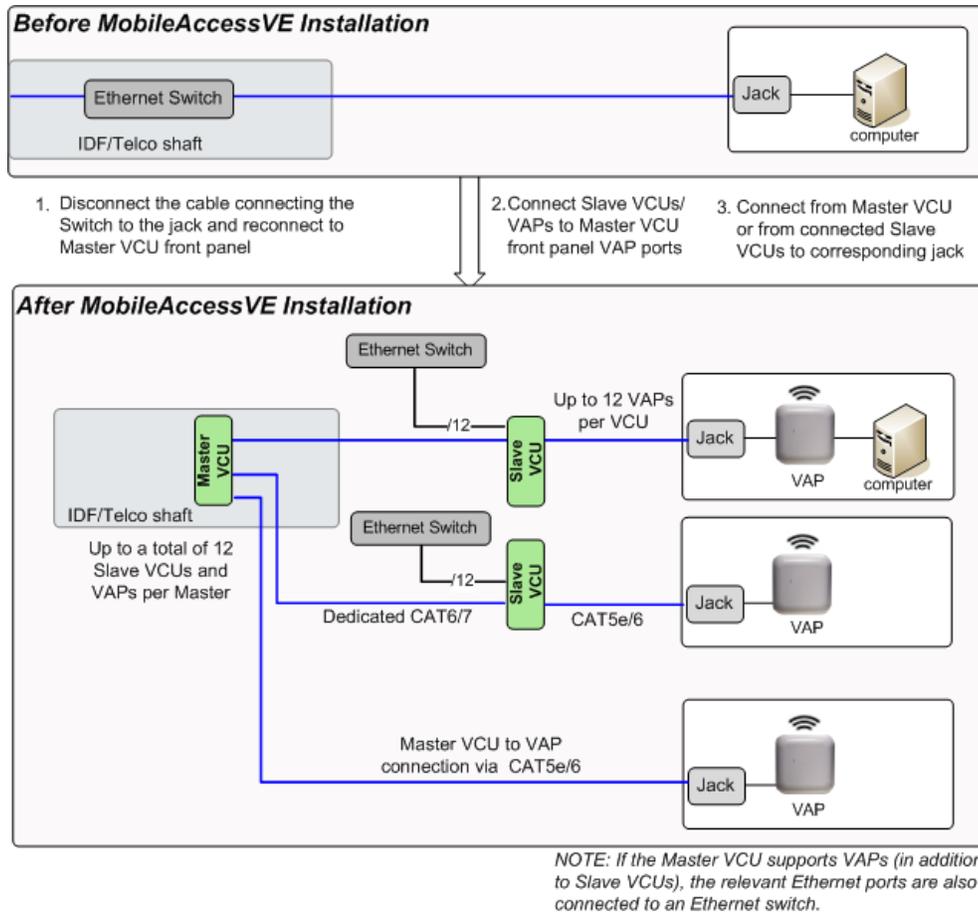
For VAPs installed on currently INACTIVE Ethernet ports, connect as follows.
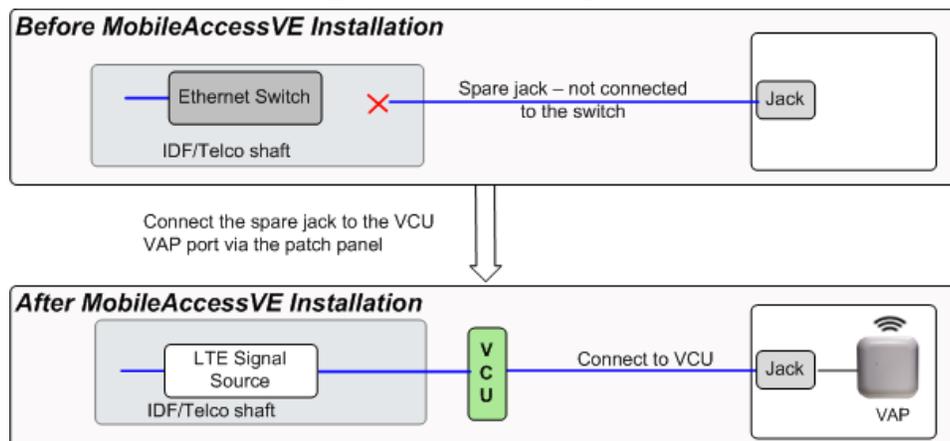
Note: After the Slave VCUs are installed and connected to the correct ports in the patch panels, please proceed with the VAP installation as described in chapter 5 . However, it is recommended to complete the VCU provisioning first (See section 4.4) because when installing the VAPs they will instantly provide the wireless service (and the installer will be able to check the coverage).

4.3.2   Operation with LAN utilizing Power over Ethernet (PoE)

Power over Ethernet (PoE) is a technology that enables passing electrical power over the Ethernet cabling. Power can either come from a PoE-enabled Ethernet device (e.g. switch) or from a "mid-span" device built specifically for "injecting" power into the Ethernet cabling.

PoE can operate over two different pairs in a CAT-5e/6 cable. These two methods are referred to as "alternative a" and "alternative b". All PoE compatible appliances, such as WLAN APs and IP phones, support both alternatives and automatically detect and use the power on the appropriate pairs (alternative a or b).

MobileAccessVE supports sharing LAN infrastructures that use either 802.3af PoE or 802.3at PoE.

In the current release MobileAccessVE supports operation with "**alternative a" PoE**.

Note: MobileAccess does offer an alternative B adapter to support coexistence with "alternative b" PoE. If this is currently required, consult MobileAccess.

4.4   Provisioning the VE Control Unit

This chapter describes how to set the basic parameters required for operation and remote management of the Master VCU using the Web GUI. The configuration dialogs are fully described in Chapter 6 .

The Master or Slave mode is automatically detected according to the VCU's physical connection. If a connection to another VCU is detected, the VCU will be identified as a Slave, otherwise it will assume the role of a Master.

Notes:
The initial configuration of the Master VCU is performed via local connection using a cross-cable and connecting to VCUs default IP address. After performing the initial configuration and assigning the Master VCU an IP address, the system can be connected, monitored, and configured via a remote management connection.
The configuration and management of all of the system units (VCUs and VAPs) is performed via local or remote connection to the Master VCU unit.

4.4.1   Configure the Computer IP Parameters

Configure the computer local LAN connection to operate in the same subnet as the default VCU IP address. Note that the procedure may vary slightly depending on the operating system installed on your computer. The following procedure is for Windows 7.

To Configure the Computer's IP Parameters:

1. Click the **Start** menu and choose **Control Panel**.
2. In the **Control Panel**, click **Network and Internet**.
3. Click **Network and Sharing Center** and then click **Local Area Connection**.

    The **Local Area Connections Status** dialog box appears with the General tab displayed by default.
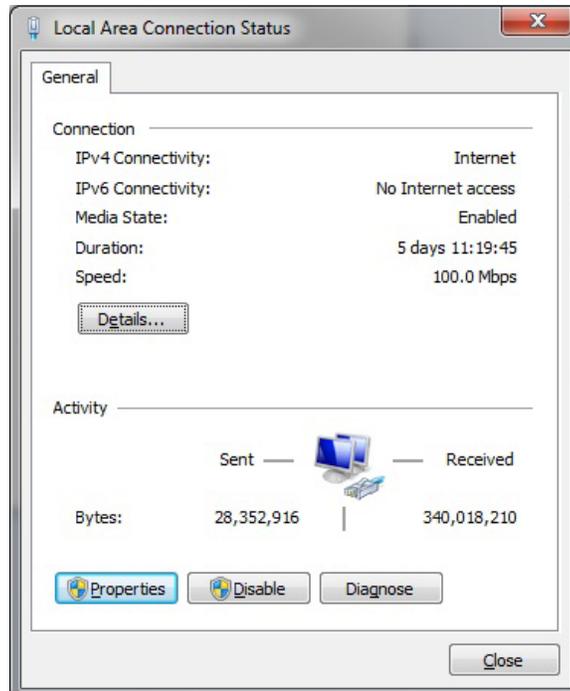
4. Click the **Properties** button in the displayed **Local Area Connection Status** dialog.
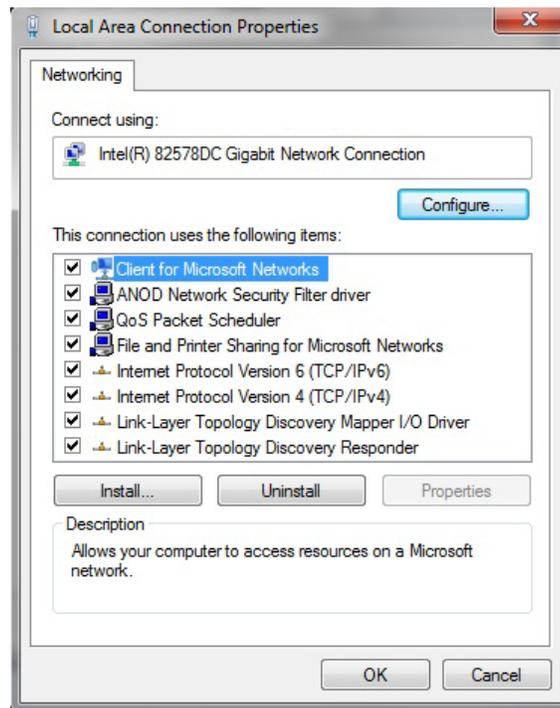
5. In the Items list, double-click the **Internet Protocol Version 4 (TCP*IPv4)** item.

The **Internet Protocol Version 4 (TCP/IPv4) Properties** dialog appears.

Note: The Master VCU is supplied with the default IP address 192.168.1.1.

- In order to communicate with the unit, it is necessary to assign your computer a *Static IP* address in the same subnet: 192.168.1.2 to 192.168.1.250.
(i.e. 192.168.1.9 as shown in the example).
- Define the subnet mask as shown: 255.255.255.0
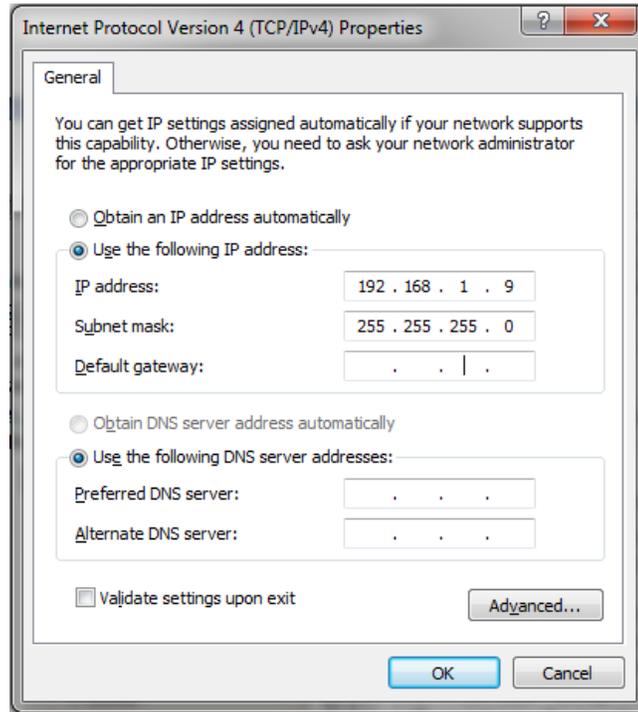
6. Click **OK**.

7. The computer communication parameters are now defined and you can open a session to the Master VCU and provision the unit.

4.4.2   Provisioning the Master VCU Unit

1. Perform a local connection to the Master VCU unit by connecting the Master VCU front panel **Management** port and a laptop computer.
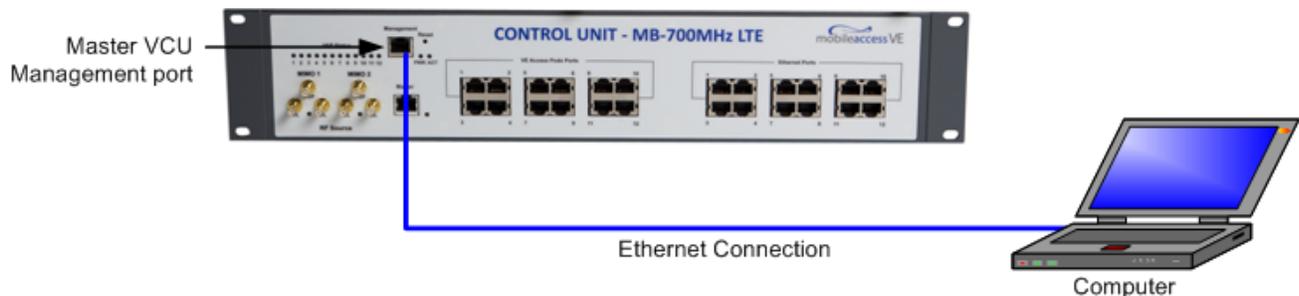
2. Open a web browser and type the Master VCU IP address in the address bar (Default: 192.168.1.1).
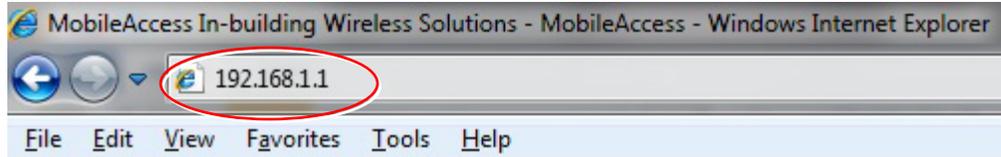
Note: If you have forgotten the VCU IP address (or want to change it) it can be retrieved via the IP Recovery Tool application provided on the Setup CD. See 9.2.

The Login window appears.
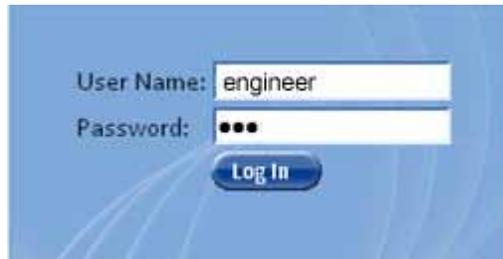
3. Type the **User Name** "**engineer"** and enter the **Password** "**eng"**.

The MobileAccessVE Web GUI appears.

Management tab

Main Menu Bar

Network Topology Tree

Sub-tabs corresponding to each main tab

4. Choose the **Management** tab in the main menu bar and click the **IP Settings** tab on the side bar.

IP Settings
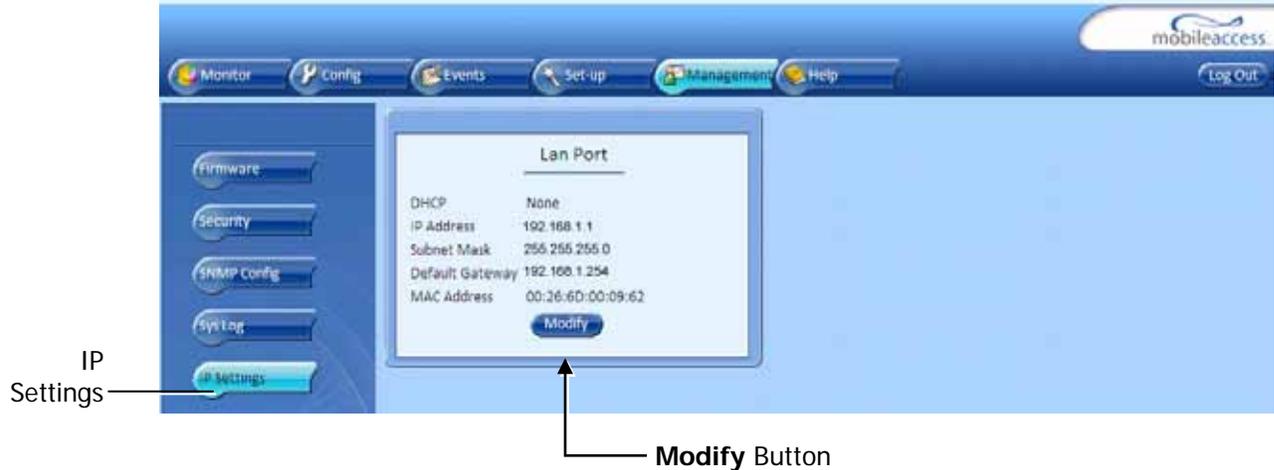
Modify Button

Note: See section 6.4 for a description of the Management tab.

5. Click the **Modify** button to define the STATIC **IP Address** according to existing LAN.

Note: After the initial IP configuration, the Master VCU can be accessed remotely via Ethernet.

· Set the Static IP address parameter (DHCP is not currently available)

   Default definitions:

   • The Default IP Address : 192.168.1.1
   • The Default Subnet Mask: 255.255.255.0
   • The Default Gateway: 192.168.1.254

· Click **OK**.

6. Log out and then log in again with the new IP settings.

7. Select the **Config** tab in the main menu bar.

Note: See section 6.3 for a complete description of the **Config** tab.

8. The Master VCU appears in the Network Topology Tree as **VCU-M**. Select the Master VCU by clicking on it.

9. Select the **Product Type** from drop-down list.
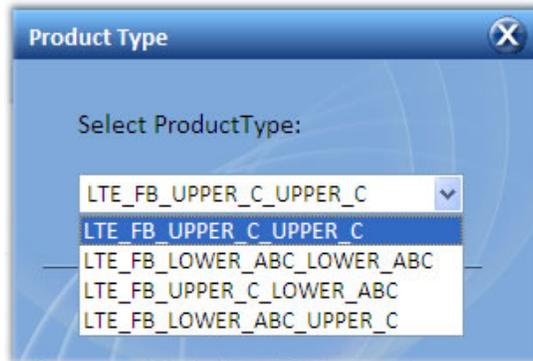
The following table provides a description of the available options.

Product Type Option	Description
LTE_FB_UPPER_C_UPPER_C	Upper C – MIMO channels
LTE_FB_LOWER_ABC_ LOWER_ABC	Lower A,B,C – MIMO channels
LTE_FB_UPPER_C_ LOWER_ABC	Upper C – SISO channel Lower A,B,C – SISO channel
LTE_FB_ LOWER_ABC_UPPER_C	Lower A,B,C – SISO channel Upper C – SISO channel

Note: Each channel is displayed in a dedicated **ServiceRF** tab so that the power and gain can be configured individually. See section 4.4.3.

10. Assign the unit an identifiable name (optional). To assign the Master VCU an identifiable name:

  · Select the **Module Info Tab** and click the **Modify** button.

Click Name **Modify** button to define the unit a name.

Uplink Cable Compensation option
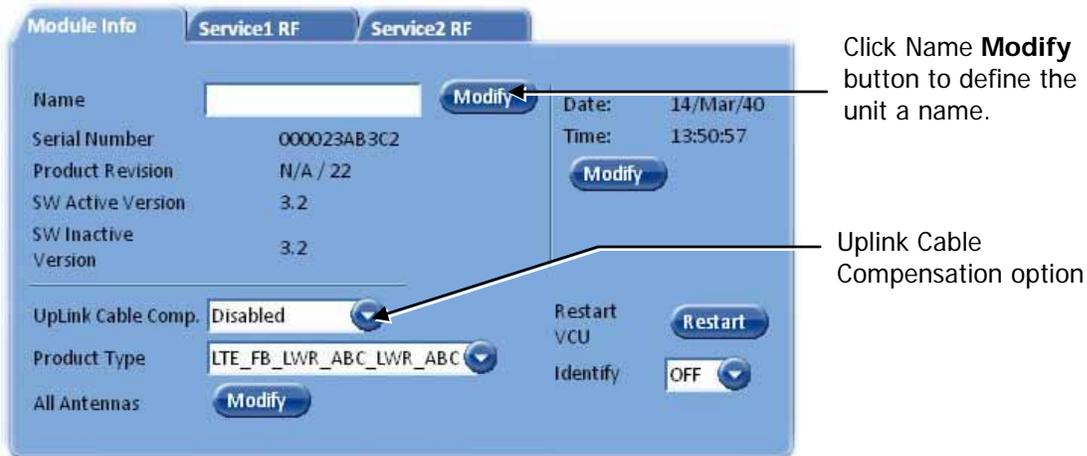
Figure 4-3. Module Info Tab

  · Type the unit name (up to 17 alpha-numeric characters) in the **Controller Name** dialog and click **OK**.

11. Uplink Cable Compensation – enable this parameter ONLY if the bonded cable lengths vary between the VCU and VAPs (reduces noise). See Figure 4-3. It is NOT recommended to enable this option for similar cable lengths between the VCU and the connected VAPs.

12. All Antennas – used to globally set usage of either external or internal antennas of VAPs that support both internal and external antenna options. (Antennas that support only external or only internal antennas are not affected.)

Note 1: The antenna type can be individually defined for each VAP via the VAP ServiceRF tab. See section 5.5
Note 2: Internal antennas (MIMO support for Horizontal Omni-Directional Antennas Only)

4.4.3   Setting RF Parameters

In a Master-Slave mode (multi-tier architecture) the RF parameters are only configured for the Master VCU unit.

The VCU supports both the Lower A,B,C and Upper C LTE bands in MIMO and SISO configurations. Each MIMO and SISO band can be individually configured in dedicated tabs.

This section describes the MIMO and the SISO configuration procedures.

To Configure the RF Parameters:

1. Select the Master VCU in the topology tree and then select the **Service RF** tab.

> Note 1: The **Type** field (Read Only) corresponds to the Product Type selected in the *Module Info* tab and shows the supported LTE 700 MHz Band (Upper C or Lower A,B,C).
> Note 2: The DL CF parameter is Read Only and pre-defined for the supported 10MHz block. In MIMO configurations, the same DL CF frequency from the Base Station is defined for Service1 and Service2.

2. Define the **BTS Connenction** according to type of RF connections (simplex/duplex) performed between the VCU and the RF Source. Default setting = duplex.

3. Define Max expected power of BTS (0-33dBm).

4. Define UL System Gain (-15 to 5dB)

Notes: Max expected Pin parameter can be obtained from your service provider. The remaining parameters are predefined to their default values. (Service Bandwidth is set to 10MHz per channel). Any updates of the service definition (Service Mode) are sent to all connected VAPs.

4.4.4   Verifying System Operation

To verify proper operation of the system, refer to the **VCU Alarms and Mask** sub-tab (in the Config tab). The following figure illustrates the MIMO alarms.
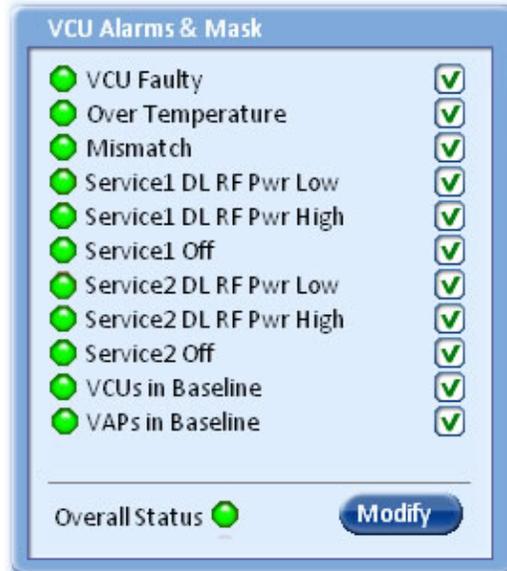
Note: SISO alarms are similar, however only **Channel 1** alarms appear.

1.   Verify that all the alarms are GREEN. Refer to the alarm descriptions in section 7.2.

Note: To briefly check the VCU status, click on the VCU name in the Topology Tree. The VCU icon will appear, showing the LEDs status.

2. Mask irrelevant alarm conditions to avoid affecting the overall status of the unit. See following example.

    For Example

    Note: Channel DL signal refers to the MIMO/SISO DL signal from the BS side towards the remote units (VAPs).

    In the example below "Service 2 RF DL Pwr High" alarm is masked (disabled) – this is the alarm *for the DL signal (from the BS side)*.

    The left dialog shows the alarm response when Service 2 DL RF Pwr High alarm is enabled and a fault corresponding to that alarm is detected. (MIMO 2 DL RF Power exceeds the defined range). The Overall Status will be RED indicating a fault.

    The right side dialog shows the alarm response when Channel 2 DL RF Pwr High alarm is masked (disabled). The Service 2 DL RF Pwr High LED will appear RED; but, the Overall Status will be GREEN – showing NO Fault.

Service2 RF DL Pwr High alarm unmasked (enabled)

Overall status **RED**

Service2 RF DL Pwr High alarm masked (disabled)

Overall status **GREEN**
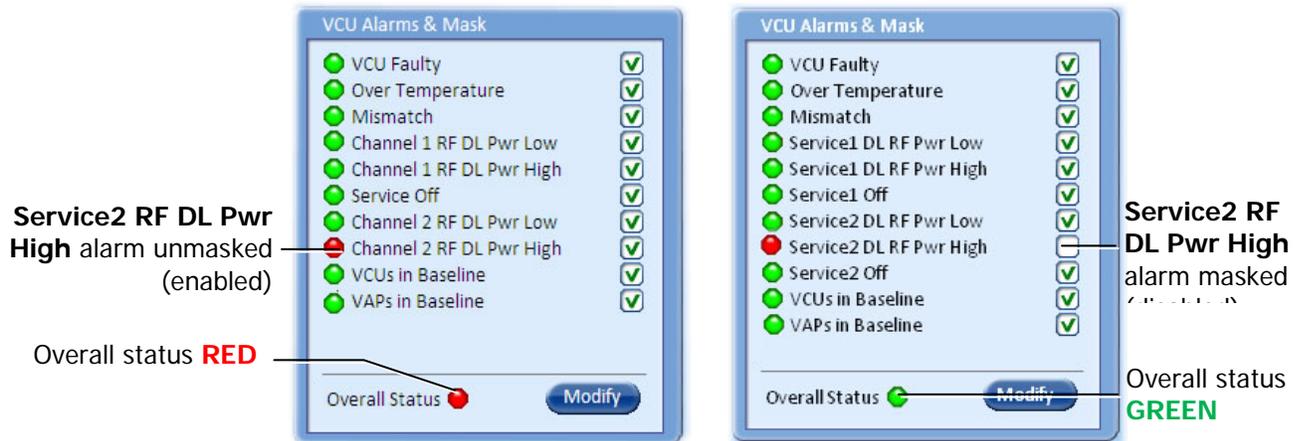
Figure 4-4. Unmasked Alarm (Enabled)   *Figure 4-5. Masked Alarm (Disabled)*

Note: To briefly check the VCU status, click on the VCU name in the Topology Tree. The VCU icon will appear, showing the LEDs status.
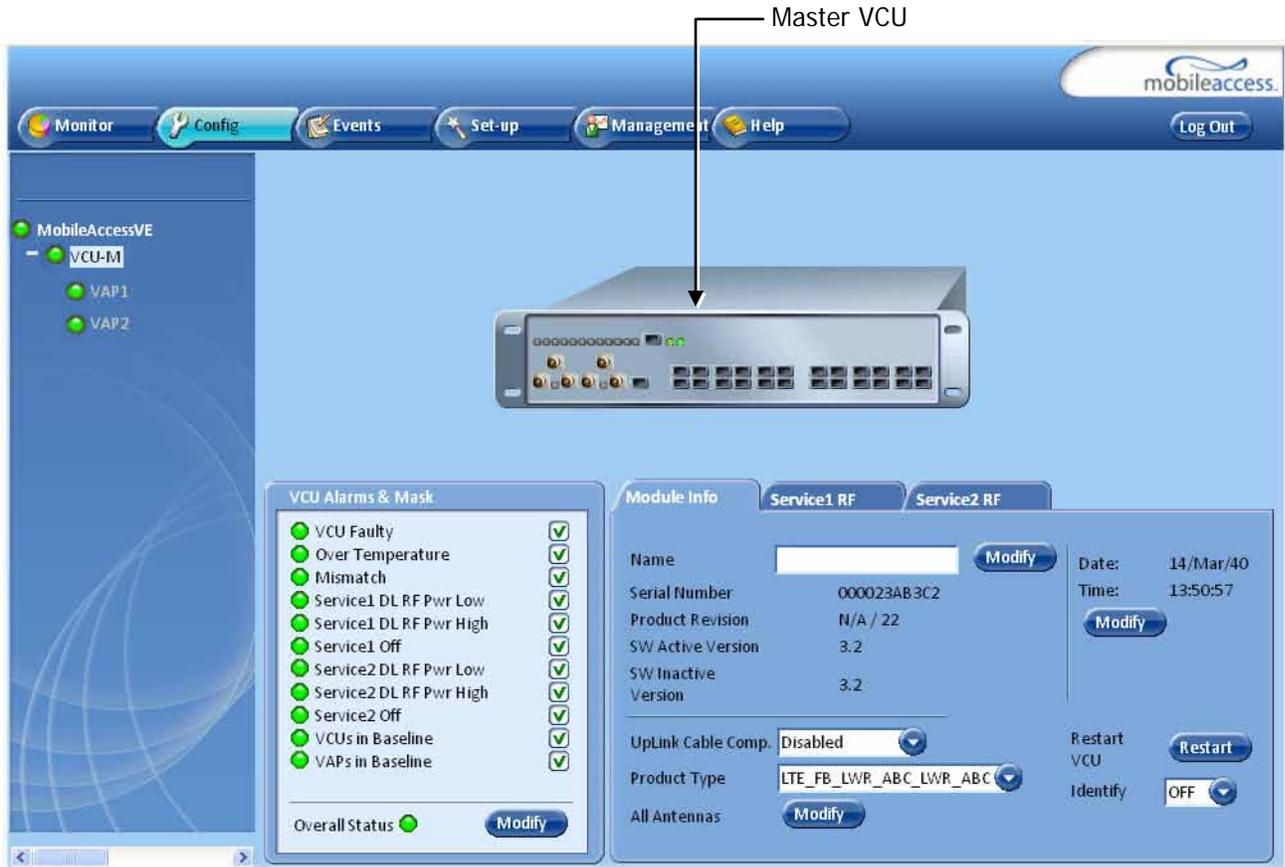
4.4.5   Provisioning Slave VCUs

Note: The Slave VCUs management and configuration is performed through a remote connection to the Master VCU, via the web management. Before provisioning the Slave VCUs verify that the Master VCU unit, to which it is connected, has been provisioned (See section 4.4.1).

The Slave VCU RF parameters are set via the Master VCU, therefore there is no need to configure the RF parameters individually for each connected Slave VCU. It is recommended to assign each Slave VCU an identifiable name.

To Assign a Name to a Slave VCU:

1. Connect to the Master VCU unit (either locally as explained in section 4.4.1 or remotely) and select the Slave VCU to be provisioned from the Network Topology Tree.

Selected Slave VCU-

Click **Modify** to assign name

Each VCU has a default name of the form "VCUPx-name", where:

- · **Px** - Master VCU port number to which the Slave VCU is connected
- · **Name** - user-defined name

2. To assign the Slave VCU an identifiable name:
    - · Select the Module Info Tab
    - · Click the **Modify** button
    - · Type the unit name (up to 17 alpha-numeric characters) and click **OK**.

3. Uplink Cable Compensation – enable this parameter ONLY if the bonded cable lengths vary between the VCU and VAPs (reduces noise). It is NOT recommended to enable this option for similar cable lengths between the VCU and the connected VAPs.

4. **Product Type** – (Read Only) corresponds to that defined for the Master VCU (see section 4.4.2).

5. All Antennas – used to globally set (for VAPs hosted by this Slave) usage of either external or internal antennas of VAPs that support both internal and external antenna options. (Antennas that support only external or only internal antennas are not affected.)

Note 1: The antenna type can be individually defined for each VAP via the VAP ServiceRF tab. See section 5.5

Note 2: Internal antennas (MIMO support for Horizontal Omni-Directional Antennas Only)

Note: The antenna type can be individually defined for each VAP via the VAP ServiceRF tab. See section 5.5.

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5 VAP Installation and Provisioning

This section provides a description of the VE Access Pods (VAPs) installation, verification, and monitoring procedures.

5.1 VAP Installation

The VAPs installation procedure consists of connecting each VAP to the Ethernet jack in the appropriate location to provide optimal coverage (See sections 3.4.

It is recommended to install the VAPs in places located high up so as to maximize the provided coverage per VAP.

Note: Mounting a VAP beneath a desk or in another secluded location (e.g. office corner) decreases the effective coverage of the VAP increasing the need for a higher number of VAPs to cover the same area.

The VAP can be installed on any flat surface (e.g. wall, lowered ceiling) whereas the screws must be appropriate for the type of surface.

VAP Installation Considerations

- Placing units in an open area.
- Availability of CAT-5e/6 infrastructure.
- The VAPs plug into standard (RJ-45) Ethernet connection jacks.
- If the jack being used is already connected to Ethernet switch. For more information see 3.4.2 and 4.3.
- Aesthetics of the VAP location.

5.2   Desk and Wall Mount VAP Installations

5.2.1   VAP Kit Contents

The LTE 700 MHz VE Access Pod (VAP) Kit includes:

Kit Items	UNIT
VE Access Pod (VAP)	Front View Rear View
Mounting Bracket *Note: Mounting Bracket can be used for installing on wall or on ceiling.*	
Assortment of optional screws for mounting bracket on surface	
RJ-45 Communication Cable	

Table 5-1: Desk and Wall Mount VAP Kit

5.2.2   VAP Installation Procedure

1. Mark and drill holes on the flat surface (i.e. wall or ceiling) according to the installation holes located in the center of the bracket.
2. Using the appropriate screws (depends on surface type) secure the bracket to the wall or ceiling.

Note 1: The bracket is mounted in the direction shown in Figure 5-1.
Note 2: An assortment of screws are supplied, however they are optional.

Figure 5-1: Optional Bracket Installation Holes

3. Connect the SMA adapters and external antennas (ordered separately) to the VAP SMA connectors. See Figure 5-2.

Note 1: The maximum external antenna gain should not exceed 10 dBi.
Note 2: This option must be SW configured via the web GUI (Internal Antenna is enabled by default).

4. Using the supplied RJ45 Ethernet cable, connect the VAP VCU port to the Ethernet jack leading to the connected parallel VCU port. See Figure 5-2.

5. (Optional) Connect the VAP **LAN** port to the LAN (e.g. computer).

Connect external antenna

Connect external antenna

To VCU

To LAN (e.g. computer, IP Phone)
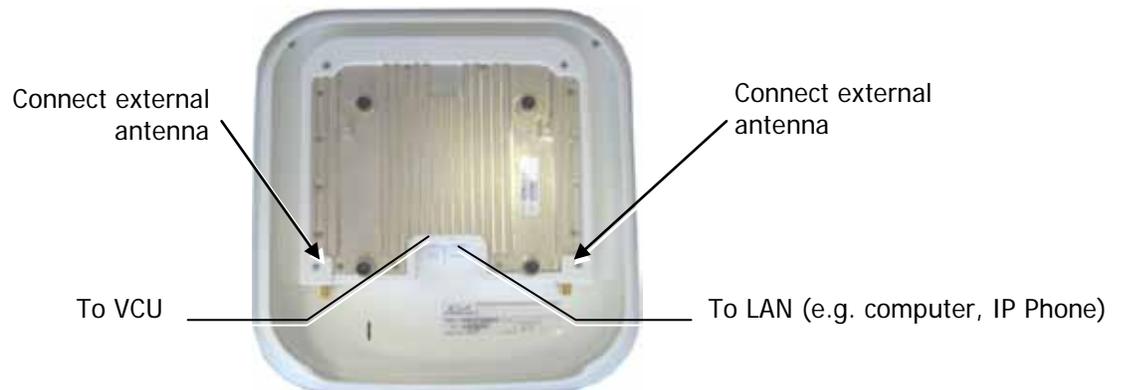
Figure 5-2: External Antenna and Cable Connections

6. Verify that the VAP receives power and connects to the VCU via the front cover LEDs on the unit - both the GREEN LED and the BLUE LED should be lit.

7. *For Installation on Lowered Ceilings Only* – Remove the top plastic rim from the rear of the VAP, by simply snapping it out of place. See Figure 5-3 below.

Note: The previously connected cables (Steps 4 and 5) are not shown in the following steps for clarity.

Remove top rim
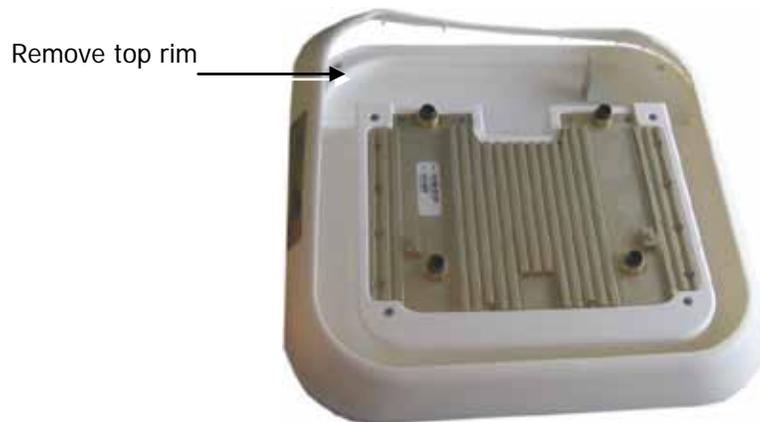
Figure 5-3: Removing Top Rim from Rear of VAP

8. Insert the (4) VAP protrusions (on rear) in the round part of the (4) most outer holes and pull the bracket downwards so it snaps in place. See Figure 5-4 and Figure 5-5.

Pass lock through bracket and VAP
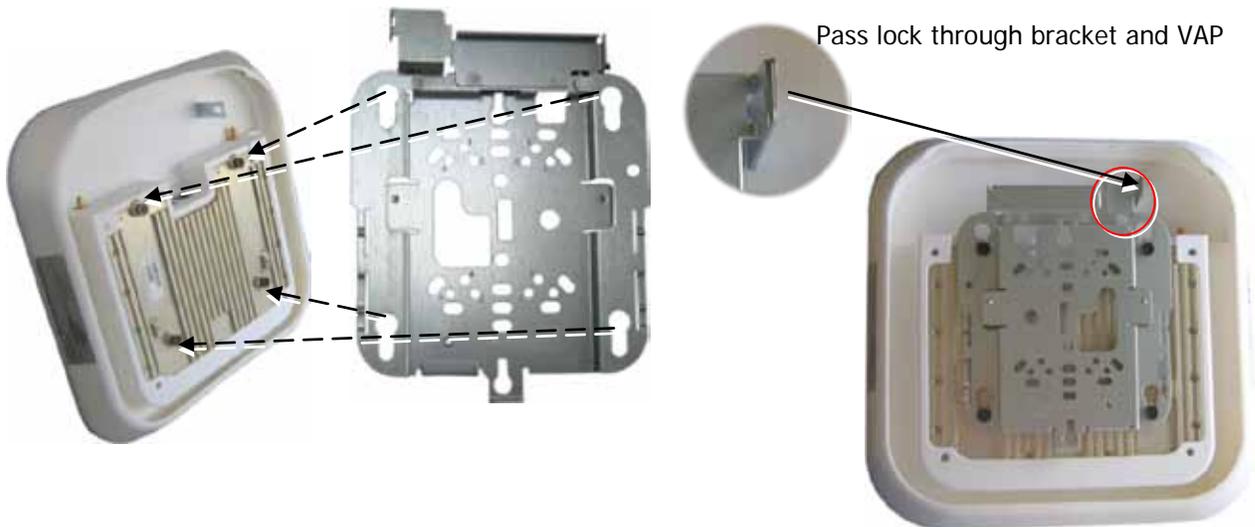
Figure 5-4: Assembling Bracket on to VAP

Figure 5-5: View of Assembled VAP and Bracket

9. (Optional) Secure Bracket to VAP with Lock by Reaching from Backside of Mounted VAP – See Figure 5-5.

5.2.3   Connecting VAP and Verifying Normal Operation

After the VAP has been mounted on the ceiling continue as follows:

· Connect the VAPs RJ-45 **VCU** connector to the Ethernet jack leading to the **VCU** (via RJ-45 cable supplied with VAP).

· When using an external antenna, connect the **Ext. Antenna** SMA connector(s) to the external antenna(s). **This option must be SW configured via the web GUI**. (Note: Internal antenna is enabled by default).

Note: The maximum external antenna gain should not exceed 10 dBi.

· Verify that the VAP receives power and connects to the VCU via the LEDs on the unit (both the GREEN LED and the BLUE LED should be lit).

Blue LED

Green LED

VAP RJ-45 VCU connector

5.3   Verifying VAP Coverage Area

Verify coverage in the areas, adding and moving VAPs for optimal coverage according to the principles described in 3.3.

5.4 Naming the VAPs, Verifying Connections and Monitoring

5.5 Provisioning the VAPs

Note: This section provides only the information required for provisioning the VAPs. For a full description of the VAP configuration options, refer to Chapter 8 .

The VAPs are auto-discovered by the VCU and can be monitored via a remote or a local connection (to the Master VCU). The VAPs are auto-configured by the VCU without user intervention (no configuration procedure is required). However, if you wish, you may assign each VAP an identifiable name corresponding to its physical location.

5.5.1 Verifying Normal VAP Operation

Use the RF Parameters and Module Info sub-tabs to review the VAP information and status.

1. If a session in not already open to the MobileAccess**VE** Web GUI application, open a session to the Master VCU according to section 4.4.2.

2. Select a VAP from the Network Topology Tree.

   Each VAP has a default name showing the number of the Slave VCU port to which the VAP is connected.

3. To verify normal operation of the VAP:

   · In the Network Topology Tree, under the Control Unit, verify that an LED is displayed (either RED or GREEN) for each connected VAP.

   · If the VAP LED is **RED**, select the VAP from the network topology tree then select the **Config** tab. Refer to the **Alarms** tab work area. Use the displayed alarms to identify the problems.
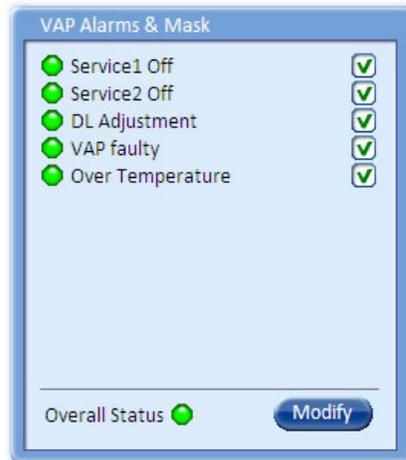
5.5.2   Naming the VAP

To assign the VAP an identifiable name:

· Open the Config **Module info** tab.

Click **Modify** to assign name

· Click the **Modify** button.
· Type the unit name (up to 17 alpha-numeric characters) and click **OK**.

6 Navigating the Web Access Application

The MobileAccess**VE** Web management application is accessed through any standard web browser connected to the Master VCU via a network within the same subnet as the Master VCU or a different subnet which is routable.

6.1 Opening a Session and Authentication Levels

After the initial configuration (as explained in 4.4.1) the MobileAccessVE system can be accessed via the network.

To access the system:

1. Open a web browser. In the address bar type the Master VCU's IP address as you set it in the Master VCU configuration operation (See section 4.4.1).

2. The Login pane appears.
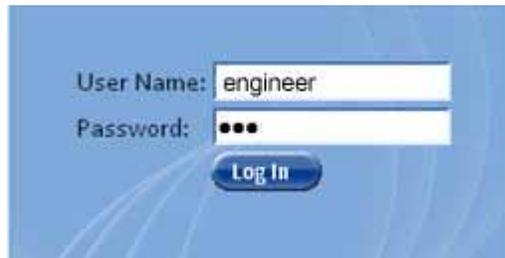
Enter your User Name and password. The following authentication levels are available:

Level	Default Password	Access
operator	oper	This user has Read Only access.
engineer	eng	This user has access to basic configuration options.
admin	Provided by MobileAccess	This user has Field Engineer permissions, in addition to access to changing passwords.

6.2 About the MobileAccessVE Web Access Window

The MobileAccess**VE** Web window includes six main tabs that provide access to the applications' main options. Here the Config tab is displayed by default.

Note: The Monitor, Events, Setup, and Help tab are future options.

The appearance of the each screen varies according to the tab displayed. The Config(uration) and Management Main Menu Bar options are used for configuration and management of the VE elements are:

· Config(uration) – Displayed by default upon login. Provides the selected units' configuration parameters and alarms

· Management - Provides upgrade, IP configuration and security options

Both of these tabs are described in detail in the following sections

6.3   Configuration Tab

The **Configuration** tab provides the general information and service RF parameters for configuration of the units appearing in the Network Topology tree.

To access a VCU Configuration tab

On the left hand side of the window select a Master VCU/Slave VCU from the network topology tree. Select the **Configuration** tab from the menu-bar. The information and parameters displayed in the Configuration sub-tabs vary depending on whether a VCU or VAP is selected in the topology tree.

The Configuration tab is divided in to three main areas:

· Network Topology Tree – Displays the system units (Master VCU, Slave VCUs and VAPs) and their status
· Display Area – Displays the icon of the selected unit including the LED statuses
· Work Area – Displays the Module Info, alarms, and RF tabs corresponding to the unit selected in the topology tree (Master VCU, Slave VCU or VAP)
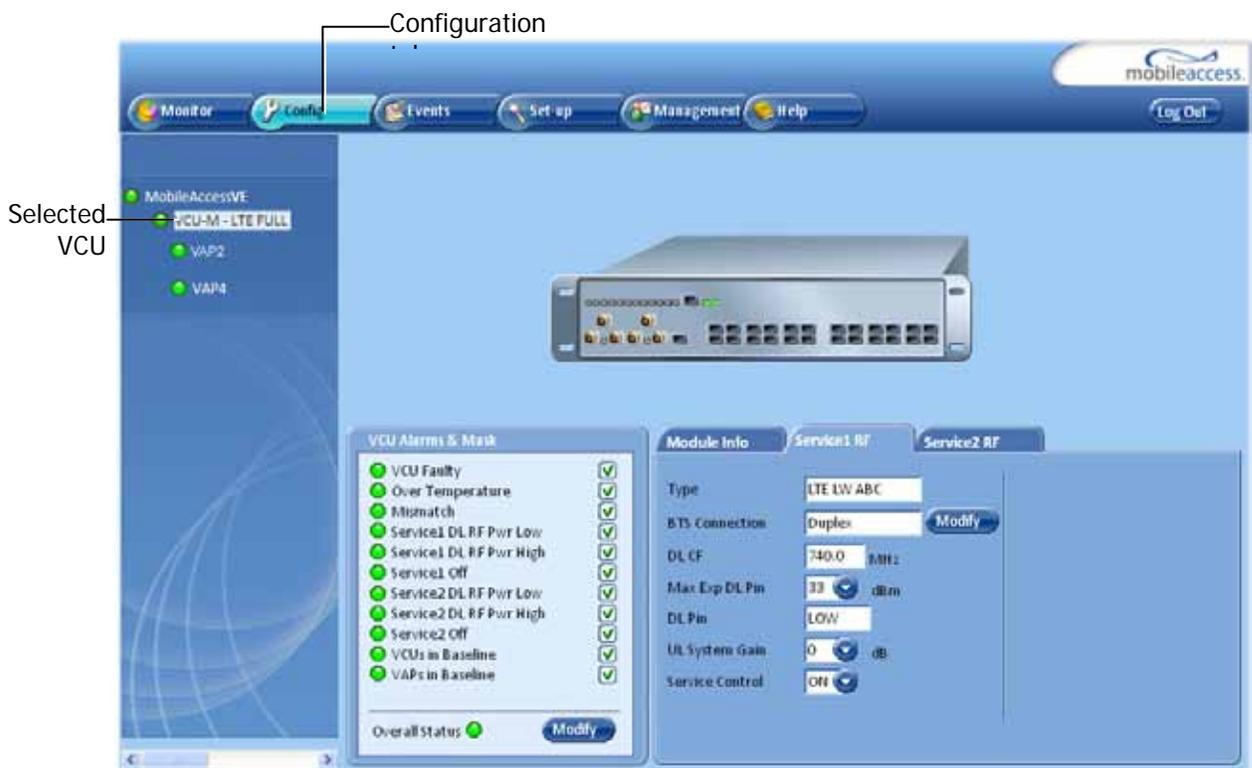
6.3.1   Network Topology Tree

The Configuration Network Topology Tree appears on the left hand side when the **Config** tab is selected. Connected Slave VCUs and VAPs are automatically detected and displayed in the topology. The MobileAccess**VE** Web Access Application includes a Baseline feature providing an indication on network elements (VCUs or VAPs) which were disconnected from the VE network. Connected Slave VCUs, and VAPs are automatically added to the Baseline upon detection, and will appear in the topology as grayed out in case they get disconnected. The network elements are displayed in two levels:

· First Level – up to 12 VCUs
· Second Level – Up to 12 VAPs connected to each VCU

Note: The root is MobileAccess**VE**.
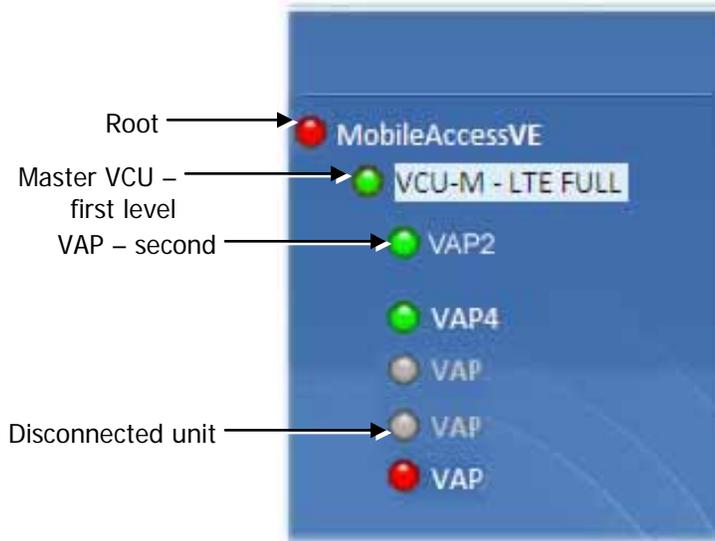
Each unit is assigned a **Type Px-name**:

· Type – VCU-M, VCU or VAP (for Master VCU, Slave VCU or VE Access Pod)
· Px - VCU port number
· Name – user defined

Each unit is displayed with a colored bullet that indicates its' status:

Color	Indicates
Green	OK
Red	Alarm Condition
Gray	Disconnected unit (e.g. faulty connection) Generates RED Baseline alarm in Alarms tab (see Viewing VCU Alarms).

The root (the entire MobileAccessVE site) is also associated with a colored bullet that indicates the overall status of the deployment:

Color	Indicates
Green	OK
Red	Alarm Condition in one or more VCUs or VAPs

6.3.1.1   Removing Network Element from Baseline

The Baseline automatically detects the connected units (VCUs and VAPs) and when for some reason a unit is disconnected or the connection is no longer detected it will not disappear from the topology but will appear in gray. In addition, the Baseline alarm in the Alarm tab will appear in Red.

In order to remove a unit from the baseline so that it no longer appears in the network topology, it must be done via the GUI from either the Topology Tree or unit icon.

To remove a unit from the baseline

1.   Click on the unit in the Topology Tree or on the unit icon (for example, VAP). The following dialog appears:
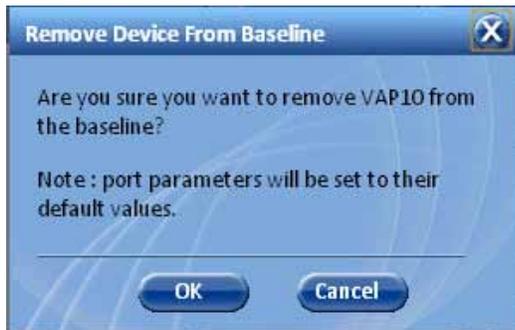
2.   Click **OK**. The unit will no longer be displayed in the Network Topology Tree.

6.3.2 Configuration Display Area

When selecting an element (Master VCU/Slave VCU or VAP) in the network topology tree, an icon representing the unit is displayed in the Configuration tab display area.
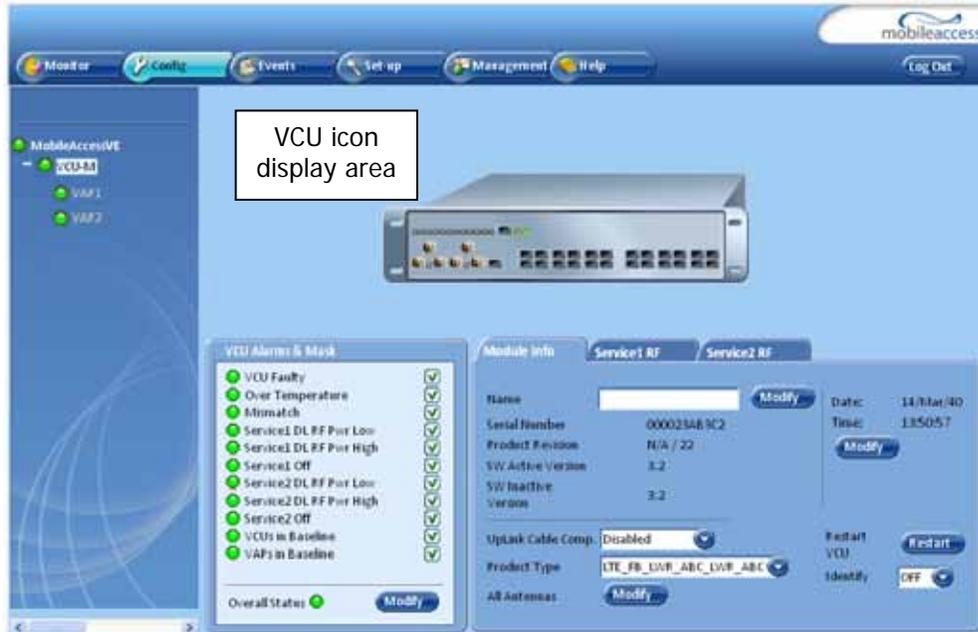
Figure 6-1: Example of VCU Config Tab (Module Info)

Figure 6-2: Example of VAP Config Tab (Module Info)

6.4   Management Tab

Note: The displayed options depend on the user access level.

The Management tab provides user administrative management options and includes the sub-menu tabs:

· Firmware – Used for upgrading/downgrading SW to VCUs
· Distribute – Used for distributing the upgrade/downgrade SW files to the VAPs
· Security – Used for changing user passwords
· SNMP Config – Used for defining the SNMP communities and trap destinations
· IP Settings – Used for viewing and modifying the network parameters
· Sys(tem) Log – N/A

The following figure shows the Management screen with the menu options on left.

7   VCU Monitoring and Configuration

7.1   Viewing VCU General Information

The VCUs general information (such as unit name and SW versions) can be viewed in the Config **Module Info** sub-tab.

The tab includes two additional options:

· Identify button - Enabling this option enables finding the physical location of the selected element (See 10.1). When this option is set to ON, the LEDs on the corresponding VCU flickers.

· Reset button - SW reset of the unit

To view VCU general information

· Click the Config tab from the main menu and select the VCU from the network topology tree. The **Module Info** sub-tab is displayed by default.

The following information is displayed:

Field	Description
Name	User defined name for system element (up to 17 characters)
Serial Number	Factory set ID number
Product Revision	Revision number of VCU/VAP
SW Active Version	Version of the SW currently being used to manage and monitor the system

Field	Description
SW Inactive Version	Version of other system SW version not in use
Uplink Cable Comp.	When enabled, used to minimize interference that may be caused by bonded cables that vary in length
Product Type	Provides options for selecting two channels in MIMO or SISO service configurations: LOWER A,B,C – LOWER A,B,C (MIMO) UPPER C – UPPER C (MIMO) LOWER A,B,C – UPPER C (SISO) UPPER C - LOWER A,B,C (SISO) *Note: Each of the channels is displayed in a dedicated Service RF tab and is individually configured.*
Antenna Type Modify Button	Enables defining the antenna type: All internal/external) for all of the VAPs at once. *Note: The antenna type can be defined for each VAP individually via the VAP GUI (Service RF tab-see section 8.3).*
Identify (ON/OFF)	Enabling this option enables finding the physical location of the selected element (See 10.1). When this option is set to ON, the LEDs on the corresponding VAP/VCU flickers.
Restart VCU Button	SW reset of the unit

7.2   Viewing VCU Alarms

The alarms displayed in the Alarms tab correspond to the VCU (Master/Slave) selected in the topology tree. When a VCU element is selected in the topology tree, the Alarm tab displays the main alarms in the unit.

To view VCU Alarms

In the Topology Tree select the **Control Unit** (VCU) then click the **Config(uration)** tab in the menu bar located at the top of the window. Refer to the **VCU Alarms and Mask** sub tab.

Product Type

·   If one or more alarms occur, the corresponding Status indicator will be illuminated in RED. If the VCU is OK and no fault occurs, the **Overall Status** indicator will show GREEN. The displayed VCU alarms include general status alarms (e.g. Over Temperature, VCU Faulty) and service specific (e.g. Service 1/2 DL RF Pwr Low).

·   When the selected product type is set for MIMO configuration (e.g. LWR ABC-LWR ABC) then the "Service1" and "Service2" alarms correspond to the MIMO1 and MIMO2 services.

·   When a SISO configuration is selected (e.g. LWR ABC-UPPER C), the "Service1" and "Service2" alarms correspond to each SISO service.

The following table provides a description of the VCU alarms.

Alarm	Description
VCU Faulty	RED - VCU fault. Remove and re-apply power to VCU. If problem persists, replace VCU.
Over Temperature	Temperature of unit exceeds normal range.

Alarm	Description
Mismatch	Red – Mismatch of services (e.g. between VCU and connected VAPs).
Service 1/2 RF DL Pwr Low	RED - DL RF Power is lower by 15dBm (or more) from the Max Expected Pin.
Service 1/2 RF DL Pwr High	RED - the input power exceeds the maximum expected Pin by more than 3 dB.
Service Off	User has disabled the service.
VCUs in Baseline	RED – Communication lost with VCU defined in baseline
VAPs in Baseline	RED - Communication lost with VAP defined in baseline
Overall Status	Indicates Fault (RED) level or GREEN if there are no faults.

7.3 Master VCU RF Parameters

Note: The RF parameters are not displayed for control units functioning as Slave VCUs.

To access the Service RF tab

Click the **Config** tab from the main menu bar and then select the Master control unit from the network topology and click the **RF Parameters** tab.
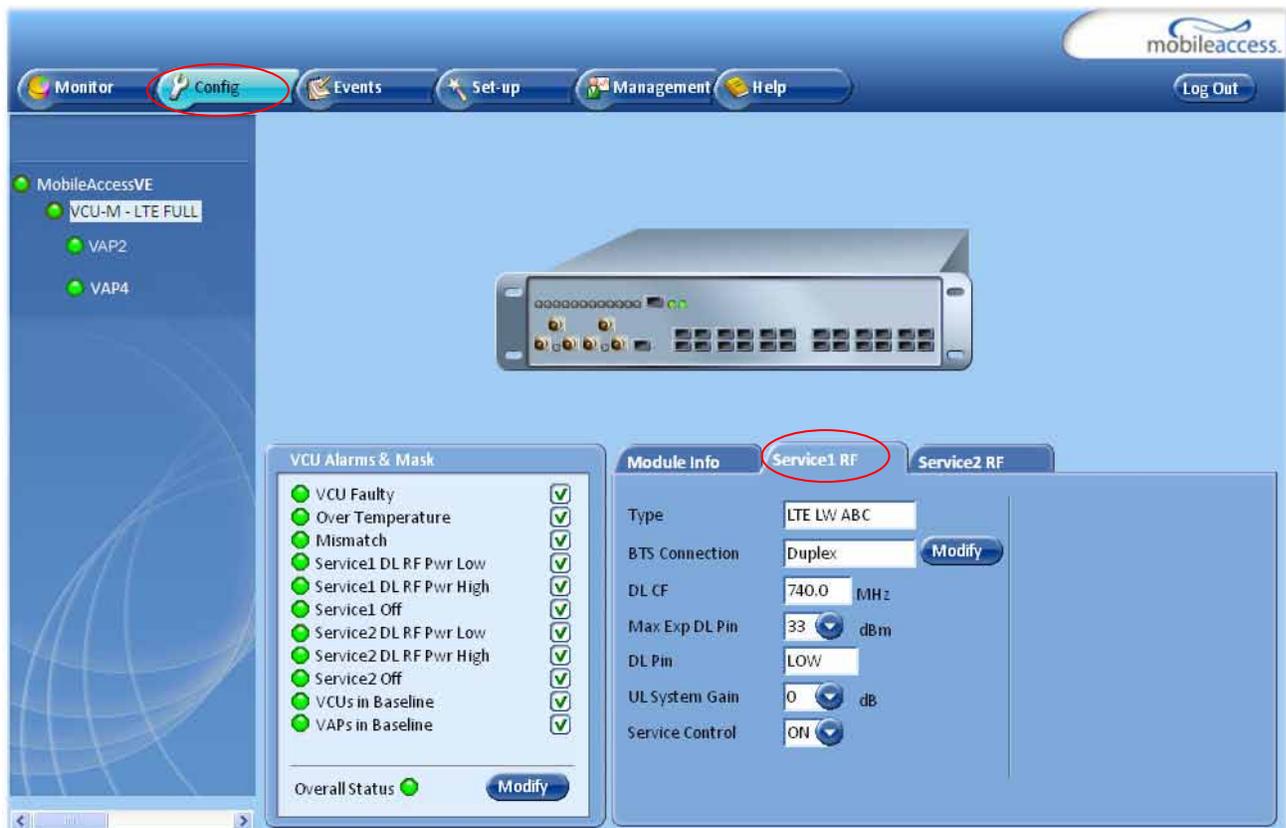
Figure 7-1: VCU Service RF Tab

The parameters displayed in Service RF tabs correspond to the services configuration selected in the Module Info tab. Each MIMO (MIMO1 and MIMO2) and SISO service is displayed in a

dedicated tab (Service1 RF and Service2 RF) and can be individually configured. For example, if the selected Product Type in the Module Info tab is LOWER A,B,C – UPPER C, each one of the SISO channels will be displayed in a separate tab. If the MIMO LOWER A,B,C-LOWER A,B,C product type is selected, each MIMO channel is also displayed in a separate tab and can be individually configured and viewed.

The following table provides a description of the RF parameters displayed in the Service RF tabs.

Parameter	Description
Type	Set (read only) according to unit type (LTE Upper C or Lower B,C – depending on model)
BTS Connection	Type of BTS RF connection (Simplex/Duplex). Default = duplex.
DL CF*	Set (read only) Center frequency (from BTS) according to LTE 700MHz range - (Upper C Block or Lower A, B, C Blocks). The CF is the same for both UL and DL signals.
Max Exp DL Pin*	Maximum expected input power from the BTS. Used for adjustment procedure. Range: 0-33 dBm. User defined.
DL Pin	Actual measured Power input (read only). In SISO mode only Channel 1 Pin is relevant.
UL System Gain	Used for adjusting the UL system gain. Range: -15 dB to +5 dB
Service Control	Enables (On)/Disables (Off) the service

* Required parameters to be provisioned by the user.

8   VAP Monitoring and Configuration

8.1   Viewing VAP General Information

The VAPs general information (such as unit name and SW versions) can be viewed in the Config **Module Info** sub-tab.

The tab includes two additional options:

- Identify button - Enabling this option enables finding the physical location of the selected element. When this option is set to ON, the LEDs on the corresponding VAP flickers.
- Reset button - SW reset of the unit

To view VAP general information

Click the Config tab in the main menu and select the VAP from the network topology tree. The **Module Info** sub-tab will be displayed by default.
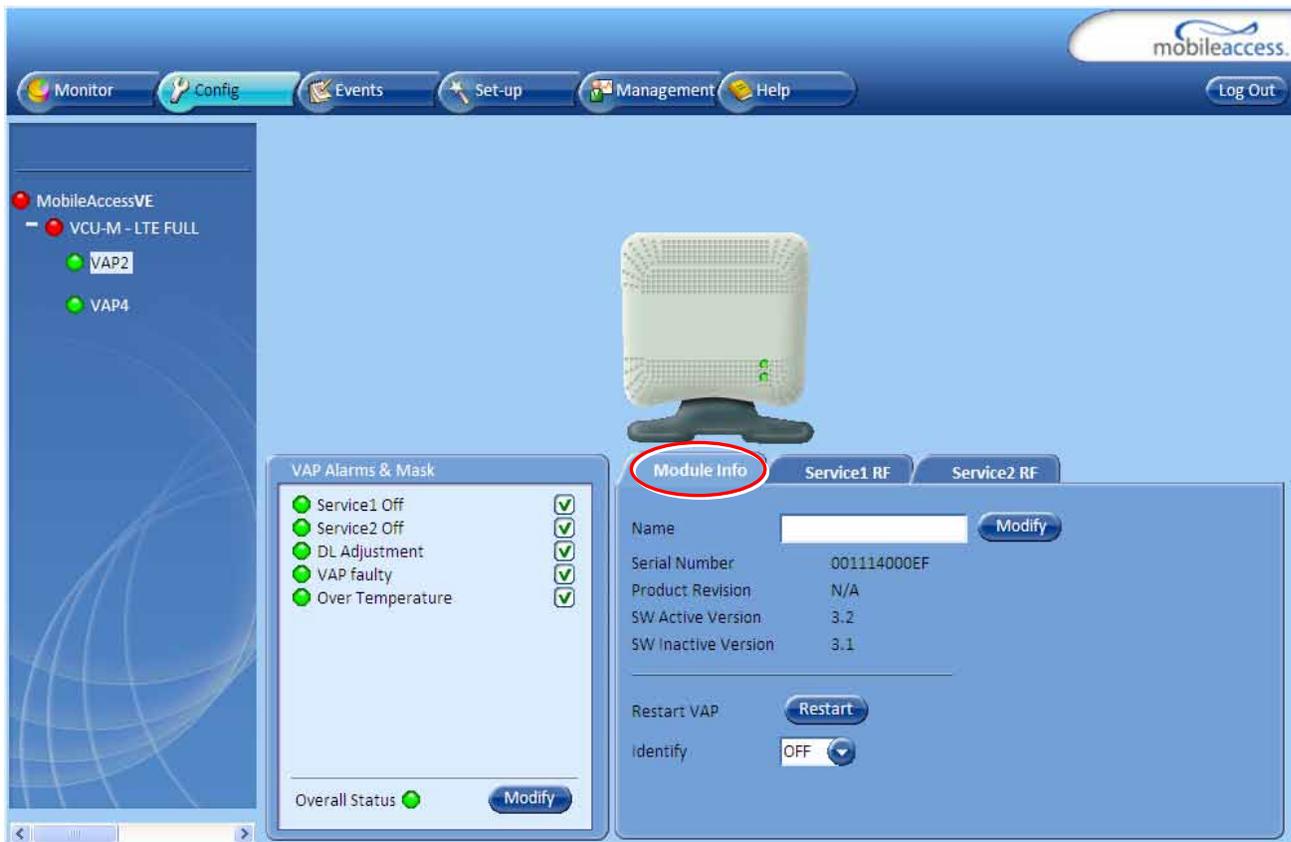
The following information is displayed:

Field	Description
Name	User defined name for system element (up to 17 characters)
Serial Number	Factory set ID number
Product Revision	Revision number of VCU/VAP
SW Active Version	Version of the SW currently being used to manage and monitor the system
SW Inactive Version	Version of other system SW version not in use
Identify Button	Enabling this option enables finding the physical location of the

Field	Description
	selected element (See 10.1). When this option is set to ON, the LEDs on the corresponding Access POD/VCU flickers.
Restart VAP	SW reset of the unit

Note: VAP Name is saved in the VCU associated to the port to which the VAP is connected, such that in case you replace a VAP, the new one will be associated with the same name. In case you do not want to keep the configuration of the replaced VAP, remove it from the topology baseline before connecting the new VAP.

8.2   Viewing VAP Alarms

When a VAP element is selected in the topology tree, the Alarm tab displays the main alarms in the unit.

To access VAP Alarms Tab

Click the Config tab in the main menu and select the VAP from the network topology tree. Select the **VAP Alarms** sub tab.

If one or more alarms occur, the corresponding Status indicator will be illuminated in RED. If the VAP is OK and no fault occurs, the **Overall Status** indicator will show GREEN.

Alarm	Description
Service 1/2 Off	User has disabled the service
DL Adjustment	RED - Cable (between VCU to VAP) is too long (over 100m/300ft)
Over temperature	RED - Temperature of unit exceeds normal range
VAP Faulty	RED - A fault has been detected in the VAP
Overall status	Indicates Fault (RED) level or GREEN if there are no faults

Note: DL adjustment alarm is raised when a VAP is connected over a cable exceeding system cable length limitation. In such cases, the system continues to provide the wireless services, but you should check the coverage of the VAP (as output power may be degraded due to excess cable loss) and check the Ethernet connection (as Ethernet standard maximum cable length has probably been exceeded).

8.3   VAP RF Parameters

The VAP **Service RF** sub-tabs provide the configurable RF parameters of the supported services and correspond to the VAP element selected in the network topology tree. The displayed RF parameters are similar for both MIMO and SISO service configuration, where each service is configured in a dedicated tab.

To view the VAP RF Parameters

Click the **Config** tab from the main menu bar and then select the VAP from the network topology and click the *Service RF* sub-tab. The parameters displayed in each Service RF tab correspond to the supported services of the selected element.

The following table provides a description of the displayed VAP RF parameters for each service.

Parameter	Description
Type	Set (Read Only) according to unit type (LTE)
Service Control	Enables (On)/Disables (Off) the service
DL Pout Level	Level of from BS side. Normal = output power will be at required (normal) level Low = output power will be attenuated by 5 dB less than the required level. This option can be used for smaller coverage areas that do not require the full power of the VAP for coverage.
DL Pout	Measured output power. Normal output power is approximately 14dBm.
Antenna	Antenna type: Internal/External/All Antennas (default)

Note: VAP RF settings (Service Mode, DL Pout Level, Antenna) are saved in the VCU associated to the port to which the VAP is connected, such that in case you replace a VAP all parameters are automatically set to the new VAP. In case you do not want to keep the configuration of the replaced VAP, remove it from the topology baseline before connecting the new VAP.

9   Administrative Operations

This chapter describes the following Administrative operations (accessible to "Admin" access level only):

· Changing password
· IP configuration parameters
· SNMP Configuration parameters
· Unit software upgrade and software management procedures

9.1   Changing Password

The Management - Security tab provides password change options.

To set the application password or change an existing password

1. Select the **Security** option of the Management tab at the top of the window.

2. Click the **Modify** button beside the User Name whose password is being modified.

3. Enter the **New Password** and re-enter in the **Confirm New Password** field.

4. Click **OK**.

Note: Passwords can only be changed when connected as an administrator.

9.2   Retrieving VCU IP Address

The IP Recovery Tool enables viewing and/or changing the VCU IP address.

To install IP Recovery Tool

1. Install the IP Recovery Tool application (provided by MobileAccess on the Setup CD) on the computer to which the VCU is to be connected.
2. Double-click on the Recovery Tool Setup and follow the prompts – standard installation procedure.

To retrieve the VCU IP address

1. Connect the computer, on which the Recovery Tool is installed, to the VCU RS-232 **Console** port located on the rear panel (See 1.3.1.2).
2. Run the IP Recovery Tool application from the computer Start menu.

The Connection dialog appears.
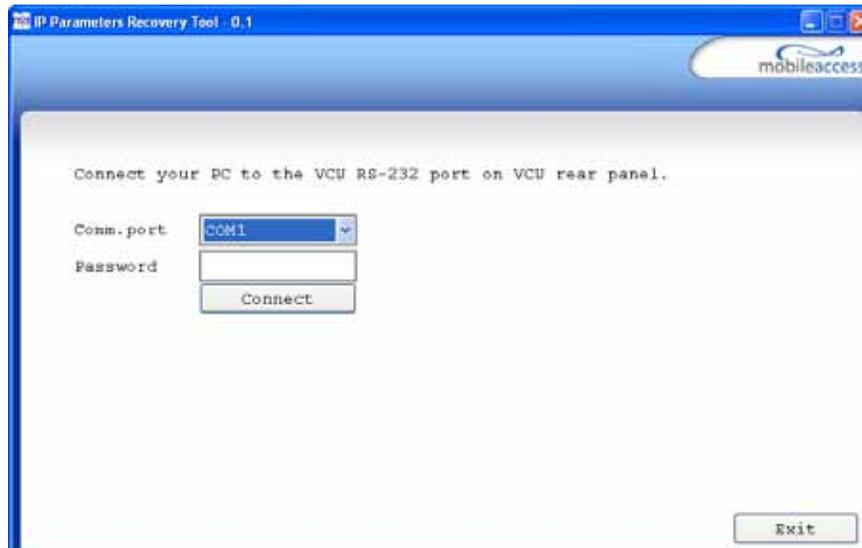
3. Select the **Comm. Port** corresponding to the connection on the computer.
4. Enter the password **Eng** and click **Connect.**

The current IP parameters dialog appears showing the VCI IP address.
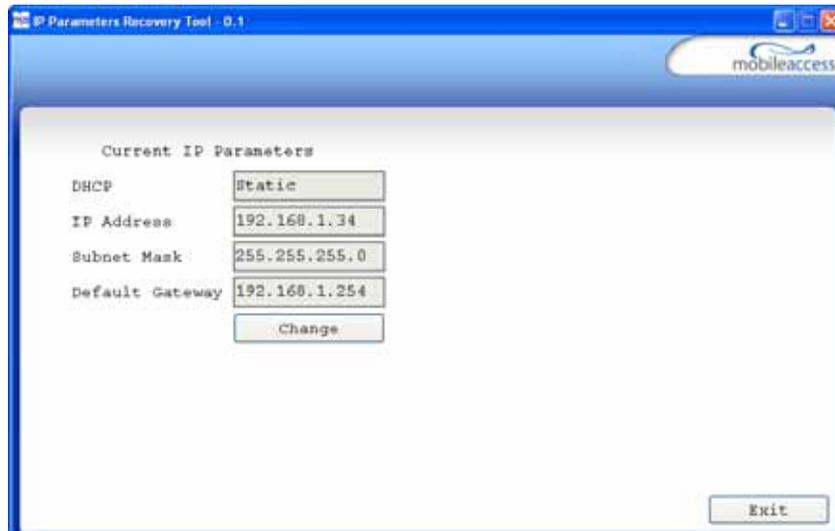
5. To modify the current IP Parameters: click **Change**. The **Change IP Parameters** dialog appears:
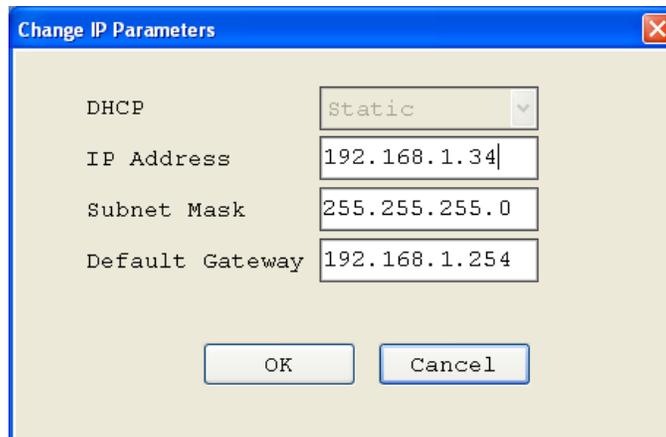
6. Enter the new parameter value and click **OK** and **Exit**.

9.3   IP Settings

The IP Settings tab is used for viewing and modifying the network parameters. The default parameter settings are as follows:

- IP Address: 192.168.1.1
- Subnet Mask: 255.255.255.0
- Default Gateway: 192.168.1.254
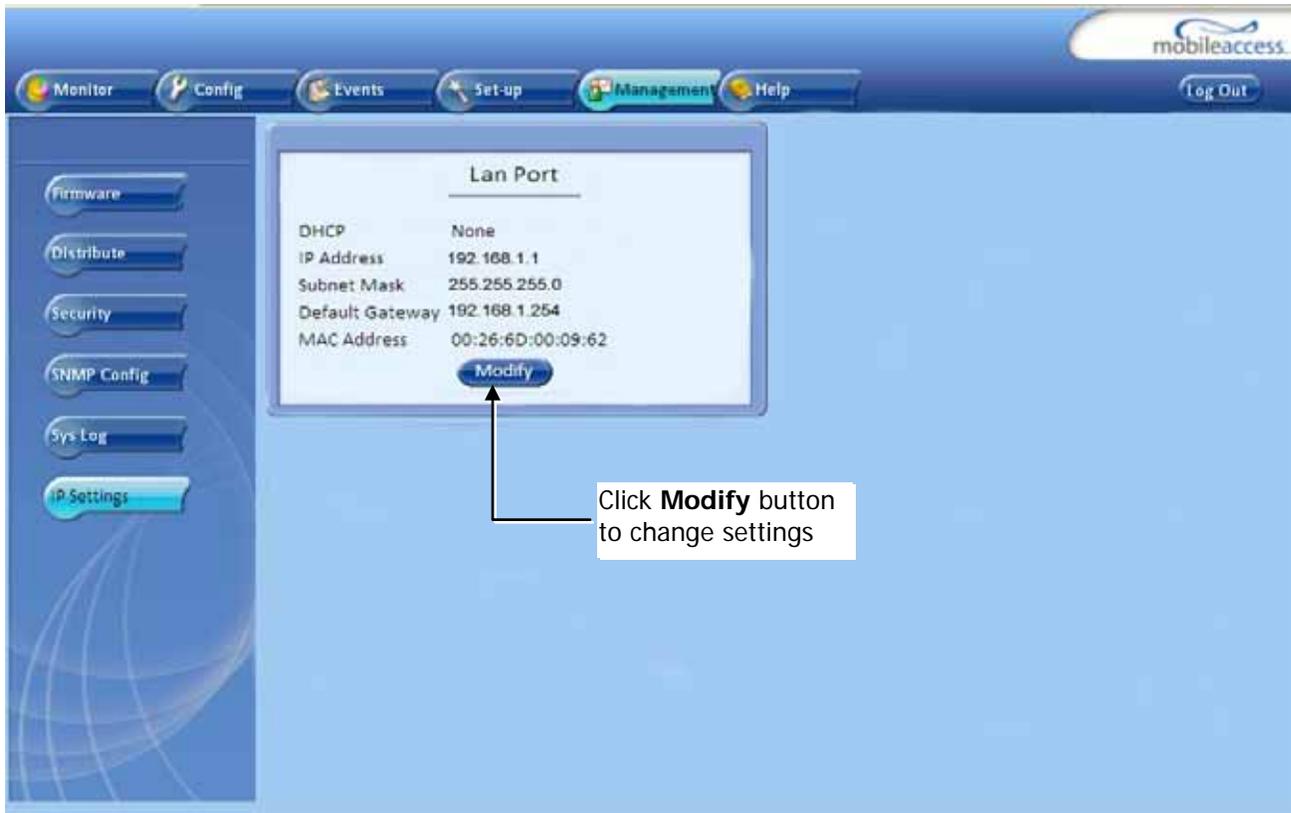
9.4 SNMP Configuration Parameters

The SNMP Config tab is used for defining the SNMP communities in which the devices and management station belongs and to where the traps are sent. The SNMP default communities are:

- Read - public
- Write - private
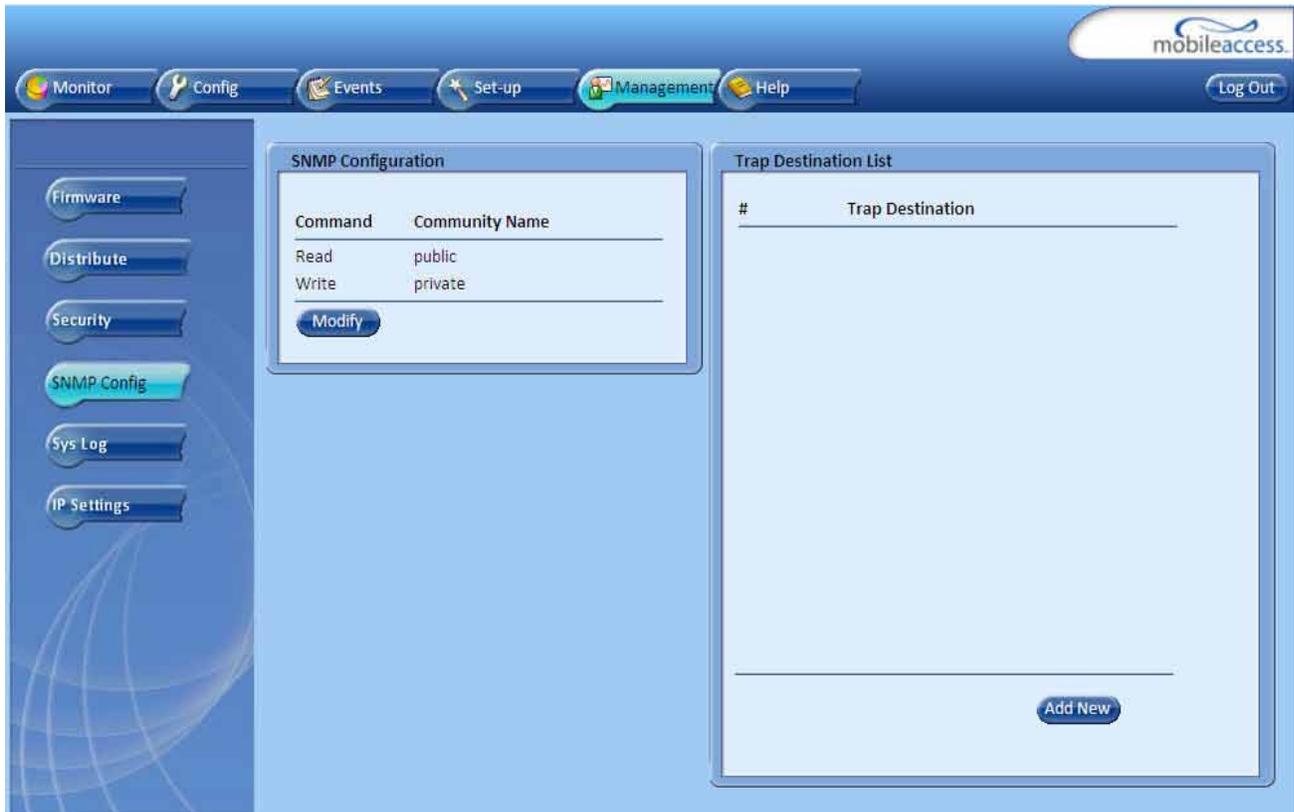
- The Community Names can be modified by clicking the **Modify** button in the SNMP Configuration display area.
- Additional Trap Destinations can be added by clicking the **Add New** button in the Trap Destination List display area:

9.5   Upgrading (or Downgrading) VCU and VAP Software

Note: Before you start, verify that the VCU and VAPs upgrade files are located in an accessible location (i.e. on your computer).

The software for each VCU and its hosted VAPs can be upgraded through access to the VCU, where the **VAPs must be upgraded first** and only then the VCU.

Note: In installations with Slave VCUs, a session should be opened to the IP address of the Slave VCU in order to upgrade the SW of the Slave VCU and associated VAPs.

Two types of files are stored on the VCU and on individual VAPs: Active software on which the unit operates, and Standby software. The Active and Standby software can be swapped on each individual unit.

In addition, the VCU holds two software images for VAPs – to be used in download process to VAPs.

The upgrade procedure consists of the following main phases:

1.   Uploading the new VCU and VAP software to the host VCU.
2.   Setting the new software as the Active software.
3.   Downloading the new software to selected VAPs and activating it as the Active software on those VAPs.
4.   Activating the new VCU software on the VCU.

The procedure is performed via two screens:

·   Firmware Screen – used to manage the software files stored on the VCU.
·   Distribute Screen – used to download the VAP software version to selected VAPs.

9.5.1   Upgrading the VAP SW

To Upgrade the VAPs SW Version:

1. Upload the VAP upgrade files from your storage location (i.e. computer) to the VCU as follows:

    · Click the **Management** menu tab and then select the **Firmware** sub-menu option located on the left side.

    · In the **Load New Firmware** display area, click the **Browse** button.

    · Browse for the file to be loaded from your computer location. The Download button appears and the progress bar will show the download status.

    · After the download is complete, the downloaded SW version will appear in the Standby Bank column of the VAP display area.

Notes:

1. Locate the Firmware files on your local hard-drive prior to the download process.
2. During the download process DO NOT disconnect the Web GUI connection to the VCU.

2. To distribute the new software to selected VAPs:
   - Select the **Distribute** sub-menu option found on the left side.

3. Download the new version to the selected VAPs (Note: The downloaded version is stored as Inactive in the VAPs until a Swap procedure is performed.)
   - In the **VAP Distribute Table** display area, checkmark the VAPs to be upgraded. The Active and Inactive SW versions for each VAP are listed in the relevant columns.
   - Click the **Distribute** button to download the new software to the selected VAPs. The software is stored as the Inactive version in the VAPs.
   - Set the new software as the Active version in the selected VAPs by clicking the Swap button.
   - The VAP upgrade procedure is complete.

Notes:
1. As during the distribution process service may be interrupted, it is advised to perform the SW download and distribution in a maintenance window scheduled at off-peak hours (e.g. nights and/or weekends).
2. During the distribution process DO NOT perform configuration changes, connect or disconnect VAPs, and/or disconnect the web GUI.
3. After the distribution process is complete and swapping between VAP SW images, the VCU will restart automatically. After restart, the VAP firmware distribution table will be empty. Within several seconds it will re-populate as the VCU re-discovers connected VAPs.

9.5.2   Upgrading the VCU SW

To Upgrade the VCU SW Version:

1. Upload the VCU upgrade files from your storage location (i.e. computer) to the VCU as follows:

   · Click the **Management** menu tab and then select the **Firmware** sub-menu option found on the left side.

Firmware Sub- tab   Management Tab

   · In the **Load New Firmware** display area, click the **Browse** button.
   · Select the file to be loaded from your computer location. The Download button appears and the progress bar will show the download status.
   · After the download is complete the downloaded SW version will appear in the Standby Bank column of the VCU display area.

2. Define the downloaded version as the Active version (to be used for upgrade) as follows:

   · (In the VCU display area), click **Swap.** The downloaded version appears in the Active Bank column and the Controller is automatically restarted.
   · The VCU Upgrade procedure is complete.

10 Troubleshooting

10.1 Finding a Specific VAP in the Building

It is recommended to assign each VAP an identifiable name corresponding to its physical location, as explained in section 5.4. If a name was not configured, or for some other reason a specific VAP cannot be physically located, identify the VAP according to the instructions in the following example.

To locate a VAP

1. Select the **Config** tab from the main menu bar and then select the VAP to be located from the topology tree.

2. Click the **Module Info** sub-tab.
3. Set **Identify** to **ON**. The Activity LED (Blue) on the corresponding Access Pod will start blinking fast. (You will need to physically locate the VAP to see the blinking LED).

Blue LED
(Activity)

Green LED
(PWR)
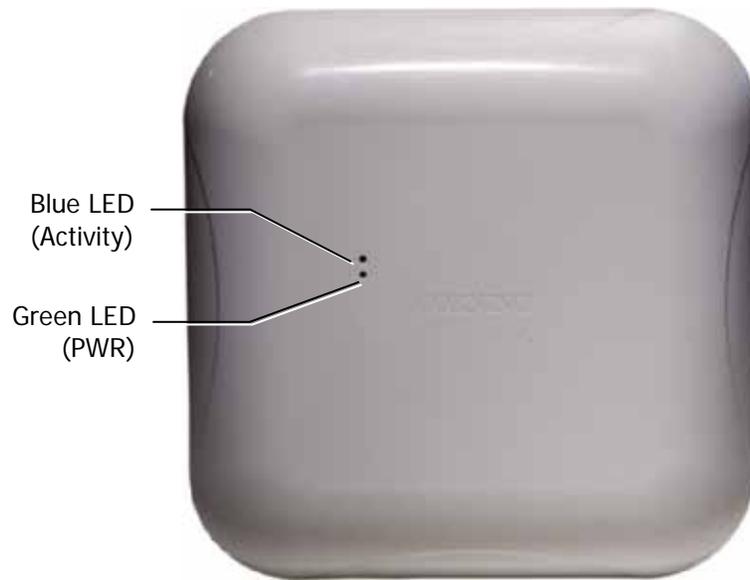
Figure 10-1: VAP LEDs-Front Cover

4. Locate the Access Pod.
5. It is advisable to assign it an identifiable name via the Access Pod **Module Info** tab, as described in section 5.4 (e.g. floor 3, room 2) and set the **Identify** field to **Off** again.

10.2   Wireless Service is Not Available

1. Verify that the Master VCU is connected to the BTS, powered up, and configured.
2. Verify that the Max Expected Power setting is correct by either:
    A) Viewing the actual VCU Power Measurement (**DL Pin**) in the relevant VCU **Service RF** sub-tab (See below).

Config tab

Service Pin
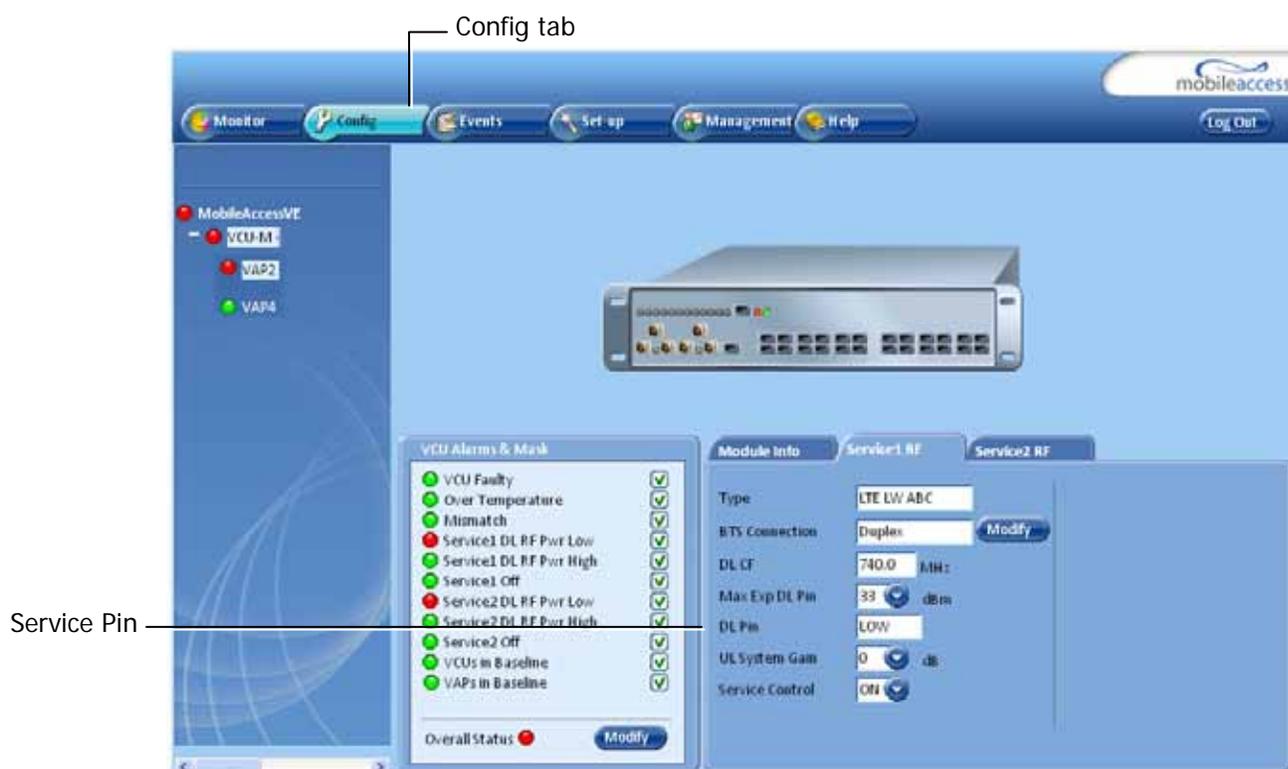
B) or by measuring the actual BTS output using a Spectrum Analyzer.
3. Verify correct settings of center frequency and system gain (See **DL CF** and **UL System Gain** parameters in RF Parameters sub-tab – see example displayed above).
4. Verify that the RF cables are properly connected to the VCU.
5. View the VCU **Alarms** (above image) and verify that the VCU is working properly.

10.3   PoE is Not Working

Verify that the PoE used is "alternative a". The MobileAccessVE system currently only supports this alternative. Verify that all pairs are wired in the patch panels and jumper cords.

Note: Future enhancements will support "alternative b". Consult MobileAccess if you currently require support for "alternative b."

10.4   Ethernet Service is Degraded

Ethernet standards specify that 100m (300ft) is the maximum distance between an Ethernet switch and appliance (computer, WLAN AP, etc). This is relevant when MobileAccess**VE** shares the IT LAN. The distance includes all patch cords (from switch to VCU, from VCU to patch panel, from RJ-45 outlet to VAP, and from VAP to appliance).

1. Review the IT documentation, which may be available from your IT department, to determine cable types and lengths.
2. Check the lengths of the patch cords being used and verify the end-to-end distance does not exceed 100m (300ft).
3. A Fluke cable tester can be used to measure cable length.

10.5   No Service from Connected Access Pod

This requires physically accessing the Access Pod to check the LEDs, and accessing the Access Pod through the Web GUI to verify the Access Pod configuration.

1. Physically view the Access Pod and confirm that both LEDs on the Access Pod are lit:
    · Power LED (Green) is OFF – either no connectivity to the VCU or the VAP is faulty. Try replacing the VAP. Try connecting the VAP directly to the VCU – if the Power LED is lit check the cable and the patch cords.
    · Activity LED is constantly blinking – the Access Pod cannot initialize due to exceeded cable length. Try using the closest free RJ-45 jack fed with a different cable.

ACT LED

PWR LED
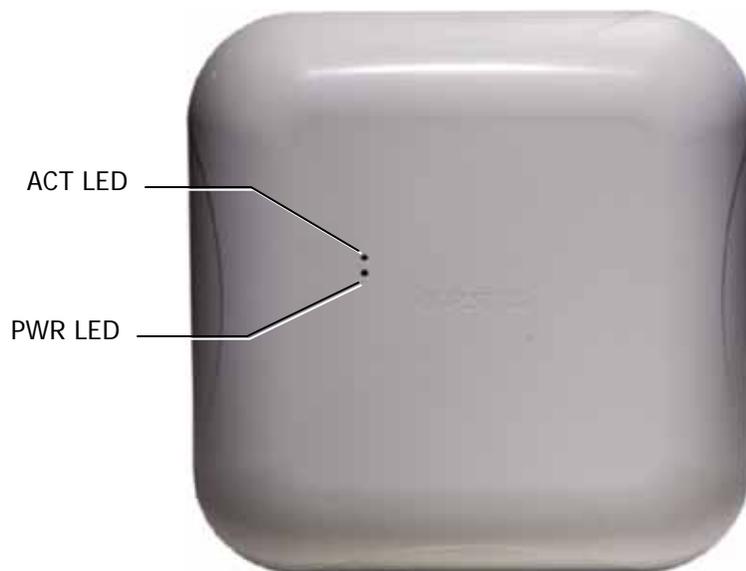
Figure 10-2: VAP LEDs

2. Check other Access Pods connected to the same VCU.
3. Verify that the VAP configuration as follows:
    · Connect to the VCU using the MobileAccess**VE** Web GUI application (See 6.1).
    · In the VCU **Config** tab, click the **RF Parameters** sub-tab and verify that the **Service Mode** parameter is set (MIMO/SISO).

Config tab

Service Mode (MIMO/SISO)
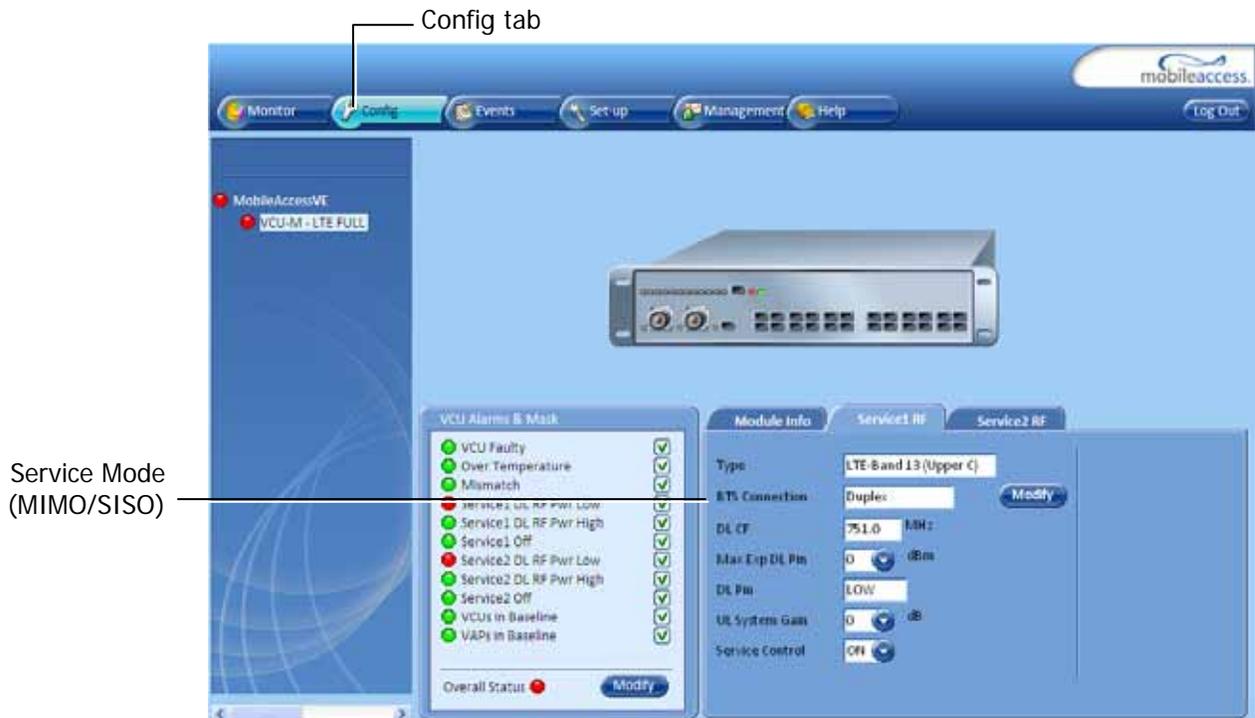
- Select the VAP from the topology tree and click the **RF Parameters** sub-tab.

Selected VAP

Service RF tab

- Confirm that the VCU port is functioning (VAP status LED - top LED in VAP icon associated with this Pod is green).

Note: The *Activity* LED on the actual VAP is BLUE.

- Verify the VAP was NOT configured by mistake to use the *internal* antennas (See **Channel 1/ Channel 2 Antenna** parameter in RF Parameters sub-tab, shown in previous figure).

10.6   VCU Cannot be monitored via SNMP

VE traps are not received by the external Fault Monitoring system.

1. Verify that the VCU is powered ON.
2. Verify that the SNMP traps destination address is configured correctly.
3. Verify the IP connectivity to the Fault Monitoring server using "ping."
4. Verify that SNMP port is not blocked or fire-walled in the IP network.
5. Initiate an Alarm and confirm the trap is received by external Fault Monitoring server. For example:

    · Access the VAP Service RF sub-tab (See section 8.3).
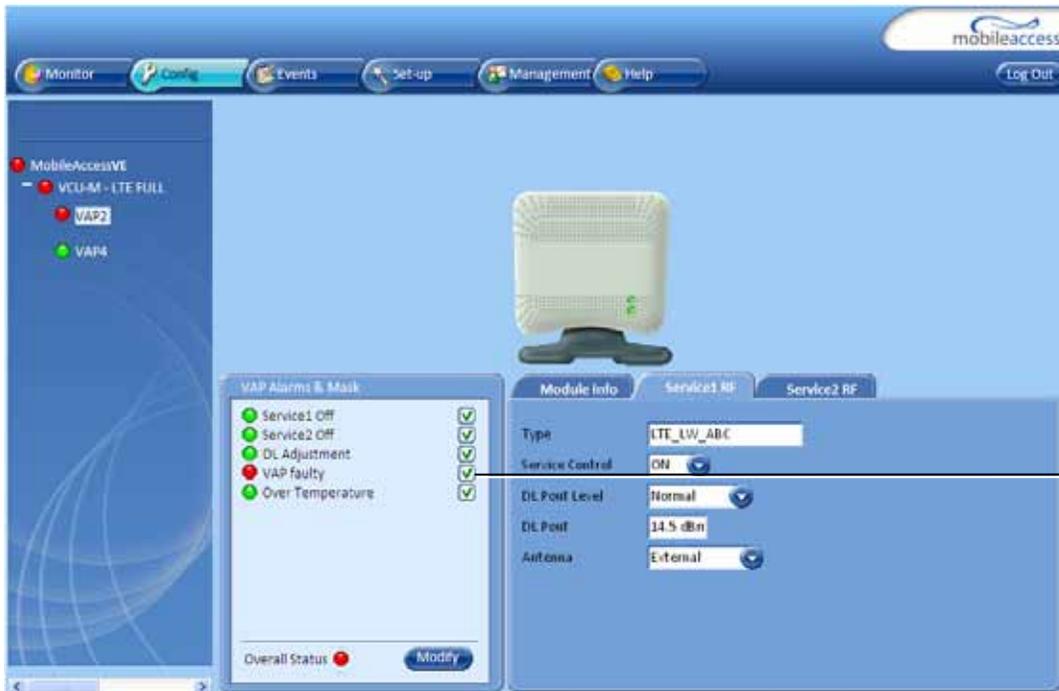
Unmasked **VAP Faulty** alarm

    · Verify that the alarm is unmasked.
    · Set the **Service Control** parameter to **Off**.
    · Confirm the trap is received by external Fault Monitoring server.

Appendix A - Traps

This section lists the MobileAccessVE LTE Controller and Access Pod Traps.

VE Control Unit (VCU) Traps

No	Trap Name	Trap Description
1	vcuChannel_1_DLPowerLow	Input RF power is 15dB lower than max expected power or no power
2	vcuChannel_1_DLPowerHigh	Input RF power is above the max expected Pin
3	vcuChannel_1_ServiceOff	Service is off
4	vcuChannel_2_DLPowerLow	Input RF power is 15dB lower than max expected power or no power
5	vcuChannel_2_DLPowerHigh	Input RF power is above the max expected Pin
6	vcuChannel_2_ServiceOff	Service is off
7	vcuFaulty	VCU HW is faulty
8	vcuOverTemperature	Temperature is above threshold
9	vcuAdjustment	Adjustment has failed or cable too long
10	vcuMismatchType	VCU service is different than VAP services
11	vcusInBaseline	At least 1 Slave VCU is missing in the VCU Baseline

VE Access Pod (VAP) Traps

No	Trap Name	Trap Description
1	vapAdjustment	VAP adjustment has failed or cable too long
2	vapFaulty	VAP HW is faulty
3	vapOverTemperature	temperature is above threshold
4	vapChannel1ServiceOff	VAP supporting Channel 1 is off
5	vapChannel2ServiceOff	VAP supporting Channel 2 is off
6	vapsInBaseline	At least 1 VAP is missing in the VCU Baseline

Appendix B – MobileAccess VE MIB Tree Structure (Version 1.8)

The following MIB is used for managing the MobileAccess VE VCU and VAPs across the network infrastructure. This MIB Structure and OIDs are specifically related to MIB Release 1.8 with the expectation that New OIDs will be added with the release of future Firmware Versions.

MIB Tree Structure is on the following pages.

MIB tree

- mgmt
- experimental
- private
  - enterprises
    - mobileAccess
      - maVE
        - maVEVCU
          - maVEVCUTable
            - maVEVCUEntry
              - vcuLocationLevelIndex1
              - vcuName
              - vcuSerialNumber
              - vcuProductRevision
              - vcuSWVersionActive
              - vcuSWVersionInactive
              - vcuReset
              - vcuIdentify
              - vcuChannel1ServiceType
              - vcuChannel1DLCF
              - vcuChannel1ULCF
              - vcuChannel1MaxExpectedPin
              - vcuChannel1ActualPin
              - vcuChannel1ULSystemGain
              - vcuChannel1ServiceControl
              - vcuChannel2ServiceType
              - vcuChannel2DLCF
              - vcuChannel2ULCF
              - vcuChannel2MaxExpectedPin
              - vcuChannel2ActualPin
              - vcuChannel2ULSystemGain
              - vcuChannel2ServiceControl
              - vcuServiceMode
              - vcuAlarms
              - vcuAlarmMask
              - vcuOverallStatus
              - vcuMACaddress
              - vcuIPAddress
              - vcuSubnetMask
              - vcuDefaultGateway
              - vcuTrapDestinationIP1
              - vcuTrapDestinationIP2
              - vcuTrapDestinationIP3
              - vcuUplinkCableCompensation
              - vcuChannel1BTSConnect
              - vcuChannel2BTSConnect
              - vcuLteProductSubType
              - vcuLteBroadcastAntenna
        - maVEVAP
        - maVEEvents
  - snmpV2

MobileAccess Version 1.13 MIBs/OID Descriptions

Module	Node Name	OID String	Description
MaVE-MIB	enterprises	.1.3.6.1.4.1	Enterprise
MaVE-MIB	mobileAccess	.1.3.6.1.4.1.15921	MobileAccess
MaVE-MIB	maVE	.1.3.6.1.4.1.15921.11	MobileAccess VE
MaVE-MIB	maVEVCU	.1.3.6.1.4.1.15921.11.1	MobileAccess VE VCU
MaVE-MIB	maVEVCUTable	.1.3.6.1.4.1.15921.11.1.1	VCU Table
MaVE-MIB	maVEVCUEntry	.1.3.6.1.4.1.15921.11.1.1.1	VCU Table Entries
MaVE-MIB	vcuLocationLevelIndex1	.1.3.6.1.4.1.15921.11.1.1.1.1	1 for Master VCU and 2 to 13 are the Slave VCUs
MaVE-MIB	vcuName	.1.3.6.1.4.1.15921.11.1.1.1.2	MA VCU NAME
MaVE-MIB	vcuSerialNumber	.1.3.6.1.4.1.15921.11.1.1.1.3	MA VCU Serial Number
MaVE-MIB	vcuProductRevision	.1.3.6.1.4.1.15921.11.1.1.1.4	MA VCU Product revision
MaVE-MIB	vcuSWVersionActive	.1.3.6.1.4.1.15921.11.1.1.1.5	MA VCU Active Software Version
MaVE-MIB	vcuSWVersionInactive	.1.3.6.1.4.1.15921.11.1.1.1.6	MA VCU Inactive Software Version
MaVE-MIB	vcuReset	.1.3.6.1.4.1.15921.11.1.1.1.7	MA VCU RESET
MaVE-MIB	vcuIdentify	.1.3.6.1.4.1.15921.11.1.1.1.8	MA VCU Indetify
MaVE-MIB	vcuChannel1ServiceType	.1.3.6.1.4.1.15921.11.1.1.1.9	MA VCU Service Type
MaVE-MIB	vcuChannel1DLCF	.1.3.6.1.4.1.15921.11.1.1.1.10	MA VCU First channel DL CF in 100Khz
MaVE-MIB	vcuChannel1ULCF	.1.3.6.1.4.1.15921.11.1.1.1.11	MA VCU First channel UL CF in 100Khz
MaVE-MIB	vcuChannel1MaxExpectedPin	.1.3.6.1.4.1.15921.11.1.1.1.12	MA VCU First channel Max Expected Input Power - in dBm ;when vcuChannel1ServiceType >50(In WiMAX/PHS)the value is (dBm value + 100))

Module	Node Name	OID String	Description
MaVE-MIB	vcuChannel1ActualPin	.1.3.6.1.4.1.15921.11.1.1.1.13	MA VCU First channel Actual Input Power In - in 0.1 dBm means: (when vcuChannel1ServiceType <50 the value is (dBm value *10) ; when vcuChannel1ServiceType >50(In WiMAX/PHS) the value is (dBm value + 100)*10
MaVE-MIB	vcuChannel1ULSystemGain	.1.3.6.1.4.1.15921.11.1.1.1.14	MA VCU First channel UL System Gain
MaVE-MIB	vcuChannel1ServiceControl	.1.3.6.1.4.1.15921.11.1.1.1.15	MA VCU First channel Service control (N/A in MIMO/SISO services)
MaVE-MIB	vcuChannel2ServiceType	.1.3.6.1.4.1.15921.11.1.1.1.16	MA VCU Service Type
MaVE-MIB	vcuChannel2DLCF	.1.3.6.1.4.1.15921.11.1.1.1.17	MA VCU Second channel DL CF in 100Khz (in MIMO refer to relevant leaf at channel 1)
MaVE-MIB	vcuChannel2ULCF	.1.3.6.1.4.1.15921.11.1.1.1.18	MA VCU Second channel UL CF in 100Khz (in MIMO refer to relevant leaf at channel 1)
MaVE-MIB	vcuChannel2MaxExpectedPin	.1.3.6.1.4.1.15921.11.1.1.1.19	MA VCU Second channel Max Expected Input Power - in dBm (in MIMO refer to relevant leaf at channel 1)
MaVE-MIB	vcuChannel2ActualPin	.1.3.6.1.4.1.15921.11.1.1.1.20	MA VCU Second channel Actual Input Power - in 0.1 dBm means: (when vcuChannel2ServiceType <50 the value is (dBm value *10) ; when vcuChannel2ServiceType >50 the value is (dBm value + 100)*10
MaVE-MIB	vcuChannel2ULSystemGain	.1.3.6.1.4.1.15921.11.1.1.1.21	MA VCU Second channel UL System Gain (in MIMO refer to relevant leaf at channel 1)
MaVE-MIB	vcuChannel2ServiceControl	.1.3.6.1.4.1.15921.11.1.1.1.22	MA VCU Second channel Service control (N/A in MIMO/SISO services)
MaVE-MIB	vcuServiceMode	.1.3.6.1.4.1.15921.11.1.1.1.23	MA VCU Service mode ; set is relevant for values of MIMO/SISO/OFF
MaVE-MIB	vcuAlarms	.1.3.6.1.4.1.15921.11.1.1.1.24	MA VCU Alarms; Bits are as follow: vcuChannel1ServiceType <50: 1 - VCU Faulty; 2 - Over Temperature; 4 - Type Mismatch; 8 - Channel1 RF DL low; 16 - Channel1 RF DL High; 32 - Channel1 RF Off; 64 - Channel2 RF DL low; 128 - Channel2 RF DL High; 256 - Channel2 Off ; vcuChannel1ServiceType >50: 1 - VCU Faulty; 2 - Over Temperature; 4 - Type Mismatch; 8 - service Off; 16 - Channel1 RF DL low; 32 - Channel1 RF DL High; ; 64 - Channel2 RF DL low; 128 - Channel2 RF DL High; 256 - Channel2 Off

Module	Node Name	OID String	Description
MaVE-MIB	vcuAlarmMask	.1.3.6.1.4.1.15921.11.1.1.1.25	MA VCU Alarm Mask; Bits refer to alarms bits described above
MaVE-MIB	vcuOverallStatus	.1.3.6.1.4.1.15921.11.1.1.1.26	MA VCU Overall Status
MaVE-MIB	vcuMACaddress	.1.3.6.1.4.1.15921.11.1.1.1.27	MA VCU MAC Address
MaVE-MIB	vcuIPAddress	.1.3.6.1.4.1.15921.11.1.1.1.28	MA VCU IP Address
MaVE-MIB	vcuSubnetMask	.1.3.6.1.4.1.15921.11.1.1.1.29	MA VCU Subnet Mask
MaVE-MIB	vcuDefaultGateway	.1.3.6.1.4.1.15921.11.1.1.1.30	MA VCU Default Gateway
MaVE-MIB	vcuTrapDestinationIP1	.1.3.6.1.4.1.15921.11.1.1.1.31	MA VCU Trap Destination Ip address 1
MaVE-MIB	vcuTrapDestinationIP2	.1.3.6.1.4.1.15921.11.1.1.1.32	MA VCU Trap Destination Ip address 2
MaVE-MIB	vcuTrapDestinationIP3	.1.3.6.1.4.1.15921.11.1.1.1.33	MA VCU Trap Destination Ip address 3
MaVE-MIB	vcuUplinkCableCompensation	.1.3.6.1.4.1.15921.11.1.1.1.34	MA VCU UplinkCableCompensation
MaVE-MIB	vcuChannel1BTSConnect	.1.3.6.1.4.1.15921.11.1.1.1.35	MA VCU Service 1 BTS Connection
MaVE-MIB	vcuChannel2BTSConnect	.1.3.6.1.4.1.15921.11.1.1.1.36	MA VCU Service 2 BTS Connection
MaVE-MIB	vcuLteProductSubType	.1.3.6.1.4.1.15921.11.1.1.1.37	MA VCU LTE Product SubType , writable only for LTE products
MaVE-MIB	vcuLteBroadcastAntenna	.1.3.6.1.4.1.15921.11.1.1.1.38	MA VCU LTE Broadcast Antenna Type , writable only for LTE products
MaVE-MIB	maVEVAP	.1.3.6.1.4.1.15921.11.2	MobileAccess VE VAP
MaVE-MIB	maVEVAPTable	.1.3.6.1.4.1.15921.11.2.1	VAP Table
MaVE-MIB	maVEVAPEntry	.1.3.6.1.4.1.15921.11.2.1.1	VAP Table Entries
MaVE-MIB	vapLocationLevelIndex1	.1.3.6.1.4.1.15921.11.2.1.1.1	1 to 12 the VAP port itself (single tier), or 2 to 13 for the Slave VCU port index
MaVE-MIB	vapLocationLevelIndex2	.1.3.6.1.4.1.15921.11.2.1.1.2	1 to 12 - for the VAP port index
MaVE-MIB	vapName	.1.3.6.1.4.1.15921.11.2.1.1.3	MA VAP NAME

Module	Node Name	OID String	Description
MaVE-MIB	vapSerialNumber	.1.3.6.1.4.1.15921.11.2.1.1.4	MA VAP Serial Number
MaVE-MIB	vapProductRevision	.1.3.6.1.4.1.15921.11.2.1.1.5	MA VAP Product revision
MaVE-MIB	vapSWVersionActive	.1.3.6.1.4.1.15921.11.2.1.1.6	MA VAP Active Software Version
MaVE-MIB	vapSWVersionInactive	.1.3.6.1.4.1.15921.11.2.1.1.7	MA VAP Inactive Software Version
MaVE-MIB	vapReset	.1.3.6.1.4.1.15921.11.2.1.1.8	MA VAP RESET
MaVE-MIB	vapIdentify	.1.3.6.1.4.1.15921.11.2.1.1.9	MA VAP Indetify
MaVE-MIB	vapChannel1ServiceType	.1.3.6.1.4.1.15921.11.2.1.1.10	MA VAP Service Type
MaVE-MIB	vapChannel1ServiceControl	.1.3.6.1.4.1.15921.11.2.1.1.11	MA VAP First channel Service control (N/A in WiMAX)
MaVE-MIB	vapChannel1DLPoutLevel	.1.3.6.1.4.1.15921.11.2.1.1.12	MA VAP first channel DL output attenuation Level
MaVE-MIB	vapChannel1DLPoutActual	.1.3.6.1.4.1.15921.11.2.1.1.13	MA VAP First channel DL Actual Output Power - in 0.1 dBm means: (when vapChannel1ServiceType <50 the value is (dBm value *10) ; when vapChannel1ServiceType >50 the value is (dBm value + 100)*10
MaVE-MIB	vapChannel1AntennaType	.1.3.6.1.4.1.15921.11.2.1.1.14	MA VAP First channel Antenna Type internal - external
MaVE-MIB	vapChannel2ServiceType	.1.3.6.1.4.1.15921.11.2.1.1.15	MA VAP Service Type
MaVE-MIB	vapChannel2ServiceControl	.1.3.6.1.4.1.15921.11.2.1.1.16	MA VAP Second Band Service control(N/A in MIMO/SISO)
MaVE-MIB	vapChannel2DLPoutLevel	.1.3.6.1.4.1.15921.11.2.1.1.17	MA VAP Second channel DL output attenuation Level
MaVE-MIB	vapChannel2DLPoutActual	.1.3.6.1.4.1.15921.11.2.1.1.18	MA VAP Second channel DL Actual Output Power - in 0.1 dBm means: (when vapChannel2ServiceType <50 the value is (dBm value *10) ; when vapChannel2ServiceType>50 the value is (dBm value + 100)*10
MaVE-MIB	vapChannel2AntennaType	.1.3.6.1.4.1.15921.11.2.1.1.19	MA VAP Second channel Antenna Type internal - external
MaVE-MIB	vapAlarms	.1.3.6.1.4.1.15921.11.2.1.1.20	MA VAP Alarms; Bits are as follow: For non SISO/MIMO services: 1 - Channel1 Off ; 2 - Channel2 Off ; 4- DL Adjustment

Module	Node Name	OID String	Description
			; 8 - VAP Faulty ; 16 - Over Temperature when SISO/MIMO services: 1 - DL Adjustment ; 2 - Over Temperature; 4 - VAP Faulty
MaVE-MIB	vapAlarmMask	.1.3.6.1.4.1.15921.11.2.1.1.21	MA VAP Alarm Mask
MaVE-MIB	vapOverallStatus	.1.3.6.1.4.1.15921.11.2.1.1.22	MA VAP Overall Status
MaVE-MIB	maVEEvents	.1.3.6.1.4.1.15921.11.9	MobileAccess VE Events
MaVE-MIB	maVEEventsParams	.1.3.6.1.4.1.15921.11.9.1	MobileAccess VE Events Parameters
MaVE-MIB	maVETrapDeviceType	.1.3.6.1.4.1.15921.11.9.1.1	Device Type
MaVE-MIB	maVETrapDeviceSerial	.1.3.6.1.4.1.15921.11.9.1.2	Serial Number
MaVE-MIB	maVETrapDeviceName	.1.3.6.1.4.1.15921.11.9.1.3	Name of the Trap
MaVE-MIB	maVETrapDeviceIndex	.1.3.6.1.4.1.15921.11.9.1.4	Master VCU port
MaVE-MIB	maVETrapDevicePortIndex	.1.3.6.1.4.1.15921.11.9.1.5	the unit itself or Slave VCU port
MaVE-	maVETrapEventText	.1.3.6.1.4.1.15921.11.9.1.6	Event description
MaVE-	maVETrapSeverity	.1.3.6.1.4.1.15921.11.9.1.7	Trap Severity
MaVE-MIB	maVENotify	.1.3.6.1.4.1.15921.11.9.2	MobileAccess VE Notify
MaVE-MIB	maVETraps	.1.3.6.1.4.1.15921.11.9.2.0	MobileAccess VE Traps
MaVE-MIB	vcuChannel1DLPowerLow	.1.3.6.1.4.1.15921.11.9.2.0.1	The input RF power is 15 dB lower than max expected power (or no signal)
MaVE-	vcuChannel1DLPowerHigh	.1.3.6.1.4.1.15921.11.9.2.0.2	when input RF power is above the defined max expected power
MaVE-	vcuChannel2DLPowerLow	.1.3.6.1.4.1.15921.11.9.2.0.3	when input RF power is 15 dB lower than max expected power (or no

Module	Node Name	OID String	Description
			signal)
MaVE-	vcuChannel2DLPowerHigh	.1.3.6.1.4.1.15921.11.9.2.0.4	when input RF power is above the defined max expected power
MaVE-	vcuChannel1ServiceOff	.1.3.6.1.4.1.15921.11.9.2.0.5	when service is off
MaVE-	vcuChannel2ServiceOff	.1.3.6.1.4.1.15921.11.9.2.0.6	when service is off
MaVE-	vcuFaulty	.1.3.6.1.4.1.15921.11.9.2.0.7	when VCU HW is faulty
MaVE-	vcuOverTemperature	.1.3.6.1.4.1.15921.11.9.2.0.8	when VCU temperature is above threshold
MaVE-	vcuMismatchType	.1.3.6.1.4.1.15921.11.9.2.0.9	When VCU services types is different than VAP services types
MaVE-	vcuAdjustment	.1.3.6.1.4.1.15921.11.9.2.0.10	when VCU adjustment has failed (or cable too long)
MaVE-	vapAdjustment	.1.3.6.1.4.1.15921.11.9.2.0.11	when VAP adjustment has failed (or cable too long)
MaVE-	vapChannel1ServiceOff	.1.3.6.1.4.1.15921.11.9.2.0.12	when VAP service is off
MaVE-	vapChannel2ServiceOff	.1.3.6.1.4.1.15921.11.9.2.0.13	when VAP service is off
MaVE-	vapFaulty	.1.3.6.1.4.1.15921.11.9.2.0.14	when VAP HW is faulty

Module	Node Name	OID String	Description
MaVE-	vapOverTemperature	.1.3.6.1.4.1.15921.11.9.2.0.15	when VAP temperature is above threshold
MaVE-MIB	vcuHeartbeat	.1.3.6.1.4.1.15921.11.9.2.0.16	system keep alive notification
MaVE-MIB	vcuConnected	.1.3.6.1.4.1.15921.11.9.2.0.17	VCU connected
MaVE-MIB	vcuDisconnected	.1.3.6.1.4.1.15921.11.9.2.0.18	VCU disconnected
MaVE-MIB	vapConnected	.1.3.6.1.4.1.15921.11.9.2.0.19	VAP connected
MaVE-MIB	vapDisconnected	.1.3.6.1.4.1.15921.11.9.2.0.20	VAP disconnected
MaVE-MIB	vcusInBaseline	.1.3.6.1.4.1.15921.11.9.2.0.21	At least one VCU-Slave is missing in the VCU Baseline
MaVE-MIB	vapsInBaseline	.1.3.6.1.4.1.15921.11.9.2.0.22	At least one VAP is missing in the VCU Baseline