

Case Study Report:

Exploring Field Test Mode on Android Phones

Objective:

This case study aims to explore and understand the key networking information available on smartphones by using the Field Test Mode. As a student using an Android phone, I followed the guidelines to gather technical details about my phone's network settings and performance.

1. Device Information:

Device Type: Samsung S23+

Operating System: Android OS

2. Key Networks and their Equipment Identity

IMEI :

- **Unique Identifier:** The IMEI number is a 15-digit unique identifier for mobile devices. It helps distinguish each mobile device on a network and is crucial for tracking and verifying a specific device, especially in cases of theft or loss. Each IMEI is unique to the device it's assigned to, ensuring no two devices share the same IMEI.
- **Network and Security Role:** Mobile carriers use the IMEI number to control access to their network. It is crucial for identifying blacklisted or unauthorized devices. If a phone is reported stolen, the IMEI can be blocked, preventing it from accessing the network and reducing the risk of misuse.

MAC Address:

1. **Unique Identifier:** A MAC (Media Access Control) address is a unique identifier assigned to a network interface card (NIC) for communication on a network. It is a 48-bit number typically represented in hexadecimal format (e.g., 00:1A:2B:3C:4D:5E). Every device that connects to a network, such as a computer, smartphone, or router, has its own MAC address, ensuring devices can be uniquely identified on a network.
2. **Layer 2 Addressing:** The MAC address operates at Layer 2 (the Data Link Layer) of the OSI model. It is used for local communication within a network segment, such as within a LAN (Local Area Network). MAC addresses enable devices to communicate on the same network without the need for IP addresses, which operate at Layer 3 (Network Layer).

IP :

- **Unique Identifier for Devices on a Network:** An IP (Internet Protocol) address is a unique string of numbers assigned to each device (like a computer, smartphone, or server) connected to a network. This allows devices to communicate with each other over the internet or local networks by identifying the sending and receiving devices.
- **Types of IP Addresses:** There are two main versions of IP addresses: IPv4 and IPv6.
- **IPv4** consists of four sets of numbers (e.g., 192.168.1.1) and is the most common version, though it's being gradually replaced by IPv6 due to a shortage of available IPv4 addresses.
- **IPv6** uses a much larger address space, represented by eight groups of hexadecimal digits (e.g., 2001:0db8:85a3:0000:0000:8a2e:0370:7334), allowing for many more unique addresses.

NETWORK OPERATOR:

- **Service Provider:** A network operator is responsible for providing telecommunication services, such as voice, data, and internet access, to customers. They manage the infrastructure required for network connectivity, ensuring smooth communication between devices and networks.
- **Network Management:** Network operators monitor and maintain the performance, security, and reliability of their networks. This includes optimizing traffic flow, managing bandwidth, and ensuring that the network meets quality standards for users.

1. Network Type

Cellular Networks: Mobile devices use different types of cellular networks, such as 3G, 4G, and 5G, each offering different data speeds and capacities. 5G, for instance, provides ultra-fast speeds and low latency compared to 4G.

Wi-Fi Networks: Wi-Fi provides a wireless connection to the internet over local networks. The strength and speed of the Wi-Fi connection depend on the router's capacity, interference, and distance from the device.

2. Signal Strength

RSSI (Received Signal Strength Indicator): Measured in dBm (decibel-milliwatts), this is a key metric indicating how strong the signal is between a mobile device and the network. The higher (less negative), the stronger the signal (e.g., -50 dBm is excellent, -100 dBm is poor).

SINR (Signal-to-Interference-plus-Noise Ratio): This measures the quality of the signal, taking into account interference. Higher SINR values indicate better signal quality, improving connection stability and speed.

3. Download/Upload Bandwidth

Download Bandwidth: This refers to the speed at which data is transferred from the internet to the device. Higher download speeds are essential for activities like streaming and browsing.

Upload Bandwidth: This refers to the speed at which data is sent from the device to the internet. It's particularly important for tasks such as video conferencing and uploading large files.

4. Mobile Location Information

GPS (Global Positioning System): Mobile devices use GPS satellites to determine their precise location. This method provides accurate location data but may drain the battery faster.

Cell Tower Triangulation: In the absence of GPS, mobile location can be estimated by triangulating signals from nearby cell towers, though this method is less accurate than GPS.

3. Steps to Access Field Test Mode:

1. Accessing Field Test Mode on Android:

- o Open the phone dialer and enter *##*#4636#*##* to access the testing menu.
- o Navigate to Phone Information and Wi-Fi Information for relevant network details.
- o Took screenshots of important details like IMEI, signal strength, and network type.

2. Details Collected:

- o IMEI, MAC address, IP address, network type (5G LTE), signal strength, and operator information.
- o Signal strength recorded at -95 dBm, network type 5G LTE, network operator is Jio Telecom.

MAC Address (Media Access Control Address):

MAC Address: 5c:a0:6c:2d:51:45

IP Address (Internet Protocol Address):

IP Address: 2409:40f4:305a:7841:8000::

Network Operator/Brand (Cellular Provider):

Operator: Jio True5G Network Type (4G LTE, 5G, etc.)

Network Type: NR_SA (5G Standalone)

Signal Strength (Measured in dBm):

Signal Strength: -92 dBm

Download/Upload Bandwidth (Physical Channel Configuration and Speed):

DL Bandwidth (kbps): 35,975

UL Bandwidth (kbps): 35,975

Phone info



Select phone index

Phone 0



IMEI: (REDACTED)

Phone Number: 916374470729 { CARRIER:
UICC:916374470729, IMS:
+916374470729 }

Current subId: 1

SubId of default data SIM: 1

IMSI: 405869088161660

Current Network: Jio True5G

Roaming: Not Roaming

Data Service: Disconnected

Data Network Type: NR_SA

Data Raw Registration State: HOME

Override Network Type: NONE

Voice Service: In Service

Voice Network Type: NR_SA

Voice Raw Registration State: HOME

WLAN Data Raw Registration State: NOT_REG_OR_SEAR
HING

Signal Strength: -100 dBm 40 asu

DL Bandwidth (kbps): 0

UL Bandwidth (kbps): 0

EN-DC Available (NSA): false

DCNR Restricted (NSA): false

NR Available (NSA): false

NR State (NSA): NONE

NR Frequency: UNKNOWN

Network Slicing Config: Unable to get slicing config.

Set Preferred Network Type:

NR/LTE/GSM/WCDMA



Mobile Radio Power



VoLTE Provisioned



Video Calling Provisioned



Wifi Calling Provisioned



5. Conclusion:

By accessing Field Test Mode on my Android phone, I was able to gather critical networking details. This process enhances my understanding of mobile network performance, and the significance of parameters like IMEI, signal strength, and network type in ensuring seamless communication.

The network performance on my device was satisfactory, with moderate signal strength and a stable 5G LTE connection. These findings emphasize the importance of understanding network diagnostics to optimize device performance.

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