GSMA TAC Allocation and IMEI Programming Rules for Device Brand Owners and Manufacturers

Training Guide
February 2018 v1.0
Introduction

About this document
This is a practical training guide to help understand TAC allocations and IMEI production as specified in GSMA TS.06 IMEI Allocation and Approval Process and TS.30 TAC IMEI Application Forms which can be found on the GSMA IMEI db homepage, together with the GSMA IMEI Security Technical Design Principles document.

Who should read this document?
This document has been compiled for device brand owners and their associates who are required to program a unique IMEI in each mobile device they produce.

About GSMA
The GSMA is the global industry administrator of the TAC and IMEI allocation system, essential to the correct functioning of 3GPP devices and the mobile ecosystem.

If you have any questions or feel a topic is not covered please contact:
imeihelpdesk@gsma.com
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Rules at a Glance

**TAC (Type Allocation Code)**

- **TAC identifies** the device model, brand owner and OEM
- **A TAC is allocated** to a specific device model and brand owner
- **Only one device model** may be allocated to a TAC
- **A new TAC** is required for each unique device model
- **TAC** is the first 8 digits of an IMEI
- **One million** devices or units / IMEI per TAC
- **After one million** units allocate a new TAC
- **Only use GSMA allocated TAC**

**TAC Applications**

- **GSMA allocates** TAC via appointed Reporting Bodies
- **Reporting Bodies** are TÜV SÜD BABT, CTIA, MSAI, TAF and TIA
- **Device brand owners** apply for TAC, even if outsourcing manufacture
- **Modem producers** apply for TAC not the end device brand owner
- **Brand owner HQ** location determines which Reporting Body is used
- **Co-branding**: The brand responsible for sales applies for TAC
- **Brand licencing**: The licensee applies for TAC

**IMEI (International Mobile Equipment Identity)**

- **3GPP devices must contain an IMEI**
- **IMEI identifies** individual unit and device model, brand owner, & OEM
- **Every IMEI** must be globally unique
- **IMEI implantation** shall be **secure and tamperproof**
- **The first 8 digits** of the IMEI are the TAC
- **Incremental IMEI serial number** for each device unit produced
- **Multi-SIM** devices with one transceiver need one IMEI
- **Devices which are 3GPP and 3GPP2 compliant** require one IMEI
- **Multi-transceiver** devices require multiple IMEI
- **Do not duplicate IMEI**
- **Spare IMEI** capacity is prohibited for use in other models
- **Secure IMEI** implementation prevents the IMEI being changed
- **Repairs** involving replacing peripheral components do not impact IMEI
- **Repairs** that replace components that contain a securely stored IMEI result in a new IMEI
How are TAC / IMEI serial numbers used?

<table>
<thead>
<tr>
<th>Consumers</th>
<th>Operators</th>
<th>Law Enforcement</th>
<th>Insurers</th>
<th>Customs &amp; Excise</th>
<th>IoT Service Providers</th>
<th>Manufacturers &amp; OS providers</th>
<th>Government &amp; regulators</th>
<th>Recyclers</th>
<th>Retailers &amp; traders</th>
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<tr>
<td>Support</td>
<td>Identification</td>
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<td>Fraud detection</td>
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Unique and accurate IMEI are **essential** for the mobile ecosystem
What is an IMEI?

Every device must have a unique IMEI number identifying brand owner & model. The Brand Owner must apply to the GSMA for the TAC code.

**Rule:**

Every device must have a unique IMEI number identifying brand owner & model.

The Brand Owner must apply to the GSMA for the TAC code.

<table>
<thead>
<tr>
<th>TAC: Type Allocation Code</th>
<th>Serial Number</th>
<th>Check Digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>86</td>
<td>916102</td>
<td>0</td>
</tr>
<tr>
<td>Reporting Body identifier</td>
<td>Unique Number assigned to individual devices by the manufacturer</td>
<td>A function of the other digits [calculated by the manufacturer]</td>
</tr>
<tr>
<td>Type Identifier Indicating brand owner and device model allocated by Reporting Body</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The 15 digit **TAC code** identifies the brand owner and model.
What devices need an IMEI?

- Mobile / Feature Phone
- Smartphone
- Tablet
- IoT Device
- Wearable
- Dongle
- Modem
- WLAN Router

All devices with a 3GPP transceiver require a unique, persistent and secure IMEI.
When outsourcing manufacture the **brand owner must be the named TAC holder**.

The brand owner is the TAC holder and the manufacturer is named as OEM on the TAC application form.

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**Process of applying for TAC**

1. **Brand owner** plans product
2. Select external design house if required
3. Select external manufacturer if required
4. **Brand owner** confirms device model specification
5. **Brand owner** applies for TAC for model
6. **Brand owner** provides TAC to manufacturer
7. **Manufacturer** produces device model and forms unique IMEI from the TAC

End products include unique IMEIs.
Who applies for TAC when IoT modems are installed in other equipment?

**Rule:** When modems are installed in other machines, the original modem producer applies for TAC.

- **Modem producer** applies for TAC
Who issues the TAC code?

**Rule:** GSMA appointed Reporting Bodies issue TAC codes. The HQ location of the brand owner determines which Reporting Body manages an application.

<table>
<thead>
<tr>
<th>Reporting Body identifier:</th>
<th>Coverage:</th>
<th>Reporting Body identifier:</th>
<th>Coverage:</th>
</tr>
</thead>
<tbody>
<tr>
<td>86</td>
<td>All device types</td>
<td>91</td>
<td>All device types</td>
</tr>
<tr>
<td>TAF</td>
<td>India</td>
<td>TIA</td>
<td>Rest of World</td>
</tr>
<tr>
<td>msaI</td>
<td>All device types</td>
<td>01</td>
<td>Optional source when applying for PTCRB certification</td>
</tr>
<tr>
<td>TUV PDO</td>
<td>Rest of World</td>
<td>CTIA</td>
<td>TIA</td>
</tr>
<tr>
<td>USA</td>
<td>35</td>
<td>USA</td>
<td>99</td>
</tr>
<tr>
<td>All device types</td>
<td>Specialist:</td>
<td>USA</td>
<td>01</td>
</tr>
<tr>
<td>All device types</td>
<td>CTIA</td>
<td>TIA</td>
<td>TIA</td>
</tr>
</tbody>
</table>

**Specialist:**
- USA
- CTIA

**Coverage:**
- TAF
- msaI
- TUV PDO
- USA
- CTIA
- TIA

**Global Decimal Administrator:**
- China
- India
- Rest of World

**Optional source:**
- Rest of World
- 3GPP / 3GPP2 multi-mode devices
How do you form an IMEI?

<table>
<thead>
<tr>
<th>TAC: Type Allocation Code</th>
<th>Serial Number</th>
<th>Check Digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 123451</td>
<td>000000</td>
<td>X</td>
</tr>
</tbody>
</table>

Use the TAC allocated to the model and increase the serial number for each unit produced.

Rule: The TAC identifies the device model. Only one model per TAC. Each device must have a unique IMEI.

Do not duplicate IMEI!
When do you need a new TAC for a device model?

The following are considered variations to a specification which **do require** a new TAC:

- **Brand owner**
- **External manufacturer**
- **Model Name**
- **Components**
  - Casing
  - Motherboard
  - Chipset
  - Number of cameras
- **Connectivity**
  - Transceiver capabilities
  - Frequency bands
- **Operating system**
  - e.g. Android, Tizen

The following are considered variations to a specification which **do not require** a new TAC:

- **Different version of same OS**
  - e.g. Android 7, Android 8
- **User interface differences**
- **Devices configurations**
  - subset of transceiver frequency bands
- **Minor variations**
  - Camera pixel count
  - Colour of device
  - Memory size
  - Minor components

A unique model **requires** a unique TAC.
TAC and multiple device models

Rule:
Each device model must be allocated a unique TAC.

Use a different TAC for each model

Do not use the same TAC for each model
A new TAC is required for every 1 million units produced.

<table>
<thead>
<tr>
<th>TAC: Type Allocation Code</th>
<th>Serial Number</th>
<th>Check Digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 123451</td>
<td>999999</td>
<td>X</td>
</tr>
</tbody>
</table>

**Model A**
- **000,000 to 999,999**
- **Over: 1,000,000**
- Use another TAC after 1 million units

**Rule:**
- Do not use the same TAC for the next million units.

**From:**
- 35 123451 000000 X
- 35 123451 999999 X

**To:**
- 35 123452 000000 X
- 35 123452 999999 X

**Model A**
- **000,000 to 999,999**
- **Over: 1,000,000**
- **Do not use the same TAC for the next million units**

**From:**
- 35 123451 000000 X
- 35 123451 999999 X

**To:**
- 35 123452 000000 X
- 35 123452 999999 X
**Unused TAC capacity**

<table>
<thead>
<tr>
<th>TAC: Type Allocation Code</th>
<th>Serial Number</th>
<th>Check Digit</th>
</tr>
</thead>
<tbody>
<tr>
<td>35 123451</td>
<td>999999</td>
<td>X</td>
</tr>
</tbody>
</table>

**Rule:**

- Unused capacity can only be used for future production of the same model.
- Do not use spare capacity for a different model.

**Model A**

- Unused TAC: 35 123451 000000 X
- Serial Number: 35 123451 000000 X

**Model B**

- Unused TAC: 35 123451 175000 X
- Serial Number: 35 123451 175000 X

Spare capacity in one TAC cannot be transferred to another device model.
Multiple SIM, UICC and eUICC

Single transceiver or single connection devices require one IMEI.

- Example: 4 SIMs with 1 transceiver requires only 1 IMEI

**Rule:**

When one network connection is present, only one IMEI is required.
Multiple transceivers

1 TAC / 2 IMEI

<table>
<thead>
<tr>
<th>1 TAC</th>
<th>Serial</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>86123451</td>
<td>000001</td>
<td>X</td>
</tr>
<tr>
<td>86123451</td>
<td>000002</td>
<td>X</td>
</tr>
</tbody>
</table>

Rule:
Each parallel connection requires a unique IMEI. Different separate transceivers require unique TACs.

Parallel connections

Multiple different transceivers

2 TAC / 2 IMEI

<table>
<thead>
<tr>
<th>2 TAC</th>
<th>Serial</th>
<th>Check</th>
</tr>
</thead>
<tbody>
<tr>
<td>86123451</td>
<td>000001</td>
<td>X</td>
</tr>
<tr>
<td>86123452</td>
<td>000001</td>
<td>X</td>
</tr>
</tbody>
</table>

One IMEI is required per parallel connection
Multiple Radio Access Technology

Rule:

Integrated 3GPP and 3GPP2 devices require only one IMEI.

1 TAC + 1 IMEI
Integrated 3GPP and 3GPP2 transceiver requires one IMEI

1 IMEI + 1 MEID
Separate parallel 3GPP and 3GPP2 transceivers require one IMEI and one MEID
How secure should an IMEI be?

Once implemented in a device the IMEI cannot be changed. The IMEI cannot be changed by a menu function.

Rule: IMEI implementation shall be resistant to hacking, spoofing or change by any means.
IMEI secure implementation principles

Here are the recommended GSMA IMEI security technical design principles to help device brand owners develop a comprehensive security architecture to protect the IMEI implementation.

<table>
<thead>
<tr>
<th>Principle</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1: Software Integrity</td>
<td>Detect, prohibit and record attempts to alter data or software</td>
</tr>
<tr>
<td>2: No Modification</td>
<td>Protect component code against manipulation</td>
</tr>
<tr>
<td>3: No Cloning</td>
<td>Prevent IMEI copying between different devices</td>
</tr>
<tr>
<td>4: No External Access</td>
<td>Make IMEI implementation inaccessible from outside the device</td>
</tr>
<tr>
<td>5: No fallback</td>
<td>Stop unauthorised reversion to old software versions</td>
</tr>
<tr>
<td>6: No tampering</td>
<td>Prevent, detect and respond to attempts to change IMEIs</td>
</tr>
<tr>
<td>7: Software Quality</td>
<td>Develop software in accordance with best process &amp; techniques</td>
</tr>
<tr>
<td>8: No Hidden Menus</td>
<td>No means to access or modify areas that store the IMEI</td>
</tr>
<tr>
<td>9: No Substitution</td>
<td>Prevent substitution of components that contain memory</td>
</tr>
</tbody>
</table>

IMEIs must not change after device production. Adopt these security requirements.
Who applies for TAC when production is outsourced?

Rule:

The brand owner must apply for TAC.

Brand owner provides TAC to manufacturer if outsourced.
The same model, produced by the brand owner in multiple factories that they own, requires one TAC.

The same model, produced by different outsourced manufacturers requires two TAC. Each outsourced OEM must be named on the TAC application form.

The same model, designed and produced by different outsourced manufacturers requires two TAC. The outsourced OEMs must be named on the TAC application form.
Sale of Brands and TAC

Original brand owner must confirm transfer of brand ownership before TAC allocation can be managed by new brand owner.

Rule:

After the brand seller confirms the new owner, GSMA allocates TAC to the new owner.
When a brand owner establishes a brand licensee, **GSMA allocates TAC to the licensee** until the brand owner provides other instructions.
Who applies for TAC when multiple brands are present?

Example:
Mobile network operator, Brand 1, provides devices in association with manufacturer, Brand 2

Rule:
Where multiple brands are involved the brand responsible for sales must apply for TAC.

Brand responsible for sales must apply for TAC
When does a repair require an IMEI to change?

**Rule:** Changing the component that securely stores the IMEI results in a change of IMEI value.

### Table: IMEI Details

<table>
<thead>
<tr>
<th>TAC: Type Allocation Code</th>
<th>Serial Number</th>
<th>Check Digit</th>
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<tbody>
<tr>
<td>35 123451</td>
<td>000000</td>
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</table>

**Model A**

<table>
<thead>
<tr>
<th>Broken screen</th>
<th>35 123451 000001 X</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>New screen</th>
<th>35 123451 000001 X</th>
</tr>
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</table>

**Peripheral components** can be replaced provided the model specification is not changed.

**Model A**

<table>
<thead>
<tr>
<th>Broken motherboard</th>
<th>35 123451 000001 X</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Replacement motherboard</th>
<th>35 123451 634535 X</th>
</tr>
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</table>

Changing out the motherboard requires changing the IMEI keeping the appropriate TAC.

Keep IMEI

Change IMEI
A well-functioning IMEI ecosystem benefits all
To register for TAC allocations or to clarify any of this material, please contact:

imeihelpdesk@gsma.com