

SONY®

White paper

April 2014



Xperia™ M2

D2303/D2305/D2306

Note: Screen images are simulated.

Purpose of this document

Sony Mobile Communications product White papers are intended to give an overview of a product and provide details in relevant areas of technology.

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Document history

| Version | | |
|----------------|--------------------------|------------|
| February 2014 | First released version | Version 1 |
| March 2014 | Second released version | Version 2 |
| March 2014 | Third released version | Version 3 |
| March 2014 | Fourth released version | Version 4 |
| March 2014 | Fifth released version | Version 5 |
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| April 2014 | Seventh released version | Version 7 |
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| April 2014 | Ninth released version | Version 9 |
| April 2014 | Tenth released version | Version 10 |

Sony Mobile Developer World

For the latest technical documentation and development tools, go to www.sonymobile.com/developer.

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Facts – dimensions, weight, performance and networks

| | |
|--------------------------|---|
| Operating system | Google™ Android™ 4.3 (Jelly Bean MR2) |
| Processor | 1.2 GHz Qualcomm MSM8926 Quad Core (D2303, D2306) 1.2 GHz Qualcomm MSM8226 Quad Core (D2305) |
| GPU | Adreno 305 |
| Size | 139.65 x 71.14 x 8.64 mm |
| Weight | 148 grams |
| Available colours | Black White Purple |
| Main screen | |
| Colours | 16,777,216 colour TFT |
| Resolution | 540x960 pixels |
| Size (diagonal) | 4.8 inches |
| Scratch-resistant | Yes – Touch panel cover glass |
| Input mechanisms | |
| Text input | On-screen QWERTY keyboard, 12 key input |
| Touch screen | Capacitive |
| Touch gesture | Yes – multi-touch, up to 4 fingers supported |
| Handwriting recognition | Yes |
| Memory | |
| RAM | 1 GB |
| Flash memory | Up to 8 GB* |
| Expansion slot | microSD™ card, up to 32 GB |
| Camera | |
| Camera resolution | 8 MP |
| Digital zoom | 4x |
| Video recording | Yes – HD 1080p |
| Front Camera | Yes – VGA |
| Sensors | |
| Accelerometer | Yes |

| | |
|-----------------------------------|--|
| Ambient light sensor | Yes |
| Proximity sensor | Yes |
| Magnetometer | Yes |
| Networks | |
| D2303 | UMTS HSPA+ 900 (Band VIII), 850 (Band V), 2100 (Band I) MHz GSM GPRS/EDGE 850, 900, 1800, 1900 MHz LTE Bands 1, 3, 5, 7, 8, 20 |
| D2306 | UMTS HSPA+ 850 (Band V), 1700 (Band IV), 1900 (Band II), 2100 (Band I) MHz GSM GPRS/EDGE 850, 900, 1800, 1900 MHz LTE Bands 2, 4, 7, 17 |
| D2305 | UMTS HSPA+ 900 (Band VIII), 850 (Band V), 1900 (Band II), 2100 (Band I) MHz GSM GPRS/EDGE 850, 900, 1800, 1900 MHz |
| Data transfer speeds | |
| GSM GPRS (upload and download) | Up to 107 kbps (download), Up to 85.6 kbps (upload). |
| GSM EDGE (upload and download) | Up to 296 kbps (download). Up to 236.8 kbps (upload). |
| UMTS HSUPA (upload) | Cat. 6, up to 5.76 Mbps |
| UMTS HSDPA (download) | Cat. 24, up to 42.2 Mbps |
| LTE (upload and download) | Cat. 4, up to 50 Mbps (upload), up to 150 Mbps (download) |
| HAC/TTY | |
| HAC | M3/T3 |
| TTY | Yes |
| Talk time (GSM) | Up to 11 hours 14 min.** |
| Standby time (GSM) | Up to 588 hours** |
| Talk time (UMTS) | Up to 12 hours 2 min.* |
| Standby time (UMTS) | Up to 633 hours** |
| Standby time (LTE) | Up to 543 hours** |
| Music listening time | Up to 37 hours 2 min.** |
| Video playback time | Up to 7 hours 58 min.** |
| Battery (Embedded) | 2300 mAh |

* Memory comprises of approximately of 3 GB firmware, plus 5 GB of "Internal Storage" for downloaded applications, music, pictures and movies, and some application data. For more details about memory, see "Memory in Android™ devices" on page 14.

*** Values are according to GSM Association Battery Life Measurement Technique as performed in controlled laboratory conditions. Actual time may vary.*




NOTE: Battery performance may vary depending on network conditions and configurations, and device usage.

NOTE: All performance metrics are measured under laboratory conditions.

Categorised feature list

| | | |
|---|--|---|
|  <p>Camera</p> <ul style="list-style-type: none"> 8 megapixel camera 4x digital zoom Auto focus Face detection Fast capture Flash/Photo light Geotagging HDR for pictures HD video recording (1080p) Image stabiliser Quick Launch Red-eye reduction Scene recognition Self-timer Send to web Superior Auto Smile shutter™ Sony Exmor RS® for mobile Steady shot Sweep Panorama Touch capture Touch focus Video light Video stabiliser White balance |  <p>Music</p> <ul style="list-style-type: none"> Album art Bluetooth® stereo (A2DP) ClearAudio+ Clear Bass™ Clear Phase™ Clear stereo Dynamic normaliser Manual equaliser PlayNow™ service* SensMe™ TrackID™ music recognition* “WALKMAN” application xLoud™ Experience |  <p>Internet</p> <ul style="list-style-type: none"> Bookmarks Google Chrome™* Google Play™ Google™ search* Google Voice™ Search* Google Maps™ for Mobile with Street view* NeoReader™ barcode scanner* Web browser (WebKit™)* |
|  <p>Communication</p> <ul style="list-style-type: none"> Call list Conference calls Facebook™ application* Friends application Hangouts™* HD voice support Loud Speaker Multiple IM Noise suppression Speakerphone Twitter™ application* Xperia™ with Facebook™ |  <p>Messaging</p> <ul style="list-style-type: none"> Conversations Email Google mail™* Handwriting recognition Instant messaging Multimedia messaging (MMS) Predictive text input Text messaging (SMS) |  <p>Design</p> <ul style="list-style-type: none"> Auto rotation Gesture input Illumination effect On-screen 12-key keyboard On-screen QWERTY keyboard Picture wallpaper Screen capturing STAMINA mode Touch screen Voice input Wallpaper animation |

* This service is not available in all markets.

| | | |
|---|---|---|
|  <p>Entertainment 3D games Media browser Motion gaming PlayMemories* Radio (FM radio with RDS) Sony Entertainment Network** Video streaming YouTube™*</p> |  <p>Organiser Airplane mode Alarm clock Calculator Calendar Contacts Document readers eCompass™ Notes Setup guide Stopwatch Timer World clock</p> |  <p>Connectivity 3.5 mm audio jack (CTIA) ANT+™ sport, fitness, health support aGPS* Bluetooth® 4.0 wireless technology DLNA Certified® GLONASS Media Transfer Protocol support Micro USB support Miracast Native USB tethering Media Go™* NFC PC Companion Play Anywhere Smart Connect Synchronisation via Facebook™ Synchronisation via SyncML™ Synchronisation via Google™ Synchronisation with computer Synchronisation via Microsoft® Exchange ActiveSync® USB High speed 2.0 support USB Host USB mass storage Xperia Link™ Wi-Fi® Wi-Fi® Hotspot functionality</p> |
|---|---|---|

* This service is not available in all markets.

** Sony Entertainment Network with Music Unlimited is not available in every market. Separate subscription required. Additional terms and conditions apply.

Technologies in detail

NOTE: The information outlined below is general and levels of compliance to standards and specifications may vary between products and markets. For more information, contact Sony Developer World or your Sony contact person where applicable.

Device-to-device communications (local)

ANT+™ wireless technology

| | |
|---------------------|--|
| Connectable devices | ANT+™ devices require download of a supporting application |
| Frequency band | 2.4 GHz |
| Data transfer rate | Up to 60 Kbps |
| Encryption | AES-128 |
| Topologies | One to Many, Many to One, Peer to Peer, Star, Practical Mesh |

Bluetooth® wireless technology

| | |
|--|--|
| Bluetooth® profiles supported | Advanced Audio Distribution Profile v1.2 Audio/Video Remote Control Profile v1.3 Generic Attribute Profile Client/Server over LE Handsfree Profile v1.6 (Wide band speech) Headset Profile v1.2 Human Interface Device Profile v1.0 Object Push Profile v1.1 Personal Area Networking Profile v1.0 DUN 1.1 |
| Core version and supported core features | Version 4.0 |
| Connectable devices | Products that support at least one of the profiles listed above. Bluetooth 4.0 accessories generally require installation of a supporting application. |

More information:

www.sonymobile.com/developer

www.bluetooth.com

Wi-Fi®

| | |
|---------------------|---|
| Supported standards | IEEE 802.11 a/b/g/n and Wi-Fi® Wi-Fi Direct®, Wi-Fi Protected Setup, Wi-Fi CERTIFIED Miracast™ |
| Connectable devices | Wi-Fi® access points Wi-Fi Direct compatible devices |
| Frequency band | 2.4 GHz / 5 GHz |
| Data transfer rate | Up to 150 Mbit/s |
| Security | Open Authentication Shared Authentication EAP-SIM EAP-AKA EAP-TLS EAP-TTLS/MSCHAPv2 PEAPv0/EAP-MSCHAPv2 PEAPv1/EAP-GTC WPA Personal and WPA2 Personal WPA Enterprise and WPA2 Enterprise |
| Encryption | WEP 64 bit, WEP 128 bit, TKIP and CCMP (AES) |
| Power save | WMM-UAPSD |
| QoS | WMM |

Messaging

MMS (Multimedia Messaging Service)

According to OMA Multimedia Messaging Service v1.0 + SMIL

Email

| | |
|------------------|--|
| Bearer type (IP) | GPRS, EGPRS, UMTS, Wi-Fi® |
| Character sets | BIG5 Traditional Chinese GB2312 Simplified Chinese GB18030 ISO-2022-JP Japanese ISO-8859-1 ISO-8859-2 Eastern Europe ISO-8859-5 Cyrillic ISO-8859-7 Greek ISO-8859-9 Turkish ISO 8859-11 KOI8-R Cyrillic Shift_JIS Japanese USASCII UTF-16 UTF-8 Windows® 874 Windows® 1251 Cyrillic Windows® 1252 Windows® 1254 Turkish Windows® 1258 Vietnamese |
| Protocols | POP3 and IMAP4 |
| Push email | Microsoft® Exchange ActiveSync® (EAS) |
| Secure email | SSL/TLS, both port methods (POPS/IMAPS) and START-TLS |
| HTML mail | Yes (read only) |

More information:

www.sonymobile.com/developer

www.openmobilealliance.org

Positioning – location based services

Supported standards:

- OMA Secure User Plane Location (SUPL) v1.0
- 3GPP™ Control Plane location (including Emergency location), only supports E911
- Qualcomm® GPSONeXtra

Provisioning (OMA CP)

OMA CP version 1.1

Multimedia (audio, image and video)

| | | |
|------------------------|--|---|
| Audio Playback | Decoder format | Supported in file format |
| | Audio decoding MPEG-1/2/2.5, audio layer 3 | MP3 (.mp3), 3GPP (.3gp), MP4 (.mp4, .m4a) |
| | AAC, AAC+, eAAC+ | 3GPP (.3gp), MP4 (.mp4) |
| | AMR-NB, AMR-WB | 3GPP (.3gp), MP4 (.mp4) |
| | General MIDI (GM) | SMF (.mid) |
| | Linear PCM 16bit | WAV (.wav) |
| | OTA | OTA (.ota) |
| | Ogg vorbis | Ogg vorbis (.ogg) |
| Audio Recording | Encoder format | Supported in file format |
| | AMR-NB, AMR-WB | 3GPP (.3gp), MP4 (.mp4), AMR (.amr) |
| | AMR-NB, AMR-WB, AAC-LC stereo Sample rate: 48 kHz Bit rate: up to 384 kbps | 3GPP (.3gp), MP4 (.mp4) |
| Image Playback | Decoder format | Supported in file format |
| | 1, 4, 8, 16, 24 and 32 bpp and RLE encoded formats | BMP (.bmp) |
| | Single and multi-frame, bitmap mask support (GIF87a format and GIF89a format) | GIF (.gif) |
| | Joint Photographic Experts Group | JPEG (.jpg) |
| | Portable Network Graphics Bitmap mask support | PNG (.png) |
| | Wireless Bitmap | WBMP (.wbmp) |
| Image Capture | Encoder format | Supported in file format |
| | Joint Photographic Experts Group | JPEG (.jpg) |
| Video Playback | Decoder format | Supported in file format |
| | MPEG-4 Visual Simple Profile | 3GPP (.3gp), MP4 (.mp4) |
| | H.264 | 3GPP (.3gp), MP4 (.mp4) |
| | H.263 Profile 0 | 3GPP (.3gp) |

| Video Recording | Encoder format | Supported in file format |
|------------------------------|--|---|
| | - Video H.263 Profile 0, H.264 Baseline Profile, H.264 High Profile - Audio: AAC-LC stereo Bit rate: 10 Mbps AMR-NB | 3GPP (.3gp), MP4 (.mp4) |
| Audio/Video Streaming | Streaming transport | RTSP according to 3GPP™ HTTP streaming |

Synchronisation (OMA DS, EAS, Google Sync™)

OMA Data Synchronisation protocol versions 1.1.2 and 1.2

OMA Data Formats: vCard 2.1, vCalendar 1.0

Microsoft® Exchange ActiveSync® protocol version 2.5

Microsoft® Exchange ActiveSync® protocol version 12.0

Microsoft® Exchange ActiveSync® protocol version 14.0

Microsoft® Exchange ActiveSync® protocol version 14.1

Google Sync™

Related information:

www.sonymobile.com/developer

Web browser

Google Chrome™ for Android™ is pre-installed.*

For more information about Google Chrome™, go to

<https://play.google.com/store/apps/details?id=com.android.chrome>

* Google Chrome™ is not available for all markets.

Related information:

www.sonymobile.com/developer

Memory in Android™ devices

To use Android devices efficiently, users should be aware of the different types of device memory. This knowledge is important in order to understand, for example, where music, photos and videos are saved; how many apps can be downloaded from Google Play™; and how photos can be copied to a PC.

The below information is also of interest to developers who want to optimise their programs to make the best possible use of the resources in the device.

Generally, all Android devices share the same basic memory setup. What differs is how much memory is available to you via the different types of memory, and whether your device uses an external SD card or an internal memory chip. Any information specific to the particular device model described in this White Paper is noted as such.

Types of memory

The types of memory described and numbered below are consistent with the terminology used in Sony mobile device menus and in other content relating to 2014 Xperia™ devices:

1. **Dynamic Memory** (also known as RAM) is used by applications that run when the device is turned on. The amount of Dynamic Memory influences how many applications and operating system services can run at the same time. The Android operating system automatically closes applications and services that are not being used.

However, such automatic functionality has limits. For example, if a lower amount of free RAM is available to applications after a new release of the operating system (due to increased capabilities in the system), device speed will eventually be impacted. This is the main reason that a device cannot be indefinitely upgraded to newer releases of Android™.

If you experience problems with RAM, for example, if the device runs slower than usual or if the Home application restarts frequently when you leave an application, you should minimise the use of apps that run all the time. Such apps could include, for example, applications that frequently download social networking service updates. You could also consider using a static wallpaper instead of a live wallpaper.

To see which apps and services are currently active, go to **Settings > Apps > Running**. You should have at least 50 MB, and ideally 100 MB or more, of free RAM to avoid slowdowns and application restarts.

You should also be aware that if you update the device to a later Android release, the load on the built-in Dynamic Memory will increase due to the addition of more features, as mentioned above. As a result, the device may run slower after an update.

The Xperia™ M2 has about 1 GB of RAM available to the Android OS and applications, of which about 200 MB is already used out of the box.

2. **System Memory** (also known as “System partition” or “/system”) is used for the Android OS and for most applications that are pre-loaded from the factory. This type of memory is normally locked, and can only be changed through a firmware upgrade. There is usually some free space available in this section of memory. However, since it is locked, you cannot save apps, photos or any other content to this memory. System Memory is reserved for future firmware upgrades, which almost always need more memory than the original firmware. You cannot see or influence the use of this memory.
3. **Internal Storage** is memory used as “working” memory. It can be compared to the C: drive on a PC or to the startup disk on a Mac.

This type of memory is used to store all application downloaded from the Google Play™ Store (and other sources) as well as their settings and data (such as emails, messages and calendar events, for example). All applications have an allocated area which no other applications can access and where the application data can be stored.

Some game applications also store content such as game music and game level information outside their own designated area. In most cases, an application can choose to save its data in a location of its own choosing (outside the protected application settings area). Generally, such content is not deleted when an application is uninstalled; it must be removed manually by connecting the device to a computer with a USB cable, or by using a file manager application.

Internal Storage is also used for all user content added, for example, as a result of the user taking photos with the camera, downloading media files, and performing file transfers. Typical user content includes:

- photos
- movies
- music
- downloaded documents (as email attachments, for example)

Internal Storage will tend to fill up as a result of normal usage. Examples of such usage are the saving of data by applications; the downloading and installation of new applications; the downloading of free or paid content; and the shooting of pictures and movies. Therefore, the larger this memory is from the start, the more applications you can download and use, and the more pictures and movies you can shoot.

If the Internal Storage starts to get full, the device slows down, and in some cases it might no longer be possible to install more apps. You should always ensure that you have at least 100 MB of free Internal Storage. If not, you should consider removing some apps that you seldom use, or move content that you do not frequently access to safe storage.

You can see approximately how much Internal Storage is free in **Settings > Storage > DEVICE MEMORY**. You can also view more detail about how much memory is used by applications in **Settings > Apps**. In the Xperia™ M2, about 5 GB of Internal Storage is available out of the box.

Please note that in Sony Mobile 2014 products, “Internal Storage” is now the combination of what was previously known as “Device Memory” or “Phone Memory” (for applications and their data – also previously known as “/data”) and “Internal Storage” (for user’s content – also previously known as “/sdcard”). The reason for this change is to make the use of available memory more flexible, and also to enable the optional encryption of user’s content.

Memory card slot

In some products you may find both a large internal memory and a memory card reader slot. However, on the current Android platform, the card reader slot does not work in the same manner in a device with a large internal memory as it does in a device with ONLY a memory card slot.

Generally, since most applications expect only a single location for storage, such applications will not generally allow you to SAVE anything to the memory card (i.e., they do not offer the option to choose a storage location). However, some applications (for instance, the Sony Mobile “Camera” application) may actually allow you to do so. Other applications, for example, backup applications such as the Sony Mobile “Memory” application, will by definition be configured to copy content from the Internal Storage to the external SD card.

On the other hand, when it comes to reading from an external SD Card, you will be able to access content (for example, videos, photos and music) on a memory card inserted in this slot without any special consideration since the Android system searches all available memory for content. Therefore, such products may be regarded as supporting a fourth type of memory, called “External Card” or “SD Card”.

4. **SD Card** (known as “/ext_card” from a programmer’s point of view, or by other names in other Android products) is the name for the removable SD memory card in all 2014 Sony Mobile products. As described above, this External Card memory is generally more limited in that any application can read from it, but many applications cannot save to this card. Only a few applications, including backup applications and file manger applications, have the capability to save to this card.

Backing up data to different memory types

Generally, you should not save photos, videos and other personal content solely on the internal memory of a device. If something should happen with the hardware, or if the device is lost or stolen, the data stored on the device’s internal memory is gone forever.

In a device where an SD card reader is the main memory, it is relatively easy to take the card out and copy all content to a PC or Mac, or to an entertainment device with a memory card slot. In a product featuring Internal Storage as the main memory, it is not possible to physically remove the memory. Instead, any critical or high-value content must either be copied to an external SD card by a special backup application, transferred to remote storage over a network (mobile or Wi-Fi), or to a computer via a USB cable.

To facilitate the transfer of data via a cable, the Xperia™ M2 supports the Microsoft standard, Media Transfer Protocol (MTP), which makes it possible to easily transfer content back and forth between your device and a Windows PC. For Apple Mac computers, a special application called Sony™ Bridge for Mac is available with built-in support for MTP. This application can be downloaded from the Xperia™ M2 Support page.

Note that you do not need to back up or make a copy of applications that you have downloaded from the Google Play™ Store. They can normally be downloaded again after you have set up your Google account to work in a new device (or in a device where the memory has been completely erased).

Note 1:

As noted above, some Android devices, including Sony Mobile devices from 2012 and Sony Ericsson devices from 2011 and earlier, do not use a single “Internal Storage” for both applications (and their data) and user content. Instead, these devices use either an external SD card for user content, or a corresponding area of internal memory to reproduce the functionality of an SD card. In such devices, there is a fixed limit between the application area (“/data”) and the user content area (“/sdcard”), with the result that user content can build up and reach this limit. The consequence of such a limit being reached, for example, for the camera application, would be that no new pictures could be taken even if there was still a considerable amount of free space in the application area (or in the user content area). In such an instance, the download and installation of new applications would also not be possible, even if there was enough free memory in the content area.

Note 2:

Some devices with integrated storage have abandoned the distinction between the application area and the content area when it comes to a Factory Data Reset. As a result, there is no option in such devices to perform a Factory Data Reset and preserve content. In such devices, all content is mandatorily and completely deleted from the device when a reset is performed.

In contrast, Sony Mobile’s memory integration solution makes it possible to preserve user content in this situation. Therefore, when performing a Factory Data Reset, the default action will still be to only remove applications and their data, and an option box must be checked if all content is to be removed as well (as might be desirable when selling the device second-hand, for instance).

Note 3:

For a developer, it is important to note that from a programming point of view the location names used to refer to the different memory areas described in Note 1 are still valid, i.e., the area used for applications (“/data”) is still present, as is the area used for content (“/sdcard”).

In reality, “sdcard” is a so-called “symbolic link” to “/data/media”. However, from inside an Android application, “/sdcard” can still be used. For example, you can use “sdcard/DCIM/100Android” to find all camera images. The continued use of “/sdcard” to access the content area ensures compatibility across different products and Android releases in this regard.

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