

Blu-ray FAQ

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Introduction

1.1 What is Blu-ray?

Blu-ray, also known as Blu-ray Disc (BD) is the name of a next-generation optical disc format. The format was developed to enable recording, rewriting and playback of high-definition video (HD). The format is also likely to become a standard for PC data storage and high-definition movies in the future.

1.2 Why the name Blu-ray?

The name Blu-ray is derived from the underlying technology, which utilizes a blueviolet laser to read and write data. The name is a combination of "Blue" (blue-violet laser) and "Ray" (optical ray). According to the Blu-ray Disc Association the spelling of "Blu-ray" is not a mistake, the character "e" was intentionally left out so the term could be registered as a trademark.

The correct full name is Blu-ray Disc, not Blu-ray Disk (incorrect spelling)

The correct shortened name is Blu-ray, not Blu-Ray (incorrect capitalization) or Blueray (incorrect spelling)

The correct abbreviation is BD, not BR or BRD (wrong abbreviation)

1.3 Who developed Blu-ray?

The Blu-ray Disc format was developed by the Blu-ray Disc Association (BDA), a group of leading consumer electronics, personal computer and media manufacturers, with more than 170 member companies from all over the world. The Board of Directors currently consists of:

Apple Computer, Inc.
Dell Inc.
Hewlett Packard Company
Hitachi, Ltd.
LG Electronics Inc.
Matsushita Electric Industrial Co., Ltd.
Mitsubishi Electric Corporation
Pioneer Corporation
Royal Philips Electronics
Samsung Electronics Co., Ltd.
Sharp Corporation
Sony Corporation
TDK Corporation
Thomson Multimedia
Twentieth Century Fox
Walt Disney Pictures
Warner Bros. Entertainment

1.4 What Blu-ray formats are planned?

As with conventional CDs and DVDs, Blu-ray plans to provide a wide range of formats including ROM/R/RW. The following formats are part of the Blu-ray Disc specification:

BD-ROM - read-only format for HD movies, music, software, games, etc.

BD-R - recordable format for video recording and data storage.

BD-RW - rewritable format for video recording and data storage.

1.5 How much data can you fit on a Blu-ray disc?

A single-layer disc can hold 25GB.

A dual-layer disc can hold 50GB.

To ensure that the Blu-ray Disc format is easily extendable (future-proof) it also includes support for multi-layer discs, which should allow the storage capacity to be increased to 100GB-200GB (25GB per layer) in the future simply by adding more layers to the discs.

1.6 How much video can you record on a Blu-ray disc?

Over 2 hours of high-definition (HD) video on a 25GB disc.

About 13 hours of standard-definition (SD) video on a 25GB disc.

1.7 How fast can you read/write data on a Blu-ray disc?

According to the Blu-ray Disc specification, 1x speed is defined as 36Mbps. However, as BD-ROM movies will require a 54Mbps data transfer rate the minimum speed we're expecting to see is 2x (72Mbps). Blu-ray also has the potential for much higher speeds, as a result of the larger numerical aperture (NA) adopted by Blu-ray Disc. The large NA value effectively means that Blu-ray will require less recording power and lower disc rotation speed than DVD and HD-DVD to achieve the same data transfer rate. While the media itself limited the recording speed in the past, the only limiting factor for Blu-ray is the capacity of the hardware. If we assume a maximum disc rotation speed of 10,000 RPM, then 12x at the outer diameter should be possible (about 400Mbps). This is why the Blu-ray Disc Association (BDA) already has plans to raise the speed to 8x (288Mbps) or more in the future.

1.8 What video codecs will Blu-ray support?

MPEG-2 - enhanced for HD, also used for playback of DVDs and HDTV recordings.
MPEG-4 AVC - part of the MPEG-4 standard also known as H.264 (High Profile and Main Profile).

SMPTE VC-1 - standard based on Microsoft's Windows Media Video (WMV) technology.

Please note that this simply means that all Blu-ray players and recorders will have to support playback of these video codecs, it will still be up to the movie studios to decide which video codec(s) they use for their releases.

1.9 What audio codecs will Blu-ray support?

Linear PCM (LPCM) - offers up to 8 channels of uncompressed audio.

Dolby Digital (DD) - format used for DVDs, offers 5.1-channel surround sound.

Dolby Digital Plus (DD+) - extension of DD, offers increased bitrates and 7.1-channel surround sound.

Dolby TrueHD - extension of MLP Lossless, offers lossless encoding of up to 8 channels of audio.

DTS Digital Surround - format used for DVDs, offers 5.1-channel surround sound.

DTS-HD - extension of DTS, offers increased bitrates and up to 8 channels of audio.

1.10 Will Blu-ray discs require a cartridge?

No, the development of new low cost hard-coating technologies has made the cartridge obsolete. Blu-ray will instead rely on hard-coating for protection, which when applied will make the discs even more resistant to scratches and fingerprints than today's DVDs, while still preserving the same look and feel. The adoption of hardcoating will also allow manufacturers to downsize players/drives and lower their overall media production costs.

1.11 Will Blu-ray require an Internet connection?

No, you will not need an Internet connection for playback of Blu-ray movies. The Internet connection will be used for value-added features such as downloading subtitles, movie trailers, web browsing, etc. It will also be required to authorize managed copies of Blu-ray movies that can be transferred over a home network.

1.12 When will I be able to buy Blu-ray Disc products?

The only place where you can currently buy Blu-ray Disc products is in Japan, where they already sell Blu-ray Disc recorders for recording HDTV. If you live in the US then you will most likely have to wait until the Blu-ray launch sometime in early 2006. While we've heard very little about the launch plans for the European market, we expect it to follow shortly after the US (a few products might launch earlier).

1.13 What will Blu-ray Disc products cost?

As with any new technology the first generation of products will likely be quite expensive due to low production volumes. However, this shouldn't be a problem for long as there is a wide range of Blu-ray Disc products (players, recorders, drives, writers, media, etc) planned, which should help drive up production volumes and lower overall production costs. Once mass production of components for Blu-ray products begins the prices are expected to fall quickly.

According to the Blu-ray Disc Association, the overall cost of manufacturing Blu-ray Disc media will in the end be no more expensive than producing a DVD. The reduced injection molding costs (one molding machine instead of two, no birefringence problems) offset the additional cost of applying the cover layer and low cost hardcoat, while the techniques used for applying the recording layer remain the same. As production volumes increase the production costs should fall and eventually be comparable to DVDs.

Current technology

2.1 Will Blu-ray replace VHS?

Yes, that's the expectation. The Blu-ray Disc recorder represents a major leap forward in video recording technology as it enables recording of high-definition television (HDTV). It also offers a lot of new innovative features not possible with a traditional VCR:

- Random access, instantly jump to any spot on the disc
- Searching, quickly browse and preview recorded programs in real-time
- Create playlists, change the order of recorded programs and edit recorded video
- Automatically find an empty space to avoid recording over programs
- Simultaneous recording and playback of video (enables Time slip/Chasing playback)
- Enhanced interactivity, enables more advanced applications and games
- Broadband enabled, access online content, download subtitles and extras
- Improved picture, ability to record high-definition television (HDTV)
- Improved sound, ability to record surround sound (Dolby Digital, DTS, etc.)

2.2 Will Blu-ray replace DVD?

It's still too early to say. In the end it's up to the movie studios to decide in what format they release their movies, so they will play a big part in the decision of which format becomes the standard for high-definition movies and the successor to DVD. The two formats will most likely co-exist for quite some time until high-definition takes over and becomes the norm.

2.3 What's the difference between Blu-ray and DVD?

Parameters	BD-ROM	DVD-ROM
Storage capacity (single-layer)	25GB	4.7GB
Storage capacity (dual-layer)	50GB	9.4GB
Laser wavelength	405nm	650nm
Numerical aperture (NA)	0.85	0.60
Protection layer	0.1mm	0.6mm
Data transfer rate (1x)	36.0Mbps	11.08Mbps
Data transfer rate (movie application)	54.0Mbps (1.5x)	10.08Mbps
Video compression	MPEG-2 MPEG-4 AVC SMPTE VC-1	MPEG-2

2.4 Will Blu-ray be backwards compatible with DVD?

Yes, several leading consumer electronics companies (including Panasonic, Philips, Pioneer, Samsung, Sharp, Sony and LG) have already demonstrated products that can read/write CDs, DVDs and Blu-ray discs using a BD/DVD/CD compatible optical head, so you don't have to worry about your existing DVD collection becoming obsolete. Although it's up to each manufacturer to decide if they want to make their products backwards compatible with DVD, the format is far too popular to not be supported. The Blu-ray Disc Association (BDA) expects every Blu-ray Disc device to be backward compatible with CDs and DVDs.

2.5 What about Blu-ray for PCs?

There are plans for BD-ROM (read-only), BD-R (recordable) and BD-RE (rewritable) drives for PCs, and with the support of the worlds two largest PC manufacturers, HP and Dell, it's very likely that the technology will be adopted as the next-generation optical disc format for PC data storage and replace technologies such as DVD±R, DVD±RW, and DVD-RAM.



2.6 What are the differences of Blu-ray to UDO

The Blu-ray Disc format was developed by the Blu-ray Disc Association (BDA), a group of leading consumer electronics, personal computer and media manufacturers, with more than 170 member companies from all over the world. BD is introduced to become the follow-up standard of mainstream CD/DVD technology with same form factor and as bare media technology. As consumer driven technology it will reach soon same acceptance and also same pricing level as DVD in 2005.

UDO (Ultra Density Optical) is a propriert blue laser format developed and manufactured from only one vendor, Plasmon. UDO was introduced to follow-up the old MO installations as cartridged media of same form factor as the old MO media (130 mm diameter) and for data storage only. The target of UDO is a professional niche marked therefore it will stay propriert and expensive.

Parameters	Blu-ray Disc	UDO
Storage capacity (single-layer)	25GB	15GB
Storage capacity (dual-layer)	50GB	30GB (2007)
Dual sided	no	yes
Laser wavelength	405nm	405nm
Numerical aperture (NA)	0.85	0.70
Protection layer	0.1mm	0.6mm
Data transfer rate (1x)	36.0Mbps	32.0Mbps
Data transfer rate (movie application)	54.0Mbps (1.5x)	32.0Mbps
Video compression	MPEG-2 MPEG-4 AVC SMPTE VC-1	

Next generation technology

3.1 Is Blu-ray the same thing as HD-DVD?

No, HD-DVD (previously known as AOD) is the name of a competing next-generation optical disc format developed by Toshiba and NEC. The format is quite different from Bluray,

but also relies heavily on blue-laser technology to achieve a higher storage capacity. The format is being developed within the DVD Forum as a possible successor to the current DVD technology.

3.2 What benefits does Blu-ray offer compared to HD-DVD?

Although both Blu-ray and HD-DVD are similar in many aspects, there are some important differences between them.

The first is capacity. Because Blu-ray utilizes a lens with a greater numerical aperture

(NA) than HD-DVD, the laser spot can be focused with greater precision to fit more data on the same size disc. This allows Blu-ray to hold 25GB per layer (50GB on a dual-layer disc), whereas HD-DVD can only hold 15GB per layer (30GB on a dual-layer disc). Blu-ray has also adopted a higher data transfer rate for video and audio (54Mbps vs 36.55Mbps). The greater capacity and data transfer rates for Blu-ray will allow the movie studios to release their movies with higher quality video and audio than the HDDVD format.

The second is content. The Blu-ray format has received broad support from the major movie studios as a successor to today's DVD format. Seven of the eight major movie studios (Warner, Paramount, Fox, Disney, Sony, MGM and Lionsgate) have already announced titles for Blu-ray, whereas HD-DVD only has support from three major movie studios (Warner, Paramount and Universal). This is an important difference because some of the studios might only support one of the formats, so you won't be able to get your favorite movies in the other format. Choosing the format with the most content support minimizes this risk.

The third is hardware support. The Blu-ray format has broad support from the world's leading consumer electronics, personal computer and media manufacturers, including Sony, Panasonic, Philips, Samsung, Pioneer, Sharp, JVC, Hitachi, Mitsubishi, TDK, Thomson, LG, Apple, HP and Dell. The Blu-ray format will also be supported in the next generation PlayStation 3 (PS3) video game console. This means that you will have a lot of choice when it comes to players and hardware. The HD-DVD format has far less supporters, so the amount of players and hardware will be very limited. So far, Toshiba is the only company to officially announce a HD-DVD player and it will only support 1080i output, while the announced Blu-ray players will support 1080p.