DVD has migrated to its long-awaited high-definition format, and Blu-ray Disc (BD) has emerged as the survivor after a protracted format war between BD and HD DVD. But what is a Blu-ray disc, really?
**A Blu-ray disc is a high-definition optical disc format with many physical characteristics similar to DVD, but with unique differences that set the two formats apart.**

The most obvious difference is Blu-ray’s gigantic storage space. Blu-ray disc media come in two sizes: BD-25 (25 GB) and BD-50 (50 GB). Compared to the 4.7 or 8.5 gigabyte storage space of DVD, Blu-Ray discs allows you to store much more data on one disc.

The name Blu-ray refers to the laser used to read the disc. A BD uses a shorter wavelength (blue) laser as opposed to the red laser used for DVDs and CDs. Because of the smaller size of the blue laser, BD utilizes smaller pits and lands than are used on DVDs. Pits and lands are the method by which information is stored on an optical disc. Because the pits and lands are smaller, they can be placed closer together, resulting in more information being stored on a disc of the same size.

The Blu-ray format can contain any type of computer data as well as high-definition audio and video. BDs feature an improved disc coating with increased resistance to scratches and smudges, helping to keep data safe and secure from damage. They can be stored in a wide range of environments and temperatures ranging from 4° to 122° Fahrenheit, but it’s advisable to store them in a cool dry place, avoiding temperature extremes. If the discs are stored in an environment different from the operating environment, the discs should be placed in the operating environment for at least two hours before use.

BD discs are quite stable, and some aging tests show the lifespan of replicated discs will last 50-300 years and duplicated BD-Rs can last 20-250 years (10 years before recording). As with any type of blank media, the lifespan of a BD-R is subject to the type of dye and the quality of manufacturing. To ensure the longest lifespan, make sure you purchase the highest quality discs.

**The two faces of Blu-ray**

It seems like ages ago but, in fact, it was only in early 2008 when Blu-ray emerged as the winner of the format war, and HD DVD disappeared. As with any other form of optical disc, publishing content on Blu-ray is divided into two distinct options:

1. Duplication. Simple Blu-ray disc titles created and distributed in nominal quantities using recordable optical disc formats, either on home/office duplicators or short-run facilities. Requires the use of BD-Rs (blank recordable discs).

2. Replication. Full-production manufactured discs which involves licensing fees and (and potential hardware/software acquisition costs).

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**Getting started with Blu-ray duplication**

The BD spec allows for the creation of BD Video titles on recordable media that do not require an AACS’ (Advanced Access Content System) content protection license. Today, many, if not most, Blu-ray Disc players can play these BD-R/RE project discs, meaning Blu-ray projects (short ones) can even be created and distributed on DVD-R media.

In order to monitor the Blu-ray projects you will create, you will need a Blu-ray disc player and suitable monitor. And you will want to acquire a Blu-ray player that has Profile 2.0 capability (“BD Live”). This will give you the ability to play commercial Blu-ray Disc titles for your reference (and enjoyment).
To create a Blu-ray Disc you will also need:

• High-definition footage — either 720p\(^2\) or 1080p\(^3\) or 1080i\(^4\).
• Authoring software to create a Blu-ray disc project.
• Recordable optical disc media (BD-Rs or DVD-Rs).
• A Blu-ray disc duplicator (AKA burner).

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Replication requirements

Taking a project to replication mandates a very different set of requirements, and possible limitation on how things are done, and in what order. First off, most Blu-ray replicators will require delivery of a BDCMF master, generally on a Windows NTFS formatted hard drive. Not all Blu-ray software can create a BDCMF, so check the software capabilities carefully.

In addition, Blu-ray disc replication requires AACS licensing, and possibly Blu-ray Disc Association logo licenses as well.

AACS and BDA licensing and fees

In addition to the larger storage capacity, the BD format has other differences from the DVD format as well — content protection licensing! Making a DVD is a fairly simple proposition — you author the project, create a replication master (DLT or DDP data on DVD-R) and deliver

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1 The Advanced Access Content System (AACS) is a standard for content distribution and digital rights management, intended to restrict access to and copying of the next generation of optical discs and DVDs. The specification was publicly released in April 2005 and the standard has been adopted as the access restriction scheme for HD DVD and Blu-ray Disc (BD). It is developed by AACS Licensing Administrator, LLC (AACS LA), a consortium that includes Disney, Intel, Microsoft, Panasonic, Warner Bros., IBM, Toshiba and Sony. (From Wikipedia).

2 720p is shorthand for a category of HDTV video modes having a resolution of 1280x720 (for a total of 0.92 megapixels or 921,600 pixels) and a progressive scan. The number 720 stands for the 720 horizontal scan lines of display resolution (also known as 720 pixels of vertical resolution), while the letter p stands for progressive scan, or non-interlaced.

3 1080p, sometimes referred to as “Full HD,” is shorthand for a set of HDTV video modes that are characterised by 1,080 lines of vertical resolution (1,080 horizontal scan lines) and progressive scan. The term usually assumes a widescreen aspect ratio of 16:9, implying a horizontal resolution of 1920 pixels. The frame rate can be either implied by the context or specified after the letter ‘p’, such as 1080p30, meaning 30 progressive frames per second.

4 1080i, or high-definition television mode (HDTV). The “i” stands for “interlaced,” (as opposed to progressive scan). 1080i assumes a widescreen aspect ratio of 16:9, implying a frame size of 1920x1080 pixels.
to the replicator. In contrast, Blu-ray has taken the replication licensing issue to an entirely new level of complexity (and absurdity, perhaps). Not only is content protection licensing mandatory, but the licensing requirements mandate that both the content provider be licensed (as an entity), as well as each Blu-ray title (i.e. disc). This is a major paradigm shift for most DVD authors, who grew up with the relatively low-cost of DVD. There are additional licenses that may be needed to use the Blu-ray logo, but these can be very simply acquired and may even be free.

**License requirements for BD-ROM (video) replication AACS Licensing**

If you are going to replicate BD-ROM discs of ANY size, someone will be required to sign a licensing agreement with the Advanced Access Content System licensing authority (AACS-LA), and also to obtain a per-title (actually, per-glass-master) Title Key Certificate, and pay a per-disc royalty.

While there are other content protection licensing schemes available for Blu-ray (like BD+), the Blu-ray powers that be decided early on that the AACS encryption would be mandatory on the Blu-ray format, not optional as it was on HD DVD.

**Content Provider License: $500/year**

This license addresses the needs of the non-Hollywood content community. It is the typical AACS licensing agreement used by independent producers. The cost of this license was originally $3,000, due and payable entirely in advance, before replication was permitted.

In June 2009, after much feedback from the industry, an option was added to allow for an annual payment of $500, up to a cap of $5,000 over ten years. The net result of this is to effectively lower the cost of licensing a new BD publisher to $500, allowing many more to potentially publish on BD-ROM.

**Per-Title fees (Title Key Certificate): $500 per title key**

Another fee new to Blu-ray involves the generation of a Title Key Certificate (a digital file), used to identify and secure each unique BD title. Originally costing $1,300 per title key issued, this fee was also lowered in June 2009, to $500. This fee is generally handled by the replication facility, who will purchase it from AACS-LA on behalf of you, the client. The cost will be added to your replication bill, and sometimes a handling fee is added by the facility.

**Per-disc royalties: $40 per 1,000 discs**

There is a standard $0.04 per disc royalty payable for use of the AACS format. This fee remained the same during the June 2009 AACS revisions. This fee is also generally handled by the replication facility, and they will remit it to AACS-LA on your behalf.

**BDA licenses: FLLA and CPA**

Separate from the AACS fees listed above, the BDA’s FLLA (Format Logo Licensing Agreement) and CPA (Con-
tent Provider Agreement) licenses are another thing entirely, and the need for them may not be obvious to many who are first getting into BD.

FLLA licenses have to do with the use of the BD format logo (the Blu-ray Disc mark you have no doubt seen). Authoring companies who plan to create commercial titles for replication should investigate if the FLLA for BD-ROM is required for their expected workload (requirements are somewhat uncertain). Authoring facilities planning on creating titles using BD-J or BD Live are encouraged to become FLLA licensees, to facilitate their interactions with licensed replicators. An FLLA agreement for BD-ROM is currently $4,000 for five years, and must be paid at the time of licensing. Most likely, this is NOT something you need to do if you are a new BD publisher/author.

CPA Licenses. If you are a content owner expecting to publish “many” commercial BD titles during a year, it may be in your best interest to become a direct CPA licensee, or a CPA-Light licensee. A full CPA license is $3,000/yr for 5 yrs; CPA-light is $500/yr for 5 yrs.

**Blu-ray License Summary**

You should NOT need a BDA CPA license if you are only creating small quantities on BD recordable, and you should NOT need an FLLA license as long as you are not attempting to use the BD logo or logotype in any advertising, or on the disc itself (other than a pre-printed BD logo on a BD-R/RE disc, which has already been licensed). If you need to use the Blu-ray logo for marketing or advertising, contact the BDA licensing agent via email, or call the BDA. You can label your own discs as being a “Blu-ray disc” in plain text — this is allowed. What you cannot do is just utilize the BD logo on its own in your advertising without SOME kind of BDA license.

**License requirements for BD recordable discs (BD-R/RE)**

There are none! BD recordable media from BDA-licensed manufacturers have already had the BDA license fee paid, and you are free to use the discs as-is, with no further payment (other than the price you paid to purchase them).

**Resources:**

- **Blu-ray Disc Association**
- **The Digital Guy**
- **Digital Media Consulting Group, Inc. (DMCGI)**
- **International Digital Media Alliance (IMDA)**
- **Disc Makers Blu-ray FAQs**
- **Blu-ray Blank discs**
- **Blu-ray automated duplicator/printers**
- **Blu-ray manual duplicators**
- **Roxio Creator 2010**
- **Apple Final Cut Pro**