



Creating BlackPearl S3 Clients Using Free and Open Source Tools

Easily move data to low-cost deep storage

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ABSTRACT

The Spectra Logic BlackPearl Deep Storage Gateway provides an easy, cloud-like interface to deep storage tape and disk libraries. The cloud interface is called Spectra S3 and is an extension of the industry standard S3 Simple Storage Service protocol. The Spectra Logic Developer Program website provides all the tools needed to build Spectra S3 clients, including a BlackPearl simulator, sample clients, software development kits, and documentation. All of these tools are freely downloadable and most are open source.

While building an S3 client directly into your application is the end goal, Spectra's Deep Storage Browser also provides an immediate ability to move data in and out of deep storage using a simple graphical user interface. This provides a simple way to immediately begin using object storage and a tool for monitoring and administering the object database.

INTRODUCTION

For many organizations, data is growing exponentially, and the data that they store is their business. These organizations must be able to store this data for months or years on a reliable and low cost medium. Digital tape media, such as LTO tape and RAID-protected disk, is the most common storage choice to meet this requirement. Traditionally, moving data to tape media in tape libraries has been complex, requiring software that can communicate directly with the tape drives in the tape library, efficiently move data between storage tiers, and provide a means to catalog that data and make it accessible. Cloud interfaces, like the industry standard Simple Storage Service (S3), make it easy to move data to storage using simple HTTP commands. Spectra Logic's BlackPearl Deep Storage Gateway, a 2U or 4U hardware appliance, provides a cloud interface to Spectra tape libraries, making it easier than ever to store data on low-cost, reliable deep storage. BlackPearl automatically takes care of data caching, recording the object metadata in an internal database, and generally controlling the disk and tape systems it uses as targets. The simple S3 front-end API allows users to focus on the simplicity of storing and retrieving their data.

Spectra Logic has created a Developer Program to make it easy for developers to create clients to interface with BlackPearl. The Developer Program, which can be found at <https://developer.spectralogic.com>, includes all the necessary components to build Spectra S3 clients. The components are freely available for download, and many are open source. Developers can see the source code of these components, which allows them to customize the components for their specific storage workflow needs. These customizations can also be given back to the developer community through the use of our GitHub site allowing developers to share advances with each other and promote the overall S3 community.

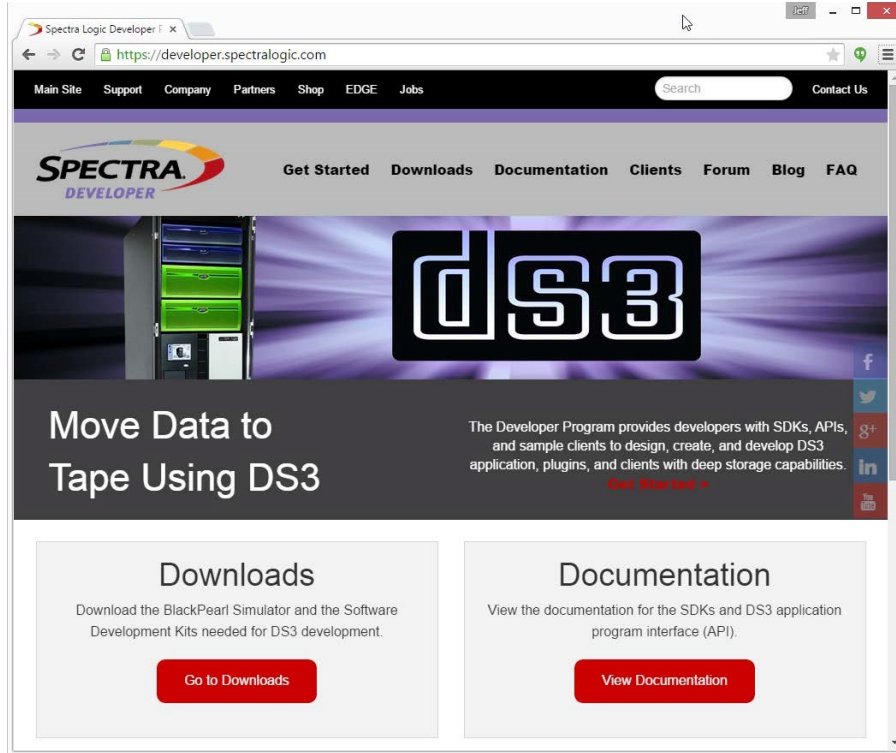


Figure 1. The Spectra Logic Developer Program Website at developer.spectralogic.com

COMPONENTS FOR BUILDING SPECTRA S3 CLIENTS

There are a number of components needed to build Spectra S3 clients for BlackPearl.

BLACKPEARL SIMULATOR

To enable both development and test, developers first need to download and install the BlackPearl simulator. The simulator allows full interaction with virtual BlackPearl system including interaction with the web interface, allowing clients to read and write data to it, and monitoring job processes all without having to invest up-front in BlackPearl hardware. The simulator runs as a virtual machine on a local computer.

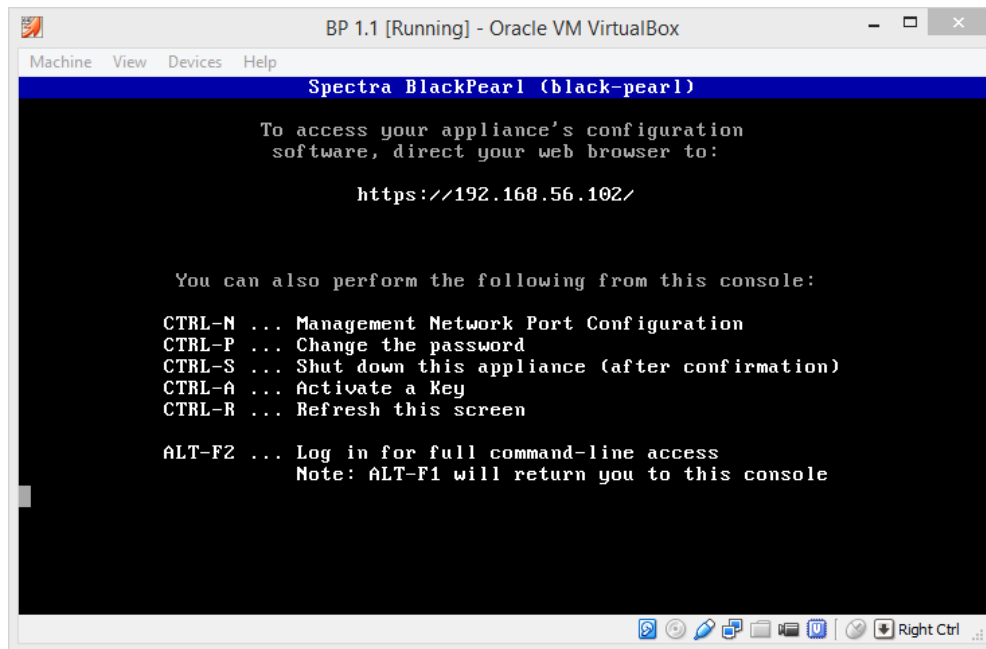


Figure 2 The BlackPearl Simulator

Once running, the BlackPearl simulator can be accessed via its web interface at the IP address shown on the simulator screen. The web interface must be accessed via https.

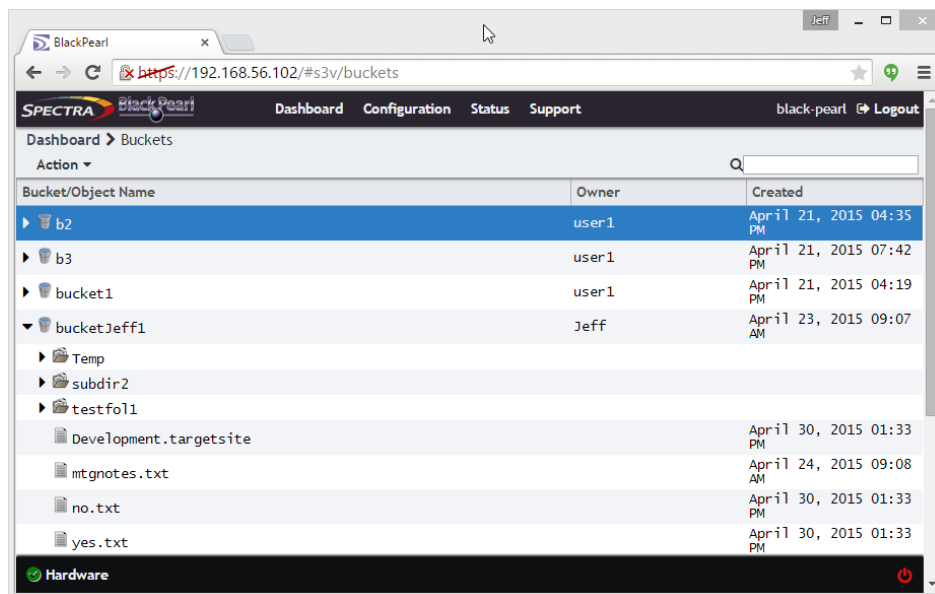


Figure 3 The BlackPearl web interface, showing buckets

EXISTING CLIENTS

Deep Storage Browser

Once the BlackPearl simulator is up and running, developers can download one of the existing Spectra S3 clients. This will help to better understand how BlackPearl works. We recommend starting with the Deep Storage Browser (formerly DS3 Browser). The Deep Storage Browser is available for Windows, Mac, and Linux. Developers can also view the source code for the Deep Storage Browser, which was created by Spectra Logic using our C Software Development Kit (SDK).

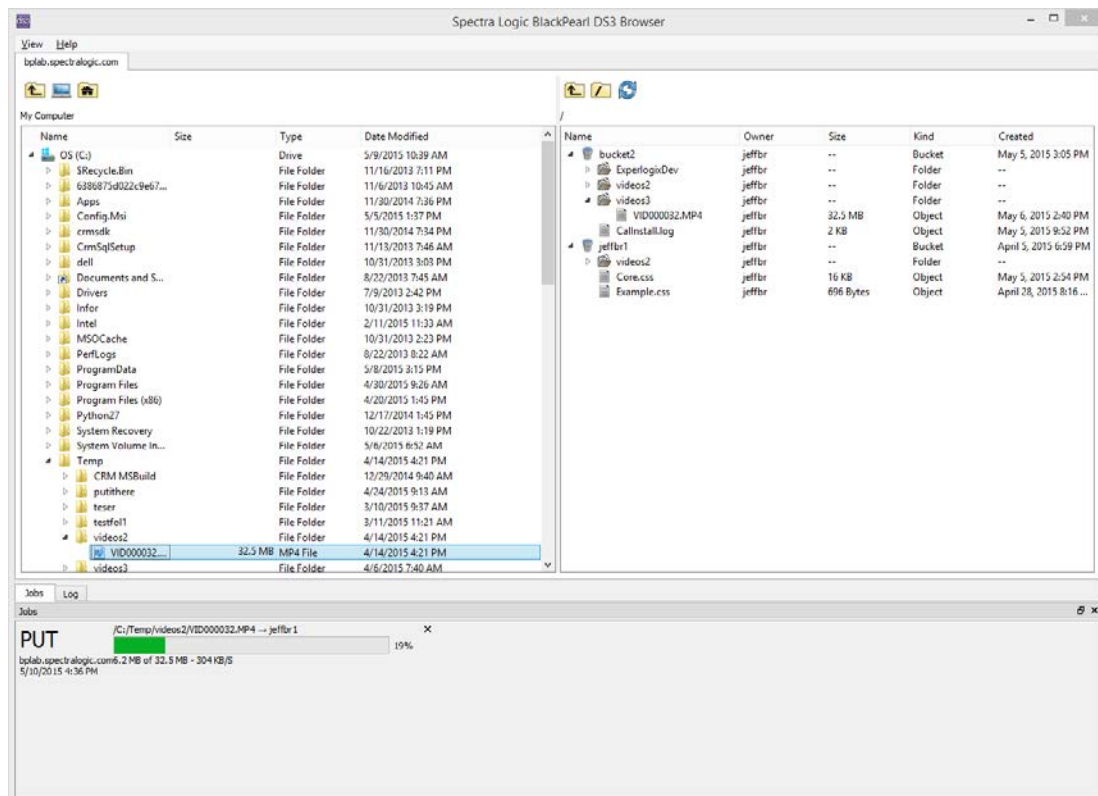


Figure 4. The Deep Storage Browser (formerly DS3 Browser)

The Deep Storage Browser is similar to a drag-and-drop, FTP-type client. The right side represents BlackPearl and the left side represents the user's local computer. Note that standard practice is to use the filename including the entire path with the folder delineators '/' included in the string as the object name. The Deep Storage Browser interprets these as an object name with the bucket name appended to the beginning of the object name. In this manner, a graphical representation of the object organization can be displayed as if it were a file structure even though the object structure is flat. When browsing the objects on the right, the user is actually

just browsing the metadata within BlackPearl. Tapes are not actually mounted until a put or get command is issued.

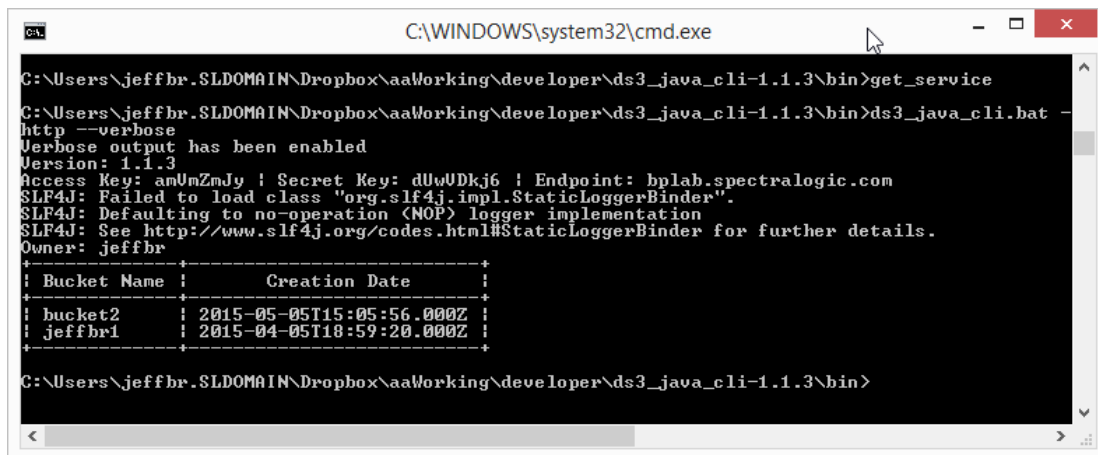
Users can drag a folder or file from their local computer to one of the buckets on BlackPearl. A bucket is a top-level container. Developers can go into the BlackPearl web interface to confirm that the object was moved to the bucket. Users can also use the Deep Storage Browser to move files and folders from BlackPearl back to their local computer.

The Deep Storage Browser can be used in manual workflow instances where movement of files to BlackPearl can be done real-time by users or administrators. It is also useful for retrieving files from BlackPearl that were moved to BlackPearl by another application or automated script. It can also be useful for understanding how BlackPearl works and can be used to manage data prior to a full client implementation. While many customers use the Deep Storage Browser as a short term solution to enable the BlackPearl environment in their existing workflow while they develop a fully integrated S3 client into their application, some customers are applying the Deep Storage Browser as the permanent method to move data in and out of Deep Storage manually.

The Deep Storage Browser was written using the [Qt Framework](#) and therefore will run on many platforms including Windows, Mac OSX and Linux. Spectra Logic provides pre-compiled version of the Deep Storage Browser for Windows, Mac and Linux, and users can also compile their own version using the source code with a C++ compiler.

Java Command-Line Interface

A Java-based Command-Line Interface (CLI) client is also available for download. The Java CLI allows users to issue common commands to the BlackPearl, such as GET and PUT, using a command-line interface on Windows, Mac, or Linux. The Java CLI is commonly used with cron jobs or scheduled tasks to move files to BlackPearl on a periodic basis.



```
C:\WINDOWS\system32\cmd.exe
C:\Users\jeffbr.SLDOMAIN\Dropbox\aaWorking\developer\ds3_java_cli-1.1.3\bin>get_service
C:\Users\jeffbr.SLDOMAIN\Dropbox\aaWorking\developer\ds3_java_cli-1.1.3\bin>ds3_java_cli.bat -
http --verbose
Verbose output has been enabled
Version: 1.1.3
Access Key: amUmZmJy ! Secret Key: dUwUDkj6 ! Endpoint: bplab.spectrallogic.com
SLF4J: Failed to load class "org.slf4j.impl.StaticLoggerBinder".
SLF4J: Defaulting to no-operation (NOP) logger implementation
SLF4J: See http://www.slf4j.org/codes.html#StaticLoggerBinder for further details.
Owner: jeffbr
+-----+
+ Bucket Name | Creation Date |
+-----+
+ bucket2     | 2015-05-05T15:05:56.000Z |
+ jeffbr1     | 2015-04-05T18:59:20.000Z |
+-----+
C:\Users\jeffbr.SLDOMAIN\Dropbox\aaWorking\developer\ds3_java_cli-1.1.3\bin>
```

Figure 5. The Java Command-Line Interface (CLI)

SOFTWARE DEVELOPMENT KITS

Once developers have seen a sample client in action, they can start building their own client. Spectra Logic has a number of Software Development Kits (SDK) available in several

programming languages to make client development easy. Developers can get the SDKs on the Downloads page of developer.spectralogic.com. The SDKs provide classes and methods for the most common Spectra S3 commands as well as helper applications that fully implement more complex S3 interface functions.

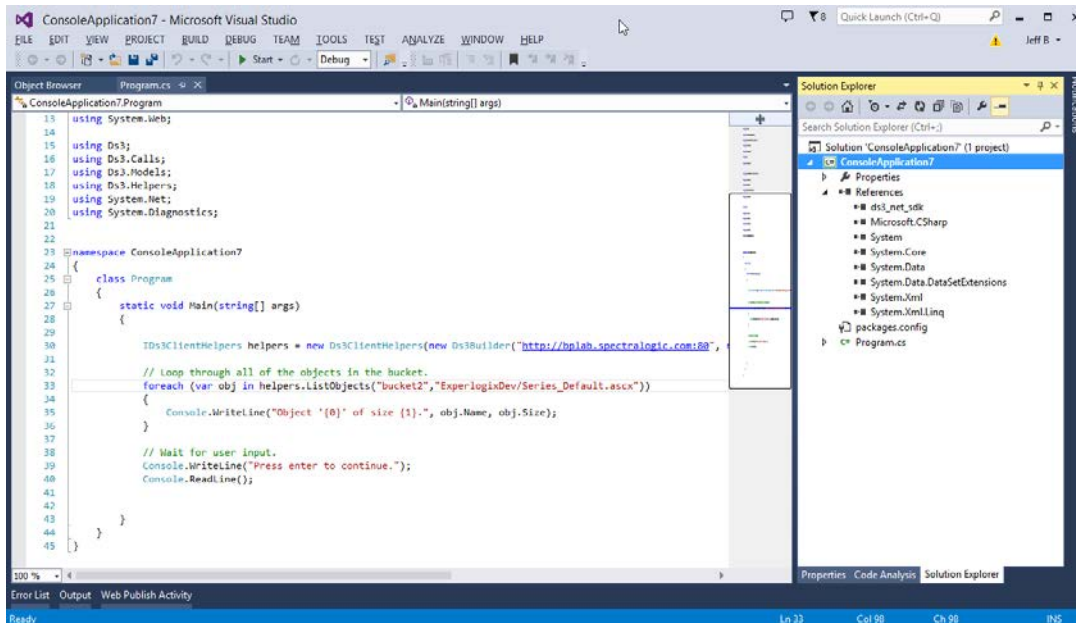


Figure 6. Developing a .NET Spectra S3 client in Microsoft Visual Studio using the C# SDK

The Documentation page on the Developer website provides assistance on installing the SDK in the appropriate development environment. There is also a full set of documentation and sample code for each SDK.

APPLICATION INTERFERENCE

If developers decide that they don't want to use the SDKs, and instead want to issue Spectra S3 commands via HTTP directly to BlackPearl, they can use the S3 API Reference. The API Reference contains a description of all available Spectra S3 commands.



Figure 7. The Spectra S3 (formerly DS3) API reference documentation

GETTING HELP

If developers need help or have any problems, they can use the Forums on the Developer website. They will need a Google account to post to the Forums. Questions are answered quickly by Spectra's Engineering Team.

CONCLUSION

The Spectra BlackPearl Gateway provides an S3-like interface to Spectra Logic deep storage tape libraries. The Spectra Logic Developer Program website provides all the needed tools to begin creating BlackPearl clients. The simulator, sample clients, SDKs, and documentation are all freely available for anyone to use to start creating Spectra S3 clients.

Deep Storage Experts

Spectra Logic develops deep storage solutions that solve the problem of long term storage for business and technology professionals dealing with exponential data growth.

Dedicated solely to storage innovation for more than 35 years, Spectra Logic's uncompromising product and customer focus is proven by the largest information users in multiple vertical markets globally.

Spectra enables affordable, multi-decade data storage and access by creating new methods of managing information in all forms of deep storage—including archive, backup, cold storage, cloud, and private cloud.

For more information, please visit <http://www.spectralogic.com>.

