

Morningstar DirectSM 3.20 Technical Specifications and Installation Procedures

Platform Requirements

Processor

- ▶ Intel® or AMD processor; 1.5GHz or faster

Memory

- ▶ 4GB (minimum)
- ▶ 8GB (recommended)

Disk Space

- ▶ 2 GB (minimum)

Operating Systems

- ▶ Windows 8.1
- ▶ Windows 10

Additional Tools/Plug-ins

- ▶ Microsoft Internet Explorer 11.0 (or higher)
- ▶ Required browsers for Direct Cloud, Asset Allocation & Portfolio Analysis: Google Chrome 48 (or higher), Mozilla Firefox 44 (or higher), Safari 5 (or higher) Microsoft Office 2010 (or higher) AdobeReader XI (or higher)
- ▶ Microsoft Windows Installer 3.1 (minimum)
- ▶ Microsoft .NET Framework 4.6.1 (required)
- ▶ Microsoft .NET Framework 4.7 required for Morningstar Direct Excel Add-In

Internet Connection

- ▶ Dedicated T1 (1.54Mbps) or faster connection

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Morningstar Direct is an Internet-based research platform that provides timely data on a wide range of investment types, as well as the rigorous research capabilities and customized reporting options.

Architecture

Morningstar Direct uses distributed 4-tier architecture for high performance, scalability, availability and inter-operability. It is architected and developed using object-oriented techniques and is highly modularized and componentized. Each class or component has its own dedicated functionality while communicating with other components through public interfaces and open standards (XML and HTTP). This enhances component reuse and reduces maintenance costs.

Investment Data

Investment data is included with the application which resides on Morningstar Direct servers and is updated continuously throughout the day. Data updates are delivered via HTTPS. Frequently used data are cached on the client side to ensure speedy response times. Microsoft SQL Server 2016 is used to store all the data. Only the database administrator has access to the database for maintenance purposes only.

Security

Morningstar uses Azure Update Manager to deploy patches to all workstations and servers. Workstations patches are tested then deployed. Server patches are defined by business unit promote to production (i.e. Dev, QA, followed by production). The Web servers are load-balanced for performance, scalability and availability. It uses TLS 1.2 throughout the

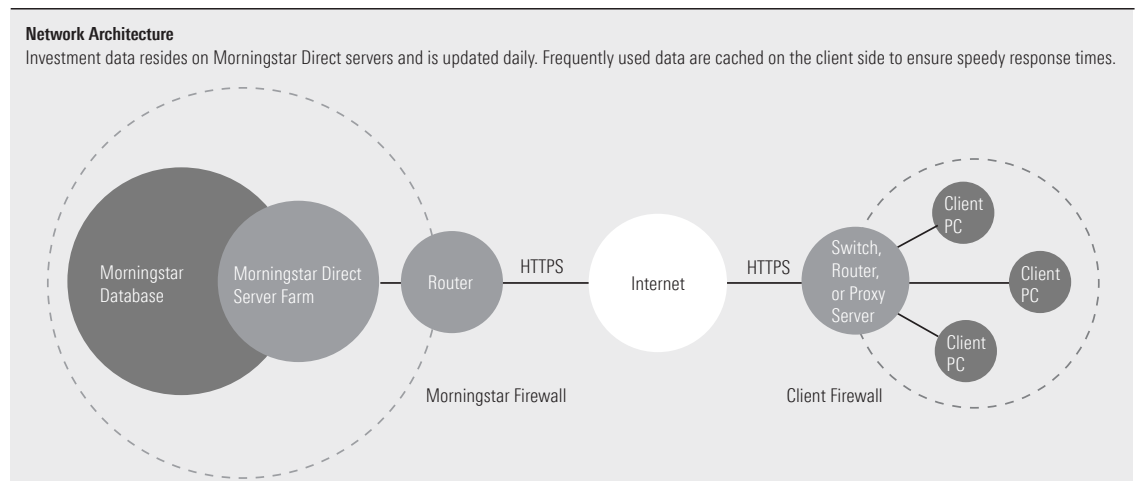
whole site to ensure maximum security. By keeping at least 40% headroom, the application ensures its site is responsive under high traffic and maintains high redundancy and availability.

All information is encrypted and protected using industry standard, such as TLS 1.2. Morningstar uses NewRelic and VictorOps for monitoring systems and automatic alerts are generated when critical systems reach specific thresholds. All workstations and servers have Cybereason anti-virus software installed.

Back-up and Recovery

All our servers are hosted in a secure and access-restricted area. Database transaction logs are backed up every hour and an incremental database backup is performed every day with the full database backup done weekly. We maintain a short term retention of 2-weeks on-prem and they are stored in a new backup disk, the vendor's name for this is Datadomain. All backups are moved to AWS S3-IA monthly. The data is erased electronically in need of destruction. We also keep inactive database servers and other spare servers for quick recovery of service. Web and application servers are fully redundant (two servers or more) with traffic and load determining the number.

To ensure quick response, we also perform periodic testing of these disaster contingency plans.



Morningstar Direct Technical Specifications and Installation Procedures

Login Information

All access to Morningstar Direct servers by an individual user is granted using a Unique Identification Code (UID) and password. UID is end-users' email address. Requests to terminate ID's may be made to the appropriate Morningstar personnel for employees who are transferred or terminate their employment. The Morningstar Direct system allows for immediate ID deactivation. All unsuccessful attempts to access application resources or transactions are logged. When a user ID is first created, the Morningstar Direct system will send an email to the user, and the user must set the password by using the link in that email.

The application does require that passwords be different than the User ID. Passwords are encrypted and protected via TLS 1.2 in transition, and hashed at rest. Minimum length of password is 8 characters, which can be recycled or reused, but is not recommended. Passwords do not expire and users can change their passwords at any time, if they are verified. Password characters are hidden, when logging in and when changing passwords within the application. The Morningstar Direct system will time out an inactive user session after 24 hours of inactivity. Concurrent logons to the same sessions are prohibited.

Morningstar Installation Procedures

Desktop (Client) Install

By default, the setup program creates a Morningstar folder under the C:\Program Files(x86) and C:\ProgramData directories. The program files include:

- ▶ Prerequisite files
 - ▶ Morningstar Direct related font files
 - ▶ Microsoft Visual C++ Redistributable files for 2015 (version 14.0.24212.0)
 - ▶ Microsoft Edge WebView2
- ▶ Main executable modules
- ▶ Auto-update module
- ▶ System files
- ▶ Presentation Studio
 - ▶ Microsoft .NET Framework 4.6.1

System Files Updated

Morningstar Direct will update the following system files if they are missing or the ones on the target system have lower version numbers.

| | | |
|---------------------------------|--------------|--------|
| MFC140U.DLL | 14.0.24212.0 | All OS |
| MSVCP140.DLL | 14.0.24212.0 | All OS |
| FinDerLibv21.dll | | All OS |
| gdiplus.dll | | All OS |
| Morningstar-1-U-LightItalic.ttf | | All OS |
| Morningstar-1-U-Light.ttf | | All OS |
| Morningstar-1-U-BoldItalic.ttf | | All OS |
| Morningstar-1-U-Bold.ttf | | All OS |
| Tt0300m_.ttf | | All OS |
| Tt0296m_.ttf | | All OS |
| MstarSym.ttf | | All OS |
| Morningstar1Lightm.ttf | | All OS |
| verdanaz.ttf | | All OS |
| verdanal.ttf | | All OS |
| verdanab.ttf | | All OS |
| verdana.ttf | | All OS |

Desktop Installation Methods

Morningstar Direct uses Windows Installer to install necessary files and set up environment. We require that Windows Installer 3.1 (minimum) be installed before Morningstar Direct is installed. There are two methods via which a user can install Morningstar Direct.

1. Install with Morningstar Direct's installation driver. This is the recommended installation method. Go to <https://gladmainnew.morningstar.com/dwsv2/direct/morningstardirectsetup.exe> and follow the instructions. The InstallShield Wizard will examine the user's machine, warn the user if Morningstar Direct cannot be installed on the target machine, and install necessary files accordingly. The InstallShield Wizard will also download additional installation files from Morningstar to complete the installation.

2. Directly install prerequisites and MSI packages.

Go to <https://gladmainnew.morningstar.com/dwsv2/direct/prerequisite.msi> to download prerequisites.

Then install full installation package through link: <https://gladmainnew.morningstar.com/dwsv2/direct/05/direct.msi>

Morningstar Excel Add-In Install

This requires a separate installation. Go to Morningstar Direct to access installation link or go to <https://addin.morningstarcommodity.com/>

Firewall/Proxy Server Configuration (exceptions)

If filter traffic via IP address, please open Firewall/Proxy for the following blocks of IP Addresses:

| | |
|------------------|------------------|
| 216.228.224.0/23 | 216.228.236.0/23 |
| 195.47.237.161 | 173.243.0.154 |
| 216.228.230.161 | 54.204.11.243 |
| 23.21.93.47 | |

Note: IP addresses for URLs hosted on Amazon CloudFront/CDN are not listed above because these will change constantly.

| URL's | Hosted with CDN | URL's | Hosted with CDN |
|-----------------------------------|-----------------|------------------------------------|-----------------|
| ftp.morningstar.com | × | doc.morningstar.com | × |
| advtools.morningstar.com | × | screener.morningstar.com | × |
| morningstardirect.morningstar.com | × | adcm.morningstar.com | × |
| adminnew.morningstar.com | × | gladmainnew.morningstar.com | × |
| oa.morningstar.com | × | awrd.morningstar.com | × |
| autodiscover.morningstar.com | × | corporate1.morningstar.com | × |
| analysis.morningstar.com | × | 529morningstar.com | × |
| analysisreport.morningstar.com | × | cef.morningstar.com | × |
| portfolios.morningstar.com | × | ajax.aspnetscdn.com | × |
| investors.morningstar.com | × | vimeo.com | × |
| performance.morningstar.com | × | f.vimeocdn.com | × |
| excelapi.morningstar.com | × | fast.fonts.net | × |
| gladpas.morningstar.com | × | akamaicdn.webex.com | × |
| addin.morningstarcommodity.com | × | ssl.google-analytics.com | × |
| portfolioanalysis.morningstar.com | × | www.google-analytics.com | × |
| gladcrm.morningstar.com | × | fonts.googleapis.com | × |
| gladtoolnew.morningstar.com | × | ajax.googleapis.com | × |
| assetallocation.morningstar.com | × | presentationstudio.morningstar.com | × |
| qt.morningstar.com | × | fundflows.morningstar.com | × |

| URL's | Hosted with CDN |
|-----------------------------------------------------|---------------------|
| direct.morningstar.com | ◆ Amazon CloudFront |
| quotespeed.morningstar.com | ◆ Amazon CloudFront |
| pullqs.morningstar.com | ◆ Amazon CloudFront |
| quotes.morningstar.com | ◆ Amazon CloudFront |
| im.mstar.com | ◆ Amazon CloudFront |
| mschart.morningstar.com | ◆ Amazon CloudFront |
| financials.morningstar.com | ◆ Amazon CloudFront |
| im.morningstar.com | ◆ Amazon CloudFront |
| uim-session-manager-awsprod.morningstar.com | ◆ Amazon CloudFront |
| insiders.morningstar.com | ◆ Amazon CloudFront |
| globalquote.morningstar.com | ◆ Amazon CloudFront |
| www.morningstar.com | ◆ Amazon CloudFront |
| etfs.morningstar.com | ◆ Amazon CloudFront |
| login-prod.morningstar.com | ◆ Amazon CloudFront |
| images.mscomm.morningstar.com | ◆ Amazon CloudFront |
| rtqimg.morningstar.com | ◆ Amazon CloudFront |
| mwc-cdn.morningstar.com | ◆ Amazon CloudFront |
| ctrsi-prod.fpf1779.eas.morningstar.com | ◆ Amazon CloudFront |
| direct-web-modules-prod.do41368.eas.morningstar.com | ◆ Amazon CloudFront |
| bi.morningstar.com | ◆ Amazon CloudFront |
| voila.morningstar.com | ◆ Amazon CloudFront |