Arius 2019b

Release Notes and
Installation Instructions

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Arius®

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1. Release notes

RELEASE 2019b ADDS A NUMBER OF NEW CAPABILITIES

What's new in Arius Deterministic

1. Factor smoothing

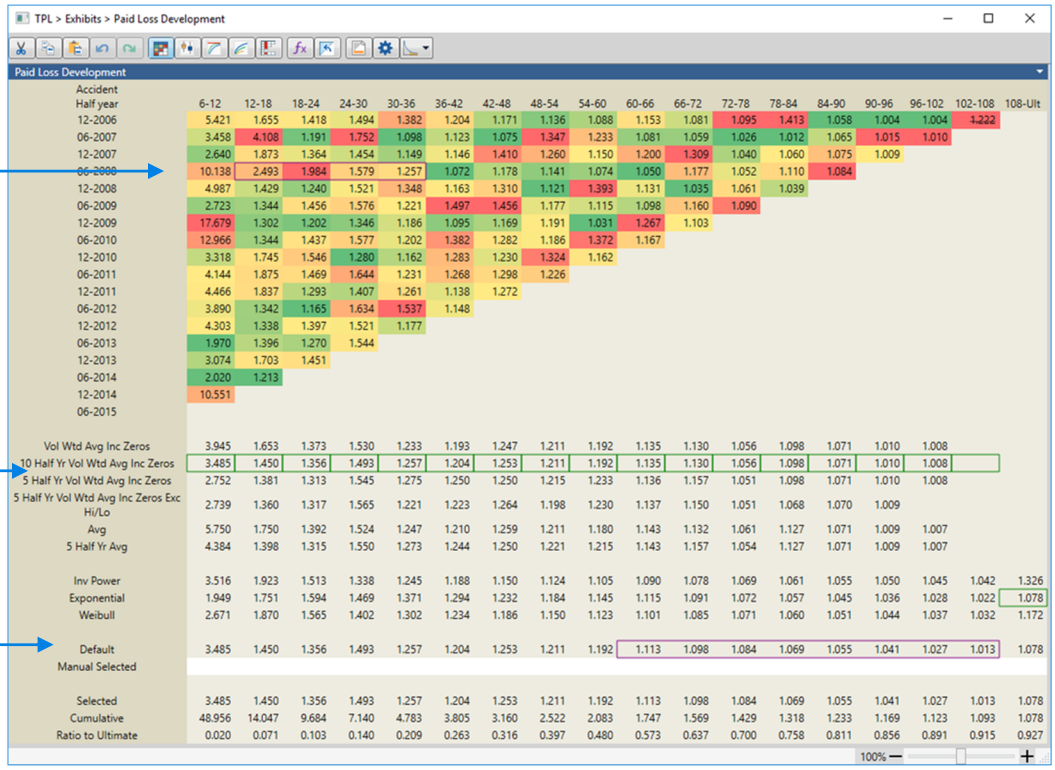
   You can now smooth factors across rows on exhibits. This allows you to account for erratic factors within a triangle of age-to-age factors, for example, providing smoothed factors to use in statistics and selections on the exhibit.

   Simply select/highlight factors in a row to be smoothed and right-click to select which algorithm – linear or exponential - to use. The new smoothed factors replace the actual factors on the exhibit and are denoted by a purple border.

Resulting smoothed factors display with purple border

Smoothed results are used in statistics calculations

You can also apply the smoothing algorithm to the Default row



Accident Half year	6-12	12-18	18-24	24-30	30-36	36-42	42-48	48-54	54-60	60-66	66-72	72-78	78-84	84-90	90-96	96-102	102-108	108-Ult
12-2006	5.421	1.655	1.418	1.494	1.382	1.204	1.171	1.136	1.088	1.153	1.081	1.095	1.413	1.058	1.004	1.004	1.222	
06-2007	3.458	4.108	1.191	1.752	1.098	1.123	1.075	1.347	1.233	1.081	1.059	1.026	1.012	1.065	1.015	1.010		
12-2007	2.640	1.873	1.364	1.454	1.149	1.146	1.410	1.260	1.150	1.200	1.309	1.040	1.060	1.075	1.009			
06-2008	10.138	2.493	1.984	1.579	1.257	1.072	1.178	1.141	1.074	1.050	1.177	1.052	1.110	1.084				
12-2008	4.987	1.429	1.240	1.521	1.348	1.163	1.310	1.121	1.393	1.131	1.035	1.061	1.039					
06-2009	2.723	1.344	1.456	1.576	1.221	1.497	1.456	1.177	1.115	1.098	1.160	1.090						
12-2009	17.679	1.302	1.202	1.346	1.186	1.095	1.169	1.191	1.031	1.267	1.103							
06-2010	12.966	1.344	1.437	1.577	1.202	1.382	1.282	1.186	1.372	1.167								
12-2010	3.318	1.745	1.546	1.280	1.162	1.283	1.230	1.324	1.162									
06-2011	4.144	1.875	1.469	1.644	1.231	1.268	1.298	1.226										
12-2011	4.466	1.837	1.293	1.407	1.261	1.138	1.272											
06-2012	3.890	1.342	1.165	1.634	1.537	1.148												
12-2012	4.303	1.338	1.397	1.521	1.177													
06-2013	1.970	1.396	1.270	1.544														
12-2013	3.074	1.703	1.451															
06-2014	2.020	1.213																
12-2014	10.551																	
06-2015																		
Vol Wtd Avg Inc Zeros	3.945	1.653	1.373	1.530	1.233	1.193	1.247	1.211	1.192	1.135	1.130	1.056	1.098	1.071	1.010	1.008		
10 Half Yr Vol Wtd Avg Inc Zeros	3.485	1.450	1.356	1.493	1.257	1.204	1.253	1.211	1.192	1.135	1.130	1.056	1.098	1.071	1.010	1.008		
5 Half Yr Vol Wtd Avg Inc Zeros	2.752	1.381	1.313	1.545	1.275	1.250	1.250	1.215	1.233	1.136	1.157	1.051	1.098	1.071	1.010	1.008		
5 Half Yr Vol Wtd Avg Inc Zeros Exc Hi/Lo	2.739	1.360	1.317	1.565	1.221	1.223	1.264	1.198	1.230	1.137	1.150	1.051	1.068	1.070	1.009			
Avg	5.750	1.750	1.392	1.524	1.247	1.210	1.259	1.211	1.180	1.143	1.132	1.061	1.127	1.071	1.009	1.007		
5 Half Yr Avg	4.384	1.398	1.315	1.550	1.273	1.244	1.250	1.221	1.215	1.143	1.157	1.054	1.127	1.071	1.009	1.007		
Inv Power	3.516	1.923	1.513	1.338	1.245	1.188	1.150	1.124	1.105	1.090	1.078	1.069	1.061	1.055	1.050	1.045	1.042	1.326
Exponential	1.949	1.751	1.594	1.469	1.371	1.294	1.232	1.184	1.145	1.115	1.091	1.072	1.057	1.045	1.036	1.028	1.022	1.078
Weibull	2.671	1.870	1.565	1.402	1.302	1.234	1.186	1.150	1.123	1.101	1.085	1.071	1.060	1.051	1.044	1.037	1.032	1.172
Default	3.485	1.450	1.356	1.493	1.257	1.204	1.253	1.211	1.192	1.113	1.098	1.084	1.069	1.055	1.041	1.027	1.013	1.078
Manual Selected																		
Selected	3.485	1.450	1.356	1.493	1.257	1.204	1.253	1.211	1.192	1.113	1.098	1.084	1.069	1.055	1.041	1.027	1.013	1.078
Cumulative	48.956	14.047	9.684	7.140	4.783	3.805	3.160	2.522	2.083	1.747	1.569	1.429	1.318	1.233	1.169	1.123	1.093	1.078
Ratio to Ultimate	0.020	0.071	0.103	0.140	0.209	0.263	0.316	0.397	0.480	0.573	0.637	0.700	0.758	0.811	0.856	0.891	0.915	0.927

2. Seasonal averages

   Arius provides this new type of average for use in the statistics section of exhibits in file structures with quarterly or semi-annual exposure periods. The new "SeasonalAverage" selection is available from the Exhibit Options | Statistics window, together with Average, Linear Trend, and Exponential Curve.

New seasonal averages display with other statistics on your exhibits

12-2010	1.416	1.056	1.010	1.002	1.000	1.005	1.000	1.000	1.000	1.000	1.000	1.000
03-2011	1.237	1.023	1.008	1.006	1.002	1.001	1.000	1.000	1.000	1.000	1.002	
06-2011	1.534	0.996	1.015	1.007	1.000	1.000	1.000	1.000	1.001	1.000		
09-2011	1.338	1.051	1.029	1.000	1.001	1.002	1.000	1.000	1.000			
12-2011	1.385	1.038	1.001	1.004	1.001	1.001	1.000	1.001				
03-2012	1.416	0.997	1.004	1.017	1.000	1.000	1.000					
06-2012	1.515	1.017	0.996	1.002	1.001	1.000						
09-2012	1.293	1.026	1.023	1.010	1.000							
12-2012	1.440	1.036	1.007	1.001								
03-2013	1.297	1.062	1.008									
06-2013	1.583	1.019										
09-2013	1.644											
12-2013												
Vol Wtd Avg	1.437	1.026	1.008	1.004	1.001	1.001	1.000	1.001	1.001	0.999	1.000	1.000
8 Qtr Vol Wtd Avg	1.444	1.031	1.010	1.006	1.001	1.001	1.000	1.000	1.000	1.000	1.000	1.001
12 Qtr Vol Wtd Avg	1.419	1.032	1.008	1.005	1.001	1.001	1.000	1.000	1.000	1.000	1.000	1.000
Vol Wtd S1 Avg	1.367	1.025	1.005	1.007	1.001	1.001	1.000	1.000	1.000	0.999	1.000	1.000
Vol Wtd S2 Avg	1.429	1.025	1.007	1.004	1.001	1.000	1.000	1.000	1.002	0.999	1.000	1.000
Vol Wtd S3 Avg	1.449	1.022	1.011	1.005	1.001	1.001	1.000	1.001	1.000	1.000	1.000	0.999
Vol Wtd S4 Avg	1.514	1.030	1.007	1.003	1.001	1.002	1.000	1.001	1.000	1.000	1.000	1.001
Default	1.514	1.026	1.008	1.004	1.001	1.001	1.000	1.001	1.001	0.999	1.000	1.000
Manual Selected												
Selected	1.514	1.026	1.008	1.004	1.001	1.001	1.000	1.001	1.001	0.999	1.000	1.000
Cumulative	1.578	1.042	1.016	1.008	1.004	1.003	1.002	1.002	1.001	1.000	1.001	1.001
Ratio to Ultimate	0.634	0.960	0.984	0.992	0.996	0.997	0.998	0.998	0.999	1.000	0.999	0.999

Seasonal averages allow you to build reports for ultimate loss projections based on 4 separate quarterly (or 2 half-year) development patterns.

Commercial Auto BI > Methods > Seasonal Paid Loss Development

Seasonal Paid Loss Development

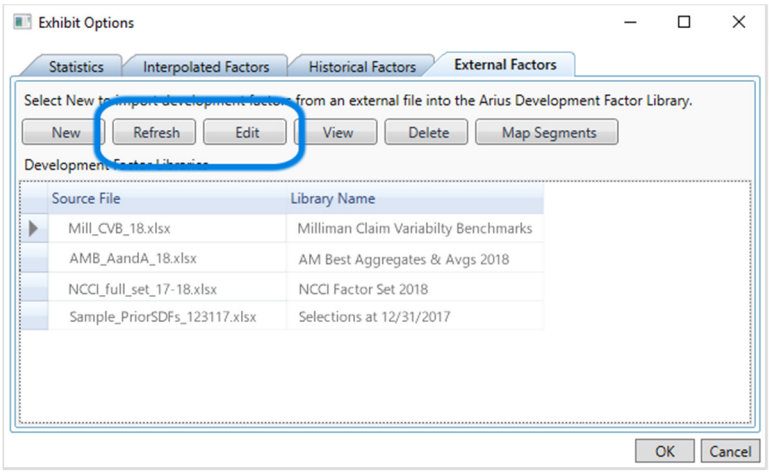
Accident Quarter	1Q Paid Loss Development Ultimate	1Q Weight	2Q Paid Loss Development Ultimate	2Q Weight	3Q Paid Loss Development Ultimate	3Q Weight	4Q Paid Loss Development Ultimate	4Q Weight	Ultimate Loss Based on Seasonal Paid Loss Development
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
12-2008	$ 2,631,547	0.000	$ 2,631,547	0.000	$ 2,629,525	0.000	$ 2,631,547	1.000	$ 2,631,547
03-2009	3,514,944	1.000	3,514,944	0.000	3,511,857	0.000	3,514,944	0.000	3,514,944
06-2009	2,401,211	0.000	2,401,211	1.000	2,398,819	0.000	2,401,211	0.000	2,401,211
09-2009	1,788,761	0.000	1,788,761	0.000	1,786,752	1.000	1,788,761	0.000	1,786,752
12-2009	3,186,951	0.000	3,186,951	0.000	3,182,932	0.000	3,186,951	1.000	3,186,951
03-2010	3,007,906	1.000	3,007,906	0.000	3,003,667	0.000	3,007,906	0.000	3,007,906
06-2010	2,108,941	0.000	2,108,619	1.000	2,114,192	0.000	2,172,597	0.000	2,108,619
09-2010	4,230,046	0.000	4,293,722	0.000	4,366,623	1.000	4,306,233	0.000	4,366,623
12-2010	3,754,992	0.000	2,823,148	0.000	3,100,596	0.000	2,921,707	1.000	2,921,707
03-2011	1,470,029	1.000	1,172,186	0.000	1,341,902	0.000	1,197,292	0.000	1,470,029
06-2011	1,951,319	0.000	1,565,825	1.000	1,950,632	0.000	1,516,417	0.000	1,565,825
09-2011	10,845,053	0.000	9,796,583	0.000	13,074,011	1.000	8,972,072	0.000	13,074,011
12-2011	2,811,067	0.000	2,266,977	0.000	3,333,370	0.000	1,956,170	1.000	1,956,170
03-2012	4,467,058	1.000	3,964,280	0.000	6,366,775	0.000	3,191,012	0.000	4,467,058
06-2012	4,627,498	0.000	5,790,335	1.000	8,067,239	0.000	3,939,135	0.000	5,790,335
09-2012	1,509,394	0.000	1,980,089	0.000	3,050,541	1.000	1,452,891	0.000	3,050,541
12-2012	3,043,570	0.000	2,939,403	0.000	5,752,210	0.000	2,585,904	1.000	2,585,904
03-2013	2,112,662	1.000	1,452,406	0.000	2,991,150	0.000	1,573,210	0.000	2,112,662
06-2013	3,793,836	0.000	4,363,574	1.000	5,733,307	0.000	3,477,777	0.000	4,363,574
09-2013	3,569,543	0.000	3,796,504	0.000	6,699,181	1.000	1,767,347	0.000	6,699,181
Total	$ 66,826,327		$ 64,844,971		$ 84,455,281		$ 57,561,084		$ 73,061,551

100%

3. External factor refresh

   You can import development factors into an Arius data file for comparative use on exhibits (industry factors, internal company benchmarks, history, etc.). New with this release, Arius now retains the locations of the source XLSX files and the other relevant information necessary so that you can update your Arius file with new information whenever it is available in the source file.

Note the new Refresh and Edit buttons on the External Factors tab

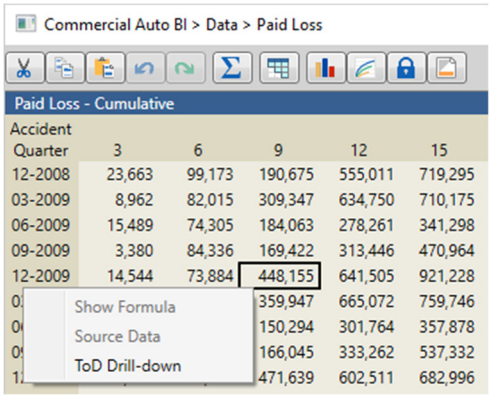


4. Canadian PfAD Reports

   We enhanced these reports to include ULAE reserves and introduced new formula-driven assumption arrays for the Claim Development and Interest Rate PfADs for added flexibility. See the user documentation on "Canadian Provision for Adverse Deviation" for more information.

5. Drill-down into triangle cell detail

   For any data triangles created with Triangles on Demand, a new right-click menu item provides a listing of the records that make up the balance in the highlighted cell. Simply right-click on a cell and select "ToD Drill down." (The short cut of Ctrl+Alt+J also provides this list.) This gives you an easy way to investigate potential irregularities or unusual amounts in your triangles.



What's new in Arius Stochastic

1. New export of shifted incrementals

   When you enable the "Use Selected Unpaid As Mean" option within an ODP Bootstrap Model for any segment, and have selected to export the incrementals to a CSV file (either by iteration or by year), a new CSV file containing the shifted incrementals will be created for each segment in which this option is selected.

2. Calculation updates

   - We made a change to the hat matrix calculation in the event that entire exposure periods were treated as outliers. This was done to correct the calculation of residuals for the ODP model. Previously, treating entire rows (at the top of a given triangle) as outliers – or utilizing an "all prior" row – would lead to incorrect residual estimation due to the system not properly resizing the hat matrix.

     For example, a 10x10 triangle will now generate the same residuals as an 8x8 triangle under both of the following conditions:

     - The first two rows of the 10x10 triangle are blank; and
     - The first two rows of the 10x10 triangle are identified as outliers.

   - In Arius 2019a, we introduced a number of changes related to the loss ratio object, more generally, utilizing the Arius "Ultimate Premiums" array as the source, instead of the "Earned Premium" array.

     There is also a failsafe in place in the system, so when the Ultimate Premiums array is not populated, the loss ratio exhibit relies on the "Earned Premium" array.

     Arius 2019a introduced an issue where in this case (no ultimate premium, but earned premium) the "totals" row for the loss ratio objects would show "Infinity" (division by zero). We corrected the total row to now refer to the total of the Ultimate Premiums vector or (if that is not populated) the total of the Earned Premium.

What's new in Triangles on Demand

1. Azure performance levels

   We added the ability for users to manage your Azure site's Performance Level settings. These settings allow someone with the proper security permission to adjust the level of performance that the Azure cloud provides to your ToD subscription. Higher Performance Levels can provide faster processing of data loads and queries, though there is higher cost from Microsoft for that service.

   We have also added a new permission setting within Roles that allows users with this permission to make these Performance Level adjustments for your site.

2. Advanced Query enhancements

We made a number of small but helpful improvements to the user interface for improved usability.

3. New list utility

   We added a new utility to generate a list of all Claim IDs in the resulting data set returned by an Advanced Query.

4. Last Modified by/date

   You will now see Last Modified by/date information on all ToD listings (Queries, Rollups, Groups, and Mappers).

What's new in Arius Enterprise

1. Azure performance levels

   The same capabilities noted in Triangles on Demand above are available in Arius Enterprise as well.

2. Delete multiple projects

   You can now delete multiple projects at one time from within the Projects screen. Simply use the check boxes to select one or more projects and then press the Delete icon. The ability to delete projects is only available to Users/Roles with the proper permission to do so.

FIXES AND USABILITY IMPROVEMENTS IN THIS RELEASE

Arius Deterministic

- We changed the way interpolated ages are calculated when saving interpolated factors back to the Historical Factor library and where the triangles are asymmetrical or in runoff. Saving interpolated factors in the historical factor library makes it easier to display and use them on future exhibits, and it also impacts cash flow calculations for these particular data structures. The new algorithm utilizes the formula "First Development Age" - "Length of Development (e.g., 3 for Quarter, 6 for Half-Year, 12 for Year) + "Length of Last Calendar Period" for the first age and then adds the Length of Development for subsequent ages. This release will now display new interpolated ages and resulting factors on the exhibits for triangles that are asymmetrical or in runoff.
- Fixed an issue where the Modify Structure process is applied to a file where a row does NOT get added or removed (e.g., appending last diagonal on an asymmetrical triangle in runoff). In this case, the value in a Weights column should NOT shift, though in prior versions of Arius it could incorrectly shift on formula-driven assumptions tables.
- When Modify Structure was to remove the last evaluation period of an asymmetrical data set in runoff, the System could incorrectly remove the default selection (green box) in the last row and

also the value in Manual Selected column in last row. This could occur in both formula-driven assumptions arrays and Comparison of Ultimates tables. This has been fixed in version 2019b.

Arius Stochastic

- We corrected an issue in which different stochastic models would generate different formatted filenames when exporting incrementals to a CSV file, specifically when the project title contained special characters. Export filenames will now be consistent across models.
- In Windows 10, the treatment of infinity has been changed from "infinity" to the universal infinity symbol (∞). This causes errors when using the Arius API interface to retrieve vectors containing infinity (age-to-age factors, BF Implied CoVs, etc.). We put an override in place to return the text "infinity" in place of the "∞" in all cases, independent of operating system.

Triangles on Demand

- We changed the maximum time before a long-running data load command times out, and made the time-out setting configurable rather than fixed at the default set by Azure. We also added the ability for users to cancel a load from ToD into Arius.
- We fixed an issue with use of Measure Mapper wherein the batch update process would rely on the most recently used Measure Mapper in the load/update rather than the Measure Mapper that was specifically identified in the script.
- We eliminated the possibility of a server error in the Arius Create Segments/Load data processes if you re-name a ToD DB and the only change was to the capitalization of the database name.
- We made several fixes to the Advanced Query Builder:
  - We substantially improved the run-time for Advanced Queries using NOT IN = {ClaimIDs}
  - Advanced Queries could get stuck in a "Preparing" state when a Data Load process is also concurrently run (causing a time-out) or when a user deletes data in the database that's required by the query (resulting an invalid query). These are now fixed.
  - Adding or removing values in Advanced Query Groups might not be properly reflected in the Arius Create Segments list in prior releases, but is handled correctly in 2019b.
  - We fixed an "unknown error" message on the web portal if a user creates an Advanced Query with same name as existing regular query.
  - The system no longer allows you to drag Claim ID into a "Group By" section.

Arius Enterprise

- When using a "measure mapper" in the "Load from TOD" command in batch script, the system could use the measure mapping last saved within the Enterprise project rather than the one specified in the script. Arius now uses the specified script in all cases.
- When filtering the projects list on the Analysis tab, the list could sometimes show projects as being selected but then they did not get included in the actual batch run. This has been fixed.

- When cancelling a job, it was not always obvious that the system had recognized the request to cancel. Instead, the overall job status could continue to say “Executing” until the current project(s) completed.
  - Now the system will show the status “Cancelling…” at the job level, and all projects that were previously in “pending” status will show “Cancelled.”
  - This applies to Batch scripts, Export to APJ, Direct Imports, and updates to Extract tables.

FILE COMPATABILITY

This system will open and work with data files from your current and previous versions of Arius.

Any data files created, edited, or saved in this version 2019b system *will not work with earlier versions of Arius*, and they cannot be shared with others on your team who do not have this version 2019b of Arius.

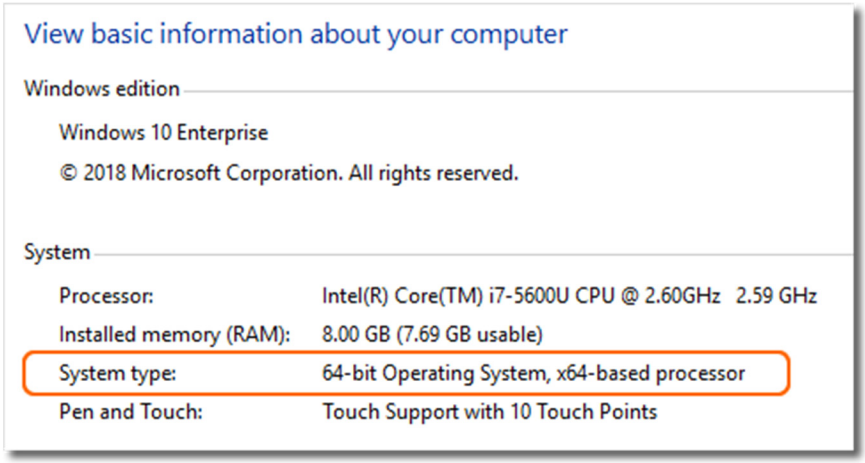
2. Installation requirements

System requirements for the basic Arius system are as follows:

- Minimum operating system: Microsoft Windows 10, 64-bit version.
- Minimum hard disk space: 3.5 GB
- Minimum RAM: 1024 MB, though 2048 MB or more is recommended
- Related tools: Microsoft Office 2007 or newer (Arius does not support Microsoft Office XP). Arius and its API support both 32-bit (Arius v3.2 and prior) and 64-bit (Arius v2019a or later) versions of Microsoft Office. Arius requires the Microsoft .NET Framework 4.7.2 or newer and Microsoft Visual C++ 2017 Redistributable (x64). (Many Windows installations may already have this; you can confirm it at CONTROL PANEL | PROGRAMS AND FEATURES.)
- An Internet connection for license authentication at http://admin.actuarialSoftware.com

To assure that your Windows system is a 64-bit version (especially with older Windows 7 or 8) you can check your system:

Select **Start** and type "Control Panel." Click to open Control Panel and select **System**. You should see something similar to the window below.



3. Installation instructions for Arius Deterministic and Stochastic

Note: Administrator privileges are required to perform this installation.

In most cases, this will be a multi-step installation process. You will:

- **Run the install program** for the new Arius software.

  If there is already a version of Arius installed, the installer will first uninstall that copy. This WILL NOT affect any data files.

  If this is a new installation of Arius, it will likely also require an install of the Matlab runtime.

- If you are directed to install the Matlab runtime, once it completes, **rerun the Arius installer**, which will install Arius.

- A note about moving from old 32-bit Arius to this newer 64-bit or vice versa:

  The Arius install system automatically uninstalls existing Arius systems before installing its latest package. It cannot automatically do that

  - when you upgrade from an old 32-bit version (3.2.1 or earlier) to this latest system, or
  - when you downgrade from this latest system to an older 32-bit version (3.2.1 or earlier).

  In either of those cases, you should first manually uninstall Arius via Control Panel. Go to Start|Control Panel|Programs and Features and select Arius to delete it.

  Anyone moving from Arius 2019a to 2019b or vice versa does not need to worry about uninstalling Arius as part of this process.

To install this software:

1. Close any existing version of Arius and all Excel workbooks before beginning the Arius installation process.
2. Click the **Download** link and **Save** (do not Open) AriusSetup_v2019b.zip onto your computer.
3. Locate the downloaded file and unzip it to Extract (do not Run) AriusSetup_v2019b.exe.
4. After it is extracted, **right-click** on the EXE file and select **Run as Administrator**.

   Some users may first need to install a newer copy of the MATLAB runtime system. When prompted to run the Matlab installation, select **Yes** to download the runtime files. The system downloads the MATLAB Installer from the MATLAB site, and you can then follow the instructions to install the runtime.

   You will then re-run the AriusSetup_v2019b.exe install. **Right-click** on AriusSetup_v2019b.exe and select **Run as Administrator**.[A]

   [A] You may also see the system installing the Microsoft Visual C++ 2017 Redistributable (x64) library. This is required for Arius 2019b, and if it is not present on your computer, the install routine will install it from the Microsoft downloads server.

Arius also requires that the Microsoft .NET Framework version 4.7.2 is installed with your operating system. This will already be the case for most users. However, if the installation routine detects that this is necessary, your IT team may need to download this from Microsoft and install it.

4. Additional information

After installation, the application is listed as Arius in your START|ALL PROGRAMS listing.

The system installs with three sample project files. They can be found at:

C:\Users\<yourname>\Documents\Milliman\Arius\DemoFiles or perhaps displayed as *Libraries\Documents\Milliman\Arius\DemoFiles*

- Arius_Sample.apj – Sample data with 5 segments, a mix of short-, medium-, and longer-tailed lines of business. This is intended to give you a sense of the system's capabilities and a sampling of how the models can be set up with different assumptions for different lines. Note that all of the segments don't necessarily work with all of the models (much like in the real world...).
- ODP_Mack_Hayne.apj – Sample data with 3 segments, showing a detailed implementation of all three families of stochastic models fully parameterized.
- Hayne_Paper.apj – Contains the data used in Dr. Roger Hayne's paper on Maximum Likelihood Estimator approaches, "A Flexible Framework for Stochastic Reserving Models."