

DFdiscover 2019 Version 5.2.0 Release and Installation Notes

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Version 5.2.0

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Abstract

The release notes for version 5.2.0 summarize the new features that have been added and those features that have been changed. It also details any unique requirements of the installation process.

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Preface

1. Getting Help

DF/Net Research, Inc.'s Technical Support Department can be contacted Monday to Friday between 9:00 am and 5:00 pm Eastern Time via any of the following methods:

55 Head Street, Suite 403
Dundas, Ontario L9H 3H8
Telephone: (905) 522-3282
Email: <support@datafax.com>
URL: www.dfnetresearch.com

2. Conventions

A number of conventions have been used throughout this document.

Any freestanding sections of code are generally shown like this:

```
# this is example code  
code = code + overhead;
```

If a line starts with # or %, this character denotes the system prompt and is not typed by the user.

Text may also have several styles:

- Emphasized words are shown as follows: *emphasized words*.
- Filenames appear in the text like so: `dummy.c`.
- Code, constants, and literals in the text appear like so: `main`.
- Variable names appear in the text like so: `nBytes`.
- Text on user interface labels or menus is shown as: **Printer name**, while buttons in user interfaces are shown as **Cancel**.
- Menus and menu items are shown as: **File > Exit**.

3. Version Numbering

DFdiscover version numbers can have up to 3 components.

The first number identifies a major release containing all software components with both new features and bug fixes.

The second number identifies a minor release with bug fixes, backward compatible features and contains all software components. If there is no minor release for a major release, this number is 0.

The third number identifies incremental patches (bug fixes only) to specified software components for the minor release identified by the first 2 digits of the version number. If there is no patch release for a major or minor release, this number is 0.

For example,

- 5.0.2 is the second patch to the 5.0.0 major release.
- 5.2.1 is the first patch to the 5.2.0 minor release.

Chapter 1. New Features in DFdiscover 2019

Version 5.2.0

A comprehensive list of the new and updated features of the release is available in the DFUG 2019 presentation, [Presenting DFdiscover 2019](#). A brief summary is included here.

1.1. DFcollect

DFcollect is a tablet app, available for Android on Google Play™, and for iOS® through the App Store®. Like **DFweb**, it is built on top of the DFdiscover API and offers direct entry and review of data in permitted DFdiscover studies.

DFcollect is ideally suited for sites participating in a trial where mobile data collection is needed. **DFcollect** is able to work in online and offline settings.

DFcollect now includes the ability to use the device camera, capture a picture of a document and attach it to the current record. Further, 95% of the edit check language's functionality is enabled. **DFcollect** includes many other feature and stability improvements.

Please consider the following before deploying **DFcollect**:

- Your DFdiscover server requires the **DFWS** feature. This is an additional part of the license that must be purchased and installed.
- **DFcollect** may or may not be an appropriate tool for a specific clinical trial. Please consult with the clinical trial team to determine whether it meets study requirements and its use is permitted.
- **DFcollect** does not (yet) support electronic signatures, lookup tables or some built-in edit check functions. For complete edit check implementation details, visit [Edit check Function Compatibility Notes](#) in the Programmer Guide. For trials needing all of these functions, **DFexplore** continues to be the correct tool.
- **DFcollect** is actively developed and maintained. Improvements, new features and bug fixes may be released on a schedule that is independent of DFdiscover major or minor releases. To take advantage of the latest features and fixes, check Google Play™ or the iOS® App Store®. To always have the most recent version installed:
 - On Android™, check **Enable auto update**. Further information is available on [this Google Play™ help page](#).
 - On iOS®, enable **Automatic Downloads** or **App Updates**. Consult [this Apple® support page](#) for more information.

1.2. DFweb

New in this release, **DFweb** includes:

- access to almost 100% of the edit check language functionality,
- the ability to display CRFs with a paper layout appearance, in addition to the existing eCRF appearance,
- functionality to resume the previous session,
- many other feature and stability enhancements.

DFweb offers a targeted subset of features from **DFexplore**, offering direct data entry and review from an HTML5 capable web browser. There is no client application to install. **DFweb** is ideally suited for sites participating in a trial that are restricted

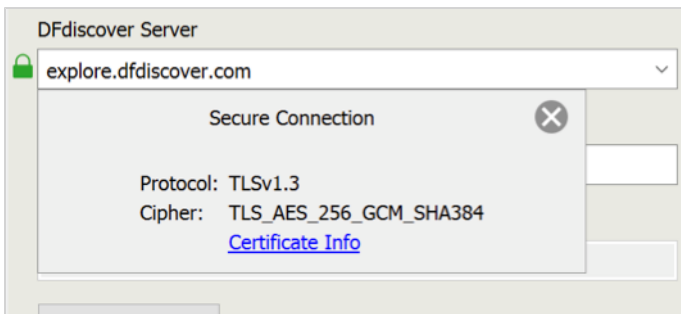
from installing **DFexplore**, yet need to enter subject data, review subject data and respond to queries. **DFweb** is built on top of the DFdiscover API,

Please consider the following before deploying **DFweb**:

- Your DFdiscover server requires the DFWS feature. This is an additional part of the license that must be purchased and installed.
- **DFweb** may or may not be an appropriate tool for a specific clinical trial. Please consult with the clinical trial team to determine whether it meets study requirements and its use is permitted.
- **DFweb** does not (yet) support electronic signatures, lookup tables or some built-in edit check functions. For complete edit check implementation details, visit [Edit check Function Compatibility Notes](#) in the Programmer Guide. For trials needing all of these functions, **DFexplore** continues to be the correct tool.
- **DFweb** is actively developed and maintained. Improvements, new features and bug fixes may be released on a schedule that is independent of DFdiscover major or minor releases. The version number and build date information on the login banner indicate when this has occurred. There is nothing to install to take advantage of the newest features. There is also no way to opt-out of the updates.

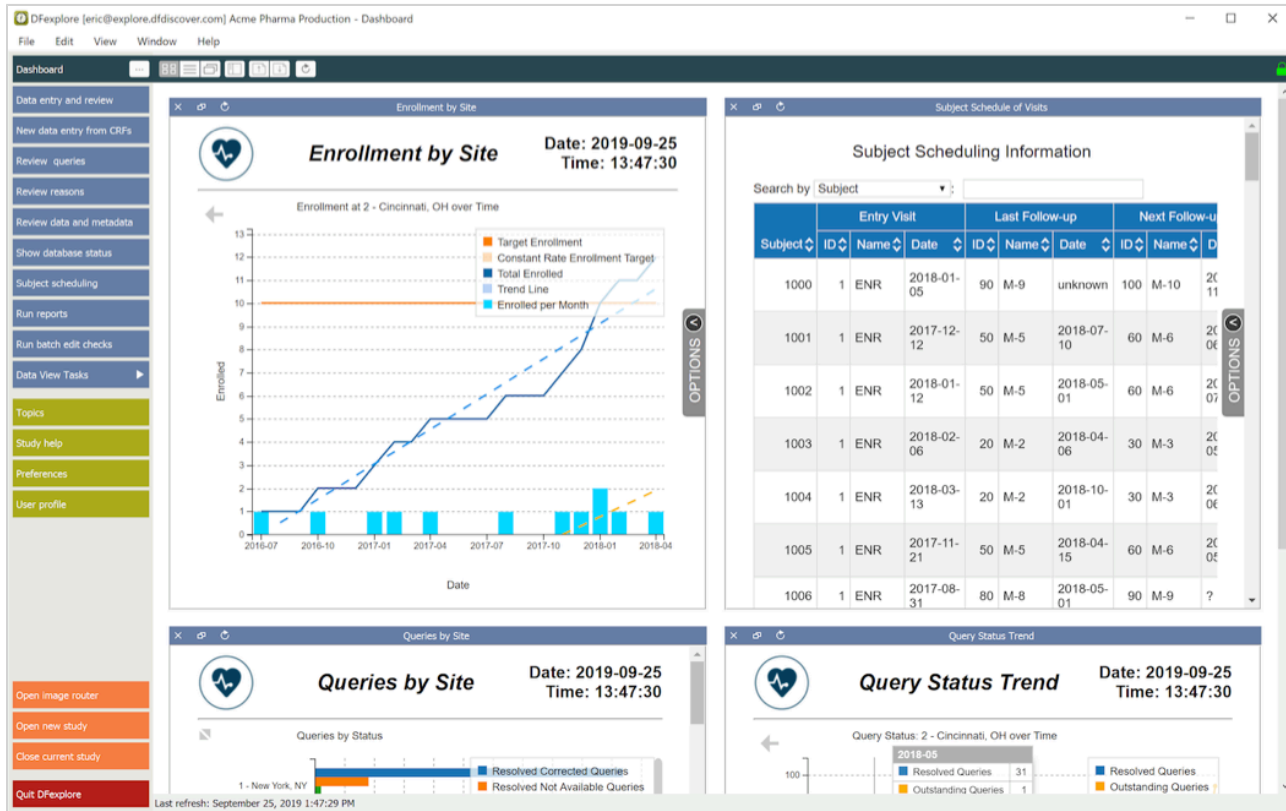
1.3. Security Updates

DFdiscover 2019 implements the latest industry advances in security and encryption, including 4096-bit keys for certificate exchange and TLS 1.2/1.3. There is added visual verification of protocol and cipher information, as well as visual verification that communication is end-to-end encrypted.



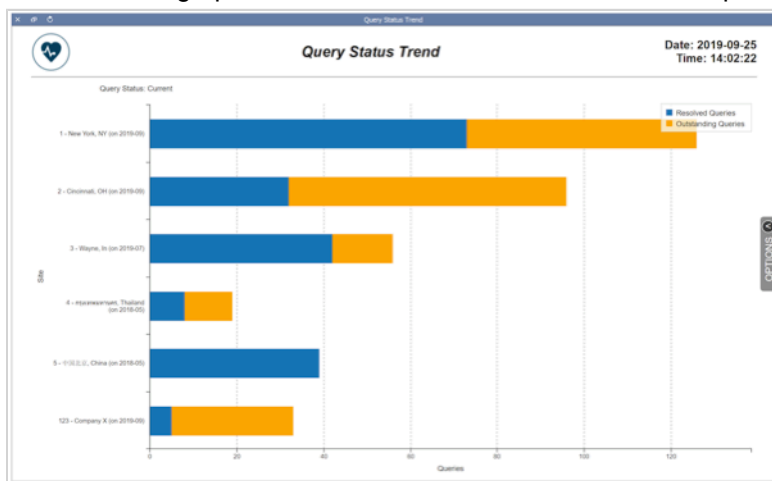
1.4. Enhanced Dashboard View

With DFdiscover 2019 it is now much easier to control the contents and appearance of **DFexplore**'s Dashboard View. From Reports View, any report can be easily pinned so that it always appears in the Dashboard View. The contents are easily re-organized to 1-column or 2-column presentation and any chart can be detached, making it available in it's own window.



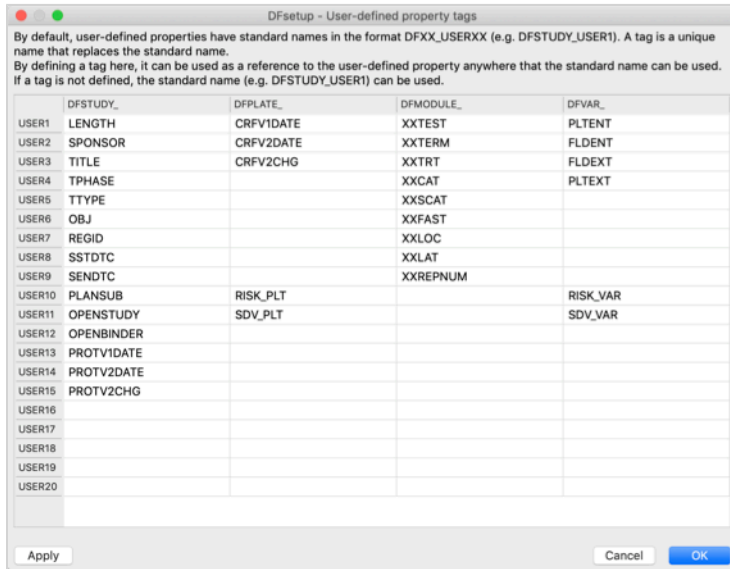
1.5. Trend Reports

Three new trend reports have been added. They include summary views across all permitted sites of query status (resolved versus outstanding), number of days to resolve queries, and the number of days to complete initial data entry. The detail view for a site graphs the trend in the measures over time, reported month-by-month.



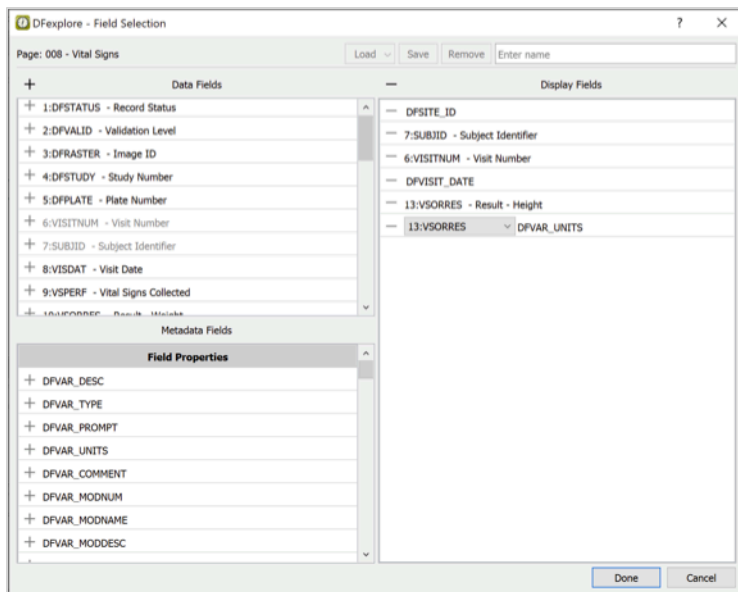
1.6. User-defined Properties

The definition of each field, module, plate and study can be extended by adding user-defined properties. Up to 20 properties can be added at each level. The properties are available in the study setup export (for documentation purposes), data exports and can be referenced in all edit checks.



1.7. Metadata Exports

Field selection and metadata inclusion have been optimized and now all results are available directly in List View. Previous separate interfaces have been combined into one interface to include, or exclude data fields, and add any metadata property, including new user-defined properties.



1.8. Customizable Login Screen

The login screen for desktop client applications has been updated to offer more space for the customizable login banner (which can itself now be web-sourced, rather than the previous static requirement), display different presentation methods for study selection, and present additional details regarding encryption and security of the server communication.

Chapter 2. Supported Configurations and Known Issues

2.1. Supported Configurations

DFdiscover 2019 Version 5.2.0 is supported in the following configurations:

- **Server:**

- OpenSUSE version Leap 42.1 and newer
- SUSE Tumbleweed
- RedHat Enterprise Linux version 7

DFdiscover is a 64-bit server application. It installs on the 64-bit versions of any of these Linux distributions. It will not run on 32-bit systems. Other Linux distributions may work, but are unsupported. Debian distributions such as Ubuntu will not work at this time. CentOS and Oracle Linux are clones of RHEL and will work as expected. CentOS 8 is not officially supported at this time.

Solaris is not supported.

- **Client:**

- Windows 10 and newer
- macOS 10.13 (High Sierra) and newer

2.2. Known Issues

The following issues were known at the time of release. Issues are identified by operating system or application if they are not generally applicable.

- **macOS, Windows, Linux.**

- The study setup definition written by **DFsetup** now contains new keywords to maintain user-defined properties. While all versions of DFdiscover tools can read them, **DFsetup** in DFdiscover 2018 cannot write them. **For studies that are planning to implement user-defined properties, ensure that all DFsetup users are using DFdiscover 2019.**
- Before requesting a certificate signing by DF/Net Research, Inc., to take advantage of 4096-bit keys, remove the local file, `/opt/dfdiscover/lib/edccert.pem`. Then use **DFserveradmin** or **DFcertReq** to send the certificate signing request.
- For customers that are upgrading from DFdiscover 2018, the value of **CDN_URL** in **DFadmin's Master** tab must be updated to read `https://cdn.dfdiscover.com/v5.2`.
- A **DFsetup** user in Normal access mode can enable **Allow Multiple Queries per field** in **Global Settings** after they save the study setup at least once in a session.
- In **DFsetup**, it is not possible to use Shift-Tab to set the input focus to the **Prompt** field from the first input field of either the **Basic** or **Detail** tabs. Click the **Prompt** to set its input focus.
- In **DFsetup**, the column presentation order of fields differs between **Field List** and **Export as Excel**.

- In Dashboard View of **DFexplore**, saving to PDF or printing a dashboard with multiple reports, writes them all to the same page. This can lead to individual reports becoming unreadably small.
- In **DFadmin**, when a user is set inactive, the behavior has changed compared to previous versions. Now, all role permissions are also inactivated. Should a user need to be reactivated, their role permissions must also be reactivated.
- **Linux.**
 - HylaFAX is no longer included with the DFdiscover distribution. It can however be downloaded from internet repositories, installed and used as it was in all previous versions.. If traditional faxing is no longer used for sending/receiving, set **Fax Service** to **EMAIL** in **DFadmin's Traffic** tab.
- **macOS.**
 - In **DFexplore** Image View, some fields may rarely appear as blacked out while tabbing through them. Clicking on them again refreshes the presentation and renders the field and value correctly.
- **DFcollect Android.**
 - The auto logout timer is not 100% accurate. On slower CPUs and older tablets, it can drift so that the actual timeout interval is longer than expected.
- **DFweb.**
 - Textarea fields on Microsoft Edge don't include a resize ability, so string fields with a display smaller than the store length cannot be expanded to display all text without scrolling.
 - In the rare case where a file cannot be loaded because the filename extension does not match the actual file type, the helper app (for example a PDF viewer) may request the user to reload the page. Do not do this as it will reload the current page, causing any unsaved data to be discarded.
 - Certain unusual formats for string fields (like `abcde^`) may cause the input cursor to be positioned incorrectly while typing.
 - For a choice/check field which contains an illegal value, the warning message includes the codes, not the labels, of the legal choices.
 - In the **Change Password** dialog, it is possible to enter a password of more than the limit of 64 characters. Doing so will cause the password to be truncated and may result in the user account being locked.
 - If an essential field contains a missing value code, it is not treated as such. This may cause implausible value testing to clear the missing value code.
 - **DFweb** does not handle reason codes. If an existing reason, which also has a code, is updated, the reason is maintained and the previous code is not.

Chapter 3. New and Changed Features

This chapter provides a summary of all changes to DFdiscover since DFdiscover 2018 Version 5.1.0.

3.1. Summary of All Changes

The changes are identified as one of the following type:

- **doc-fix.** This is a fix that was applied to the documentation only.
- **sw-fix.** This is a fix that was applied to the software.
- **sw-new.** This is a completely new feature of the software.

	Type	Synopsis
1.	sw-fix	Qt has been updated to the most recent long-term support (LTS) version, 5.12. OpenSSL has been updated to 1.1.1a, which includes support for TLS 1.3.
2.	sw-fix	Sort optimizations have been added to several JSON objects returned in API requests. This will simplify/remove sort work that an API client may have to do.
3.	sw-fix	<p>The following documented issues in the DFdiscover 5.0.0 and 5.1.0 releases have been addressed:</p> <ul style="list-style-type: none"> • Cmd+T, Cmd+B are available only if the system preference General > Show scroll bars is set to Always. • The fill color from the color picker in DFsetup changes slightly as it moves from the color picker dialog to the field properties. If the value is directly entered as displayed in the color picker dialog, the result is correct. • The behavior of the Copy and Paste keyboard shortcuts is inconsistent. In some environments, the keyboard shortcuts are handled by the operating system and in some they are handled, correctly, by DFsetup. Use the menu items to avoid this problem. • Resuming a previous session which was timed out and then immediately switching to a Dashboard View which takes several seconds to update may cause the display to not update completely. Re-executing the view switch, or re-selecting the current view, resolves the issue. • In the customization panel for Dashboard View, the Subject Tracking group is shown but does not contain any options. It should not be shown. • In the CRF view, the Fill Color input field has moved to be before the Display input field. In Field List view, it still appears after the Display column.
4.	sw-fix	<p>The following documented known issues in DFdiscover 5.1.0 reports have been addressed:</p> <ul style="list-style-type: none"> • The Database Setup report does not include screen breaks and grouping information. Similarly, exporting to Excel does not include screen breaks and grouping. • The Categorical Age charts in the Queries by Site incorrectly label the x-axis as 'Days' when it should be '#ofQueries'. • Legacy Reports do not generate Excel output.
5.	sw-fix	This change fixes a bug that could cause DFoutbound.rpc to exit unexpectedly if a DFfaxq request is received and the outgoing document queue is empty.

	Type	Synopsis
6.	sw-fix	Several improvements have been made to the Site Enrollment report, including a bug which could lead to mis-counting subjects if the study visitmap referenced multiple baseline visits.
7.	sw-fix	DFATK has been updated to: <ul style="list-style-type: none"> • perform version checking against the study server, and • remove unused content (deleted images and old schema definitions) from several module start states.
8.	sw-fix	The following issues in DFExplore have been corrected: <ul style="list-style-type: none"> • If a field requires a (new) reason, and the reason is added using the metadata panel, the Add Reason dialog still appears when leaving the field. The dialog should not appear. • In Data view, if Field > Revert is chosen or the Revert to Old Value button is clicked in the reason dialog, the data field becomes read-only. The read-write state should not change. • If no legal range is defined and the field data value is reset to the No Choice or Not Checked value, the resolved Missing Value query is not updated. The query should be automatically un-resolved.
9.	sw-fix	This change fixes a bug in DFedcservice . Under specific circumstances, it was possible for query records updated via the API to not save the text of the query reply.
10.	sw-fix	The following issues in DFExplore have been corrected: <ul style="list-style-type: none"> • In Define View mode it was possible to use the Filter sub-panel. The sub-panel should be hidden as its use is not appropriate for this view. • While toggling between Queries View and Data View, or Reasons View and Data View, it is possible for the queries/reasons filter settings to be lost when returning back from Data View.
11.	sw-fix	Conditional syntax in the scheduling maps and the new Schedule View has been updated to once again allow numeric ranges. Several updates to rules regarding finding the actual visit date and the screening visit, plus termination visits, have been applied.
12.	sw-fix	Several issues in DFcollect have been fixed / improved. <ul style="list-style-type: none"> • For numeric fields that also have coding, never display the label in query and reason dialogs. • When determining if a numeric field has been edited, ignore leading 0s. • For a choice or check field, which is defined as having an Essential value, the legal value testing has been updated. • The logic that infers the category for a new query has been updated to consider all field and value attributes. • Ensure that characters such as : and \ in the study name or visit labels are not interpreted as delimiters.
13.	sw-fix	The About dialog now contains information about the security settings (TLS version and encryption method) that has been negotiated between the client and server.
14.	sw-fix	DFcollect has been updated to gracefully handle swipe events that terminate DFcollect.

	Type	Synopsis
15.	sw-fix	This change fixes the following bug in DFedcservice . For new server installations only, the absence of inbound and outbound configurations will cause DFAdmin and DFedcservice to exit unexpectedly.
16.	sw-fix	Several improvements have been made to the dashboard view in DFExplore, including the ability to add charts directly from Reports View, re-order charts and present charts in 1-column, 2-column or tabbed view.
17.	sw-fix	DFbatch has been updated to call <code>DFopen_study</code> before the first batch in the batchlist is loaded.
18.	sw-fix	Output from string data type fields has been updated to use the system font rather than the old behavior of constant width font.
19.	sw-fix	Previously, meta-words in field description were not decoded despite being described as behaving that way in the documentation. This change fixes that bug so that meta-words in the description are decoded.
20.	sw-fix	Several bugs related to the display and selection of grouped fields in DFsetup have been fixed.
21.	sw-fix	DFsetup now warns a user if they are opening a setup file which is newer than the version expected. In the event of new study setup, DFsetup no longer displays warnings that default styles are being recovered.
22.	sw-fix	New edit check functions, <code>dfday()</code> , <code>dfmonth()</code> and <code>dfyear()</code> have been added to the language.
23.	sw-fix	A bug in DFsetup that could create duplicate coding has been fixed. The bug occurred in check styles or check fields where labels were defined but not the numeric codes.
24.	sw-fix	A bug that resulted in DFcollect returning an incorrect value from the <code>dflevel()</code> edit check has been fixed.
25.	sw-fix	The API Server preference in DFcollect has been updated to allow configuration of the port number over which communication to the API server occurs.
26.	sw-fix	The action of DFAdmin when loading user/role/permissions has been sped up significantly by optimizing order of operations.
27.	sw-fix	An overflow condition that could cause DFbatch to lose contact with the study server has been corrected.
28.	sw-fix	An error in use of large study numbers (> 255) in queries has been addressed in DFserver.rpc.
29.	sw-new	New preferences have been defined and implemented in <code>dfpref</code> and <code>dfprefinfo</code> . These expose edit check control over which of the 8 schedule views are visible by default.
30.	sw-new	Three new reports, and a new 'Trend' report category, have been added. The new reports present over time data for query resolution status (outstanding vs resolved), time to query resolution and time to first data entry.
31.	sw-new	Positioning of fields in DFsetup has been updated to allow more control over inter field alignment.
32.	sw-new	Backend library dependencies have been updated to the most recent versions. Oracle SQL (18.3) and PostgreSQL (11.2) library support in DFsqlload, as well as several other open source libraries have been updated (libtiff.so.5.4, libstdc++.so.6, libevent.so.2.0.5, libssl.so.1.0.2k, libcrypto.so.1.0.2k).
33.	sw-new	Non-legacy reports can now take advantage of customizable fonts in their html5 output. Further, DFdiscover reports that include graphs/charts can take advantage of customizable color palettes. For these reports a keyboard accelerator to switch between views in the chart has also been added.

	Type	Synopsis
34.	sw-new	The login dialog for all client tools has been updated.
35.	sw-new	In DFExplore, the Dashboard and Reports View, are now able to remember and restore the user settings of the Options drawer.
36.	sw-new	The Apply action has been removed from the metadata panel. Updates are now automatically saved in memory and applied to the study database when the user chooses a record status.
37.	sw-new	A study / style / field level preference has been added which permits the DFsetup user to define when the presentation style of choice boxes versus drop-down list will be used.
38.	sw-new	Attached document handling in DFcollect has been updated to: <ul style="list-style-type: none"> • display more metadata information about each attachment • include a download to local option • access the local camera and use it to acquire document photos to attach to the current record
39.	sw-new	The ability to add metadata fields to List View presentation has been added and also removed from the export data operation.
40.	sw-new	The following new requests have been added to DFedcservice and the API: <ul style="list-style-type: none"> • get plate background image • get queries for a specific site • get contents of lookup table in a compact format • get all setup information in one request • verify user credentials
41.	sw-new	DFsetup does not allow user to enter valid characters for field description in the field paste dialog. This bug has been fixed.
42.	sw-new	DFweb can now display standard CRFs using data entry fields over a background image, the same as they appear in DFExplore.
43.	sw-new	DFsetup field and style property dialogs have been visually modified to group property subsets under different tabs.
44.	sw-new	HylaFAX is no longer included in the DFdiscover server rpm. A new option, email only, has been added to outbound configuration.
45.	sw-new	Study specific, user-defined properties can now be added to the study setup definition at the field, module, plate and study level.
46.	sw-new	Certificates signed by DF/Net have been updated to use 4096-bit RSA keys.
47.	sw-new	DFcollect now supports the French language setting for user interface elements.

Chapter 4. Installation

This release of DFdiscover is a complete release. It can be installed as a new install or as an upgrade of any previous release. Existing studies will continue to work in the updated installation, once migrated with the **DFmigrate** utility (required for upgrades from pre-2014.X releases).

4.1. Pre-upgrade Steps

The steps in this section are required only for an upgrade installation. Skip this section if you are performing a new installation on a system where DFdiscover is not running.

4.1.1. Halt DFdiscover

Before installing, the existing DFdiscover installation must be stopped.

To halt DFdiscover,

1. **Ensure that all users have exited DFdiscover.**

This is easiest if the installation is performed at a pre-arranged time when all users are known to be out of DFdiscover.

2. **Shutdown DFdiscover.**

As the DFdiscover administrator, shutdown is initiated using the command:

```
% /opt/dfdiscover/bin/DFshutdown -f
```

4.1.2. Halt HylaFAX if required

If you are using HylaFAX to send and receive faxes, you must stop the existing HylaFAX installation. If you are using Protus fax services you can skip this step.

To halt HylaFAX,

1. **Wait for incoming/outgoing faxes to terminate.**

Use **faxstat** to monitor the status of any faxes that are being received or sent, as in:

```
# /opt/hylafax/bin/faxstat -a
```

For each idle modem, turn the modem off - this will prevent it from answering another incoming call. Repeat as necessary until all modems are off.

2. **Shutdown HylaFAX daemons.**

As super-user, this can be accomplished using the command:

```
# /etc/init.d/hylafax stop
```

3. **Disable faxgetty processes.**

A **faxgetty** process is spawned by **init** for each defined modem. These processes must be disabled separately. Edit the `/etc/inittab` file and for each record that references **faxgetty**, replace the word `respawn` in field 3 with `off`. Save the changes and exit the file.

The `init` process must be informed that the file has been updated. Do this with the command:

```
# kill -1 1
```

This is the end of the pre-upgrade steps.

4.2. Installation

Release 5.2.0 is a complete release that includes all components. Installation of complete releases is documented in the [Software Installation Guide](#). Follow the instructions in that guide.

4.3. Post-upgrade Steps

4.3.1. Restart DFdiscover

DFdiscover must be restarted following the upgrade. To restart, as super-user, use the command:

```
# /opt/dfdiscover/bin/DFbootstrap
DFmaster.rpcd: your software license expires in 290 days
1. Checking state of incoming daemons...
2. Checking /opt/dfdiscover/work/.dfincoming_work...
   0 stale incoming entries obsoleted
3. Checking /opt/dfdiscover/incoming...
   0 faxes awaiting processing.
   # DFmaster.rpcd: started.
Done.
```

4.3.2. Update value of `CDN_URL`

This step is required only if upgrading from a previous DFdiscover release, and is not required for new installs or when upgrading from a previous DataFax release.

This release includes updated resources used during the display of graphical report output. Those resources are specified in the value of `CDN_URL` in the system master configuration. To inspect and update the value:

1. Start **DFadmin**.
2. Click the **Master** tab to display the master configuration panel.
3. Inspect the value specified for **CDN_URL**.
4. If the value reads `https://cdn.dfdiscover.com/v5.2`, it is already up-to-date and no change is needed. Exit **DFadmin**.
5. Otherwise, update the value to read `https://cdn.dfdiscover.com/v5.2`.
6. Click **Save** to apply the change.
7. Exit **DFadmin**.

4.3.3. Restart HylaFAX if required

Note

HylaFAX is no longer distributed with DFdiscover. If it is still needed, download and install the official build from an internet repository.

If you use HylaFAX, it must be restarted following the upgrade. To restart, as super-user:

1. Enable faxgetty processes.

Edit the `/etc/inittab` file and for each record that references **faxgetty**, replace the word `off` in field 3 with `respawn`. Save the changes and exit the file.

The **init** process must be informed that the file has been updated. Do this with the command:

```
# kill -1 1
```

2. Restart HylaFAX daemons.

As super-user, issue the command:

```
# /etc/init.d/hylafax start
```

This is the end of the post-upgrade steps.

4.4. Documentation

Documentation Updates

The documentation included with the release rpm, and the client packages, is a snapshot of the documentation at the time that the release was built.

The documentation is maintained and updated regularly. For the most up-to-date version of the documentation, please use the online documentation, hosted on www.dfnetresearch.com at [DFdiscover 2019 Version 5.2.0](#).

Release 5.2.0 is accompanied by updates to all of the documentation. The documentation is installed on the server into the `doc` directory as part of the installation process.

The documentation for the release is available in the following formats:

- HTML
- PDF

4.4.1. HTML documentation

This is the "native" documentation format for DFdiscover and is displayed when selecting the **Help > Topics** menu item in each client tool.

The documentation can be found under the `doc` directory of `/opt/dfdiscover`. The main index page that is the starting point for all of the documentation is `/opt/dfdiscover/doc/allman/html/index.html`.

The HTML documentation can be copied from the `/opt/dfdiscover/doc` directory to a suitable location on a web server by simply copying the entire `doc` directory hierarchy to a new location. It is important to maintain the relative positions of

files and directories within that hierarchy so that the across-guide hyperlinks stay intact. The original `doc` hierarchy should additionally be maintained, if possible, as this is the location that the help browsers built-in to the DFdiscover tools expect.

The documentation can also be viewed with traditional web browsers such as Edge, Firefox, Chrome, Safari, etc.

4.4.2. PDF documentation

The documentation set includes PDF documentation in separate files for each of the software manuals.

The PDF documentation can be found under the `doc` directory of `/opt/dfdiscover`. The PDF file for a specific manual is located below this directory in a further `manual/pdf` directory. For example, the PDF file for the Programmer's Guide (progman) is `/opt/dfdiscover/doc/progman/pdf/progman.pdf`.

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When a program is linked with a library, whether statically or using a shared library, the combination of the two is legally speaking a combined work, a derivative of the original library. The ordinary General Public License therefore permits such linking only if the entire combination fits its criteria of freedom. The Lesser General Public License permits more lax criteria for linking other code with the library.

We call this license the "Lesser" General Public License because it does Less to protect the user's freedom than the ordinary General Public License. It also provides other free software developers Less of an advantage over competing non-free programs. These disadvantages are the reason we use the ordinary General Public License for many libraries. However, the Lesser license provides advantages in certain special circumstances.

For example, on rare occasions, there may be a special need to encourage the widest possible use of a certain library, so that it becomes a de-facto standard. To achieve this, non-free programs must be allowed to use the library. A more frequent case is that a free library does the same job as widely used non-free libraries. In this case, there is little to gain by limiting the free library to free software only, so we use the Lesser General Public License.

In other cases, permission to use a particular library in non-free programs enables a greater number of people to use a large body of free software. For example, permission to use the GNU C Library in non-free programs enables many more people to use the whole GNU operating system, as well as its variant, the GNU/Linux operating system.

Although the Lesser General Public License is Less protective of the users' freedom, it does ensure that the user of a program that is linked with the Library has the freedom and the wherewithal to run that program using a modified version of the Library.

The precise terms and conditions for copying, distribution and modification follow. Pay close attention to the difference between a "work based on the library" and a "work that uses the library". The former contains code derived from the library, whereas the latter must be combined with the library in order to run.

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The "Library", below, refers to any such software library or work which has been distributed under these terms. A "work based on the Library" means either the Library or any derivative work under copyright law: that is to say, a work containing the Library or a portion of it, either verbatim or with modifications and/or translated straightforwardly into another language. (Hereinafter, translation is included without limitation in the term "modification".)

"Source code" for a work means the preferred form of the work for making modifications to it. For a library, complete source code means all the source code for all modules it contains, plus any associated interface definition files, plus the scripts used to control compilation and installation of the library.

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This option is useful when you wish to copy part of the code of the Library into a program that is not a library.

5. You may copy and distribute the Library (or a portion or derivative of it, under Section 2) in object code or executable form under the terms of Sections 1 and 2 above provided that you accompany it with the complete corresponding machine-readable source code, which must be distributed under the terms of Sections 1 and 2 above on a medium customarily used for software interchange.

If distribution of object code is made by offering access to copy from a designated place, then offering equivalent access to copy the source code from the same place satisfies the requirement to distribute the source code, even though third parties are not compelled to copy the source along with the object code.

6. A program that contains no derivative of any portion of the Library, but is designed to work with the Library by being compiled or linked with it, is called a "work that uses the Library". Such a work, in isolation, is not a derivative work of the Library, and therefore falls outside the scope of this License.

However, linking a "work that uses the Library" with the Library creates an executable that is a derivative of the Library (because it contains portions of the Library), rather than a "work that uses the library". The executable is therefore covered by this License. Section 6 states terms for distribution of such executables.

When a “work that uses the Library” uses material from a header file that is part of the Library, the object code for the work may be a derivative work of the Library even though the source code is not. Whether this is true is especially significant if the work can be linked without the Library, or if the work is itself a library. The threshold for this to be true is not precisely defined by law.

If such an object file uses only numerical parameters, data structure layouts and accessors, and small macros and small inline functions (ten lines or less in length), then the use of the object file is unrestricted, regardless of whether it is legally a derivative work. (Executables containing this object code plus portions of the Library will still fall under Section 6.)

Otherwise, if the work is a derivative of the Library, you may distribute the object code for the work under the terms of Section 6. Any executables containing that work also fall under Section 6, whether or not they are linked directly with the Library itself.

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Also, you must do one of these things:

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- b. Use a suitable shared library mechanism for linking with the Library. A suitable mechanism is one that
 - i. uses at run time a copy of the library already present on the user’s computer system, rather than copying library functions into the executable, and
 - ii. will operate properly with a modified version of the library, if the user installs one, as long as the modified version is interface-compatible with the version that the work was made with.
- c. Accompany the work with a written offer, valid for at least three years, to give the same user the materials specified in Subsection 6a, above, for a charge no more than the cost of performing this distribution.
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5.1.15. c3.js

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5.1.16. d3.js

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