DFdiscover 2018 Version 5.1.0 Release and Installation Notes

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Version 5.1.0

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Abstract

The release notes for version 5.1.0 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. DFdiscover Mailing List

DF/Net Research, Inc. provides an automated email mailing list for tips, help, and interaction with other DFdiscover users.

To subscribe to the mailing list, complete the simple form found at the DFdiscover User's Group mailing list webpage. It is also possible to unsubscribe from the mailing list by visiting the same webpage.

Procedure 1. To submit a message to the mailing list

1. Subscribe to the list. Message submissions are only accepted from members of the list.
2. Create your email message.
3. Send the email message to <DFUG@datafax.com>.

3. 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**.

4. 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, backwards comptaible 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,

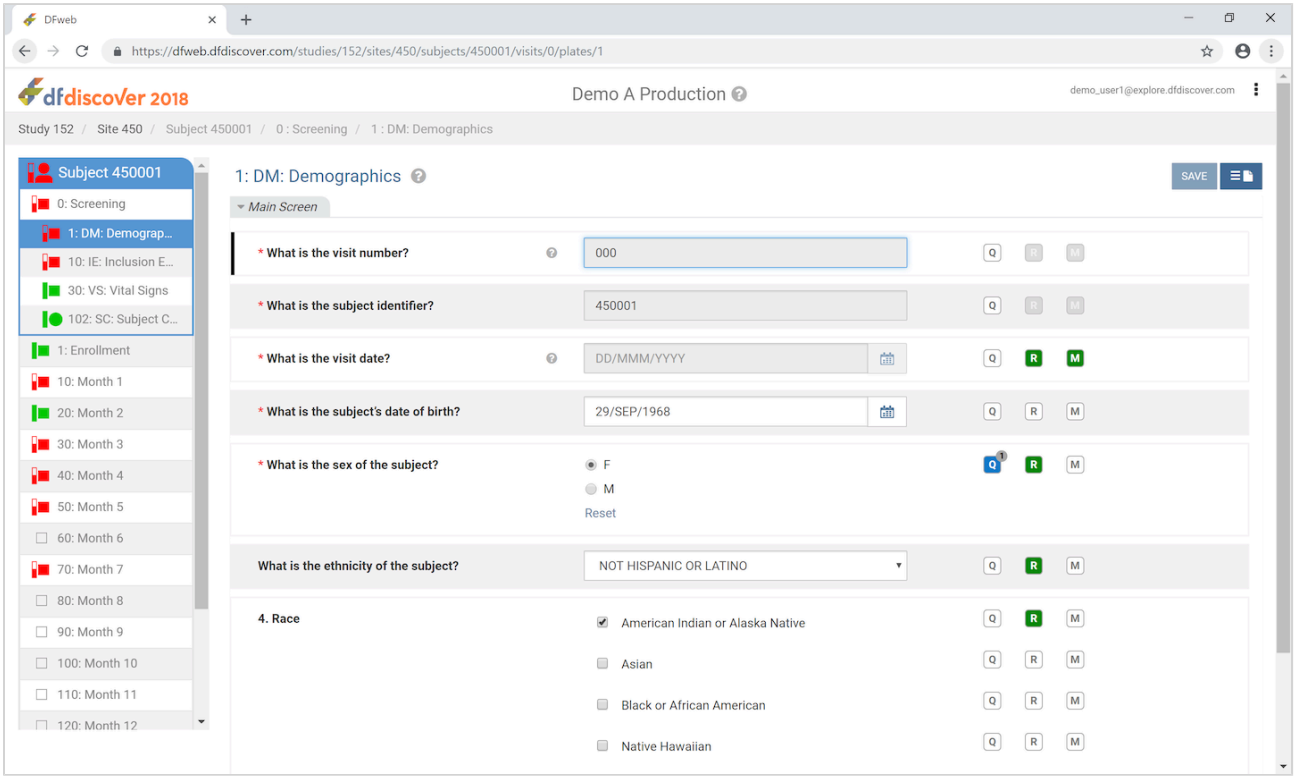
- 5.0.2 is the second patch to the 5.0.0 major release.
- 5.2.1 is the first patch to the 5.2.0 minor release.

Chapter 1. New Features in DFdiscover 2018 Version 5.1.0

1.1. DFweb

DFweb is a new feature, built on top of the DFdiscover API, that offers direct data entry and review from an HTML5 capable web browser. There is no client application to install.

DFweb offers a targeted subset of features from **DFexplore**. **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.



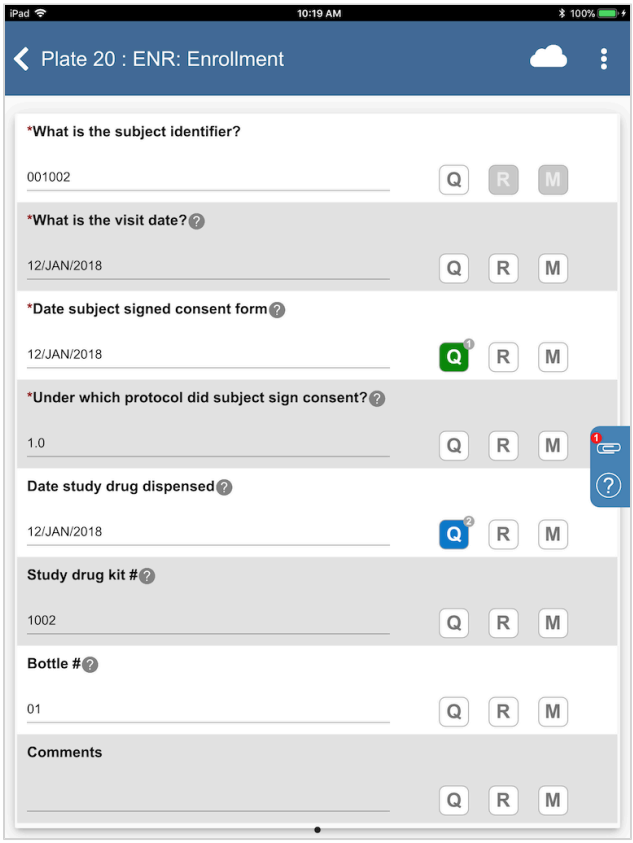
DFweb is an application built to demonstrate the power and flexibility of the DFdiscover API. It is provided to all licensed clients on an as-is basis. Please consider the following before deploying **DFweb**:

- 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 study edit checks. For such trials, **DFexplore** is 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.

1.2. DFcollect

DFcollect is a new tablet application, available for Android through the Google Play Store, 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 is an application built to demonstrate the power and flexibility of the DFdiscover API. It is provided to all licensed clients on an as-is basis. 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. [1] For such trials, **DFexplore** is 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 the Google Play Store 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.

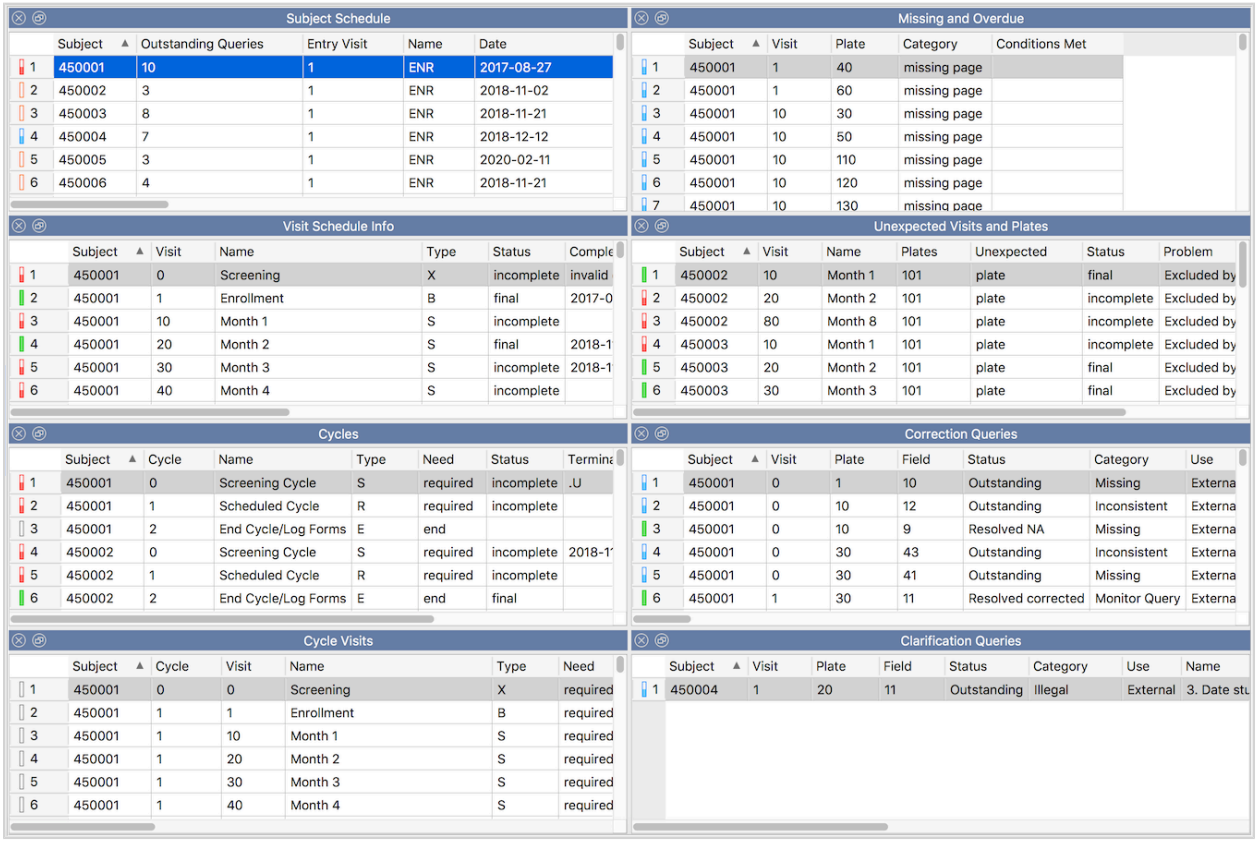
[1] The following edit check functions are not implemented in this release: `dfexecute`, `dfmail`, `dfmetastatus`, `dfmode`, `dfmoveto`, `dfneed`, `dfpref`, `dfprefinfo`, `dfstay`, `dftask`, `dftrigger`, `dfaddmpqc`, and `dfdelmpqc`.

- On iOS, enable **Automatic Downloads** or **App Updates**. Consult this Apple support page for more information.

1.3. Subject Schedule Reporting

Subject schedule calculation and reporting has been significantly re-implemented in this release. It is now possible to view and track visitmap schedule and compliance without the need for missing page or overdue visit queries. The new Schedule View provides all of the needed information.

It is also now possible to update and filter the schedule report by a subset of subjects or sites, as well as the previously available method for the entire study.



DF_QCupdate and **DF_QCreports** continue to be available and function independent of Schedule View. There are a few notable differences between the two approaches:

- There are differences in the syntax allowed for expressing conditions. Schedule View implements a subset of the syntax that **DF_QCupdate** implements. Specifically, Schedule View understands:

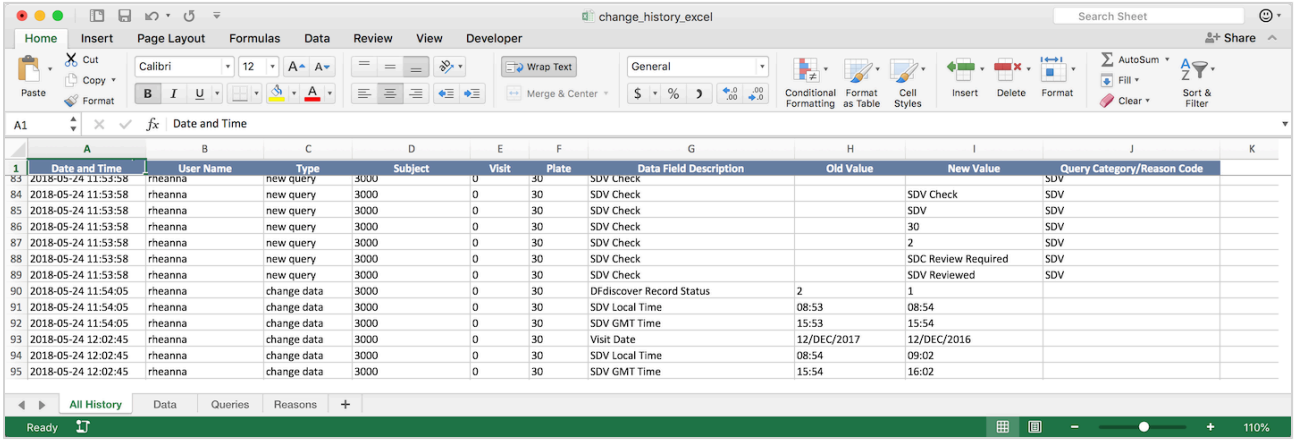
Test Operator	**Examples**
equal	=42, =2018/05/30, =AB
not equal	!=42, !=2018/05/30, !=AB
less than	<42, <2018/05/30, <AB
less than or equal	<=42, <=2018/05/30, <=AB
greater than	>42, >2018/05/30, >AB
greater than or equal	>=42, >=2018/05/30, >=AB

Test Operator	Examples
contain	~4, ~2018/05, ~AB
not contain	!~4, !~2018/05, !~AB
is blank	blank
is not blank	!blank
contains a missing value code	missing
does not contain a missing value code	!missing

- In Schedule View, a missed visit or missed plate does not by itself signal that a visit or cycle has occurred; in **DF_QCupdate** it does.
- **DF_QCupdate** can only be run by a user that has full database permissions; Schedule View computes the schedule results for the sites and subjects that the user is permitted to see and further needs only read permission.
- In Schedule View, internal queries are included if:
  1. the user has permission to view internal queries on at least one plate (and then all internal queries are included)
  2. **include internal queries** is checked

1.4. Audit History available as Excel

The capability to review the change history for a data field or CRF, at the subject, site or entire study level has been augmented to include an export to Excel option. This capability is available to permitted users in **DFexplore** and to the study admin through the **DFexport** application.



Date and Time	User Name	Type	Subject	Visit	Plate	Data Field Description	Old Value	New Value	Query Category/Reason Code
2018-05-24 11:53:58	rheanna	new query	3000	0	30	SDV Check			SDV
2018-05-24 11:53:58	rheanna	new query	3000	0	30	SDV Check		SDV Check	SDV
2018-05-24 11:53:58	rheanna	new query	3000	0	30	SDV Check		SDV	SDV
2018-05-24 11:53:58	rheanna	new query	3000	0	30	SDV Check		30	SDV
2018-05-24 11:53:58	rheanna	new query	3000	0	30	SDV Check		2	SDV
2018-05-24 11:53:58	rheanna	new query	3000	0	30	SDV Check		SDC Review Required	SDV
2018-05-24 11:53:58	rheanna	new query	3000	0	30	SDV Check		SDV Reviewed	SDV
2018-05-24 11:54:05	rheanna	change data	3000	0	30	DFdiscover Record Status	2	1	
2018-05-24 11:54:05	rheanna	change data	3000	0	30	SDV Local Time	08:53	08:54	
2018-05-24 11:54:05	rheanna	change data	3000	0	30	SDV GMT Time	15:53	15:54	
2018-05-24 12:02:45	rheanna	change data	3000	0	30	Visit Date	12/DEC/2017	12/DEC/2016	
2018-05-24 12:02:45	rheanna	change data	3000	0	30	SDV Local Time	08:54	09:02	
2018-05-24 12:02:45	rheanna	change data	3000	0	30	SDV GMT Time	15:54	16:02	

The legacy report **DF_ATmods** remains available for users that prefer the older text-based output.

Chapter 2. Supported Configurations and Known Issues

2.1. Supported Configurations

DFdiscover 2018 Version 5.1.0 is supported in the following configurations:

- **Server:**
  - OpenSUSE version 13.2 and newer, Leap 42.1 and newer
  - SUSE Tumbleweed
  - RedHat Enterprise Linux up to version 7.2 and newer

  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.

  Solaris is not supported.
- **Client:**
  - Windows 10 and newer
  - OS X 10.12 (Sierra) and newer

2.2. Known Issues

Issues are identified by operating system or application if they are not generally applicable.

- **Windows 10 with HiDPI displays.** At low resolution, some features of the display are too large compared to high resolution. At 1024 x 768, scrollbars, radio buttons, and arrows appear proportionally larger than at high resolution.
- **OS X.**
  - 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.
- **Windows and OS X.** Ctrl+Z (Windows) and Cmd+Z (OS X) do not work if the field also auto expands.
- **DFexplore.**
  - A few reports, Database Setup, DF_SSvars, and DF_SSschema, do not include screen breaks and grouping. 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 '# of Queries'.

- Legacy Reports do not generate Excel output.
- 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.

- **DFsetup.**
  - eCRFs do not have support for multiple languages. There is no support for printing an annotated eCRF (use Reports View as a workaround).
  - The Query Category Map dialog highlights all rows, not just the editable row which has the focus. All other dialogs correctly highlight only the row with the focus. This is a visual artefact - the editing behavior is correct.
  - 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.
- **DFcollect.** It is possible to briefly edit the value in a choice or check data field even though the field has a field entry edit check that uses `dfaccess` to disable the field. Applying `dfaccess` during plate entry prevents this timing problem from occurring.
- **DFcollect Android.**
  - Text input fields will default to capitals automatically.
  - 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.**
  - **DFweb** has minimal accessibility support.
  - The date value auto-formatter can become confused if the last character of a delimiter is also an allowable character (or digit) in the date part that follows the delimiter.

Chapter 3. New and Changed Features

This chapter provides a summary of all changes to DFdiscover since DFdiscover 2018 Version 5.0.0.

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.	doc-fix	The help documentation system has been updated to DocBook v5, bringing several presentation benefits with it. Of primary benefit, PDF generation is now built upon FOP, the industry standard that allows greater programmatic control over page layout.
2.	doc-fix	Documentation errata have been applied to all published end-user documentation.
3.	doc-fix	An index has been added to each published user guide.
4.	sw-fix	A minor bug in the login dialog, that can cause a click of Login to be ignored, has been fixed.
5.	sw-fix	The date picker in **DFsetup** and **DFexplore** has been updated to synchronously refresh the month/day display when the year is changed.
6.	sw-fix	The status tabs in **DFadmin** have been fixed to synchronously apply the selected filter.
7.	sw-fix	Several minor look-and-feel issues in **DFsetup** have been fixed.
8.	sw-fix	The add study dialog, in **DFadmin** Studies tab, has been fixed to only allow valid study numbers.
9.	sw-fix	The plates view in **DFsetup** has been updated to include a column for plate help. This will further allow plate help to be included when exporting to Excel.
10.	sw-fix	The maximum time for **DFadmin** auto logout interval is 60 minutes. Previously values greater than 60 minutes, up to 99 minutes, were allowed, but not saved.
11.	sw-fix	Several minor issues related to the coding tables in **DFsetup** have been fixed.
12.	sw-fix	Following the JWT standard, DFws has been updated to use/require base64url encoded tokens.
13.	sw-fix	**DFmaster.rpcd** has been updated to accept user passwords, without change, when migrating from previous DataFax systems.
14.	sw-fix	DFws has been updated to fix a crash condition that could happen during an unexpected connection termination by the client.
15.	sw-fix	Batch edits view in **DFexplore** now ensures that control files have a proper filename extension.
16.	sw-fix	In **DFexplore** and **DFadmin**, there are some keyboard shortcuts that are overloaded and hence behave inconsistently. This has been corrected.
17.	sw-fix	An inconsistency in the button status (some disabled buttons should be enabled) for various **View** actions in **DFsetup** has been fixed.
18.	sw-fix	Use of the Esc key to abort the active dialog, without applying changes, has now been implemented consistently across all desktop applications.
19.	sw-fix	A bug in the Select All action while in **DFsetup**'s Plates view has been fixed.
20.	sw-fix	Several button behaviors in **DFsetup** View menu items have been improved for consistency.

	Type	Synopsis
21.	sw-fix	In **DFexplore** on OS X, it is possible to close a study in which a report is currently running, rendering the application unresponsive. This issue has been corrected.
22.	sw-fix	The web context menu has been removed from all windows which display HTML output (help and reports). It served no purpose and was unresponsive in **DFexplore** and **DFsetup**.
23.	sw-fix	In **DFexplore**, when running a report from the history list, the options used to run the report are not restored in the Options field. This issue has been corrected.
24.	sw-fix	A bug in de-referencing of some meta-words, such as `$(plate)`, in legacy applications has been fixed.
25.	sw-fix	A bug that could cause the **Copy** menu item to disappear from the **Edit** or **Action** menus in **DFadmin** has been fixed.
26.	sw-fix	The ATK has been updated to include modules for **DFcollect** and **DFweb**.
27.	sw-fix	A permissions bug that prevented **DFexplore** users from marking a record as Missed has been fixed.
28.	sw-fix	The edit check `dfhelp()` now also updates the help message in the metadata panel and the hover text.
29.	sw-fix	An update has been applied to the behavior of settings in the batch edit checks control file. Specifically, with `apply` set to `none`, `dfmail()` and `dfexecute()` behave the same as `dfmessage()`, echoing the argument as a message *without executing it*.
30.	sw-fix	Several bugs in **DFexplore** have been fixed: • if there are unsaved changes to the current record on-screen, selecting **Plate** > **Attach Subject Document** must prompt the user to save the record first. • several bugs have been fixed in the metadata panel. • in the image viewer, correctly orient rotated images. • in Data view and Image view, the width of the drop-down list for Choice fields has been fixed. • edit check `dfaddqc()` removes the trailing blanks in query detail and note properties. • edit check `DFopen_patient_binder()` is prevented from being recursive which previously could cause **DFexplore** to exit unexpectedly. • the data entry window background is now filled using the plate Fill Color defined in the study setup. • **Help** > **Study Help**, **Help** > **Plate Help** and **Help** > **Field Help** now render help text encoded with html in the same manner as the metadata editor panel does. • a leftover reference to 'QC' in the data import dialog has been corrected to 'Query'. • in Batch view - **Edit Check Lookup** dialog, the edit check parameters have been removed from the picklist of edit checks. • a bug in the combination of using **Field** > **Revert to Last Save** and not having data modify permission has been fixed.
31.	sw-fix	A bug that could cause **DFmaster.rpcd** to crash while processing a malformed `DFstudies.db`, `DFinbound.db` or `DFoutbound.db` file, has been fixed.

	Type	Synopsis
32.	sw-fix	**DFsetup** now warns users when the fields on an eCRF will extend beyond 4 virtual pages in length.
33.	sw-fix	**DFserver.rpc** has been updated to gracefully handle the addition of new choice fields on an eCRF that do not have any code value/label pairs defined.
34.	sw-fix	To support being offline, **DFcollect** captures the actual data entry time in UTC during the save action. This UTC time is updated to server time when **DFcollect** returns to an online state and syncs the local data to the server.
35.	sw-fix	Several enhancements have been added to the Save to Excel feature in **DFsetup**. Improvements have been made to headings, page level markup and formatting of HTML help.
36.	sw-fix	A bounds checking error in **DFcompiler**, that could cause it to hang with very long study, plate, or field help properties, has been fixed.
37.	sw-fix	The standard eSignature module has been updated to include metadata related to the reason for an eSignature.
38.	sw-new	A new administration tool for DFws, DFwsadmin, has been added to administer API client accounts, log activities and more.
39.	sw-new	**DFcollect** is a new client application, built on top of the DFdiscover API, that offers direct data entry and review, online and offline, on Android and iOS tablets.
40.	sw-new	Additional legacy reports from DataFax have been updated to generate the new HTML / Excel output style.
41.	sw-new	DFweb is a new client application, built on top of the DFdiscover API, that offers direct data entry and review from an HTML5 capable web browser.
42.	sw-new	Several new service requests have been added to **DFedcservice** and DFws.
43.	sw-new	The methodology for calculating missing plates, overdue visits and the overall subject status has been simplified, made more granular and significantly sped up.
44.	sw-new	The API request for client generated password updates has been modified to support optional encoding. DFedcservice enforces encoding for accounts with expired or temporary passwords.
45.	sw-new	The Export to Excel feature in all tools has been standardized to include the advanced styling dialog and an option to open the Excel document after the export completes.
46.	sw-new	Several features, which aid in the task of creating SDTM compatible data sets, have been added to **DFexport**.
47.	sw-new	The Password field in the login dialog for each application now shows that the caps-lock key is on.
48.	sw-new	The File Print and File Save As PDF actions in **DFsetup** have been standardized.
49.	sw-new	It is now possible to zoom the contents of undocked report windows in **DFexplore**. Previously this was limited to the active, docked window.
50.	sw-new	Improvements have been made to the handling of query replies. Specifically, • the new `dfreplyqc()` function allows the edit check programmer to specify conditions under which a query reply can be generated automatically, • a new lookup table named `QCREPLY`, for defining standard query replies, is available.
51.	sw-new	New functions `dfstudyinfo()` and `dfpageinfo()` have been added to the edit checks language. Analagous requests for exportable metadata in **DFexport** have also been added.
52.	sw-new	**DFaudittrace**, **DFexport** and **DFexplore** now support saving the complete page or field change history to an Excel file. The output can be filtered by subject, site or study.

	Type	Synopsis
53.	sw-new	References to www.datafax.com in visual elements and exported metadata have been updated to www.dfnetresearch.com.
54.	sw-new	The ability to clone field definitions across modules has been added to **DFsetup**.
55.	sw-new	In **DFexplore**, the contents of the dashboard are now customizable and may include reports.

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 5.1.0 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/v5.1`, it is already up-to-date and no change is needed. Exit **DFadmin**
5. Otherwise, update the value to read `https://cdn.dfdiscover.com/v5.1`.
6. Click Save to apply the change.
7. Exit **DFadmin**.

4.3.3. Restart HylaFAX if required

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 2018 Version 5.1.0.

Release 5.1.0 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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5.1.16. c3.js

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5.1.17. d3.js

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