

A Tale of Kleopatra

Accessibility: From Insufficient to Minor Limitations

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ABOUT ME

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KDE hacker since 2000

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KLEOPATRA

The KDE Certificate Manager

Packaged for Windows by g10 Code GmbH as

Gpg4Win and GnuPG VS-Desktop®

GnuPG VS-Desktop® is approved by the German BSI for handling EU RESTRICTED (VS-NfD) data



ACCESSIBILITY

January 2022

Not compliant with BITV 2.0

Users	Accessibility
visually impaired	limited
blind	insufficient
mobility impaired	insufficient
cognitive impaired	limited



Kleopatra

22 findings

Rated with 3 levels of severity for the considered types of impairment

All findings of levels 2 and 3 and most findings of level 1 were addressed

ACCESSIBILITY

January 2022

Not compliant with BITV 2.0

Users	Accessibility
visually impaired	limited
blind	insufficient
mobility impaired	insufficient
cognitive impaired	limited



Kleopatra

February 2023

Partially compliant with BITV 2.0

Users	Accessibility
visually impaired	limited
blind	limited
mobility impaired	limited
cognitive impaired	not checked

“Compared to the previously tested version, 8 problems have been fully solved and 5 problems have been partially solved.”

Main View

The screenshot shows the Kleopatra application window. The title bar reads "Kleopatra". The menu bar includes "File", "View", "Certificates", "Tools", "Settings", "Window", and "Help". The toolbar contains icons for "Sign/Encrypt", "Decrypt/Verify", "Import", "Export", "Certify", "Lookup on Server", "Certificates", "Notepad", and "Smartcards". Below the toolbar is a search bar with the text "Search...<Alt+Q>" and a dropdown menu set to "All Certificates". The main area displays a tree view of certificates. The "All Certificates" folder is expanded, showing a list of certificates with columns for Name, E-Mail, User-IDs, Valid From, Valid Until, and Key-ID. The certificates are color-coded: green for valid, red for expired or not compliant, and blue for root certificates. The status bar at the bottom right indicates "VS-NFD Compliant".

Name	E-Mail	User-IDs	Valid From	Valid Until	Key-ID
	berta.boss@demo.gnupg.com	★ VS-NFD C...	16.05.19		EE77 B3D5 7243 F72E
	edward.tester@demo.gnupg.com	★ VS-NFD C...	06.02.20		1F5C 8972 CE8B FED7
Ada Lovelace	ada@example.net	★ VS-NFD C...	12.07.22	12.07.24	AF32 AE91 2BF7 7880
Berta Boss	berta.boss@demo.gnupg.com	expired	04.07.19	03.07.20	F8F8 09EF 1DF5 37DA
g10 Code TEST CA 2019	info@g10code.com	★ VS-NFD C...	15.02.19	12.02.29	3114 1CEA DD10 B78F
Berta Boss	berta.boss@demo.gnupg.com	★ VS-NFD C...	16.05.19	05.04.63	63A1 4B55 93C5 9C15
Berta Boss	berta.boss@demo.gnupg.com	★ VS-NFD C...	16.05.19	05.04.63	DFCB D9C7 E297 583E
Edward.Tester	edward.tester@demo.gnupg.com	★ VS-NFD C...	16.05.19	05.04.63	11D7 A264 CA89 261C
Edward.Tester	edward.tester@demo.gnupg.com	★ VS-NFD C...	16.05.19	05.04.63	1095 9DB1 F6FC E189
Ted Tester	ted.tester@demo.gnupg.com	★ VS-NFD C...	03.06.20	05.04.63	3F02 66F3 80CB 555D
Intevation Root CA 2016	ca@intevation.de	★ VS-NFD C...	13.12.16	13.12.28	3989 CCD6 A082 2B40
Intevation Test Root CA 2016	ca@intevation.de	★ VS-NFD C...	12.12.16	12.12.28	E6F7 2A5C 64DC F10E
Not Compliant	bad@example.net	certified	12.07.22	12.07.24	4B72 4734 7C00 8AD6
Ted Tester	ted.tester@demo.gnupg.com	invalid	03.06.20	05.04.63	6612 2EF6 0E05 F87D
Ted Tester	ted.tester@demo.gnupg.com	★ VS-NFD C...	03.06.20		41FA C215 ADE1 CB46
Tester Edward R.S.	edward.tester@demo.gnupg.com	not certified	17.05.21	16.05.24	F7E0 17CA ED15 8080
Testuser 1	test1@testkolab.intevation.de	★ VS-NFD C...	12.01.17		5ER2 71E0 2EF2 90AF

Main View

as seen by assistive tools (January 2022)

The screenshot shows the Kleopatra application window. The title bar reads "Kleopatra". The menu bar includes "File", "View", "Certificates", "Tools", "Settings", "Window", and "Help". Below the menu bar is a search bar with the placeholder text "Search...<Alt+Q>" and a dropdown menu currently set to "All Certificates". Below the search bar is a tab labeled "All Certificates". The main area displays a list of certificates with columns for Name, Issued, Validity, and Issued To. The list is filtered to show certificates issued by "g10 Code TEST CA 2019". The "Name" column is expanded to show a tree view of certificate names. The "Issued" column shows dates, and the "Validity" column shows expiration dates. The "Issued To" column shows the names of the certificate holders. The list is color-coded: green for valid certificates, red for expired certificates, and blue for certificates that are not compliant. The "Name" column is expanded to show a tree view of certificate names. The "Issued" column shows dates, and the "Validity" column shows expiration dates. The "Issued To" column shows the names of the certificate holders. The list is color-coded: green for valid certificates, red for expired certificates, and blue for certificates that are not compliant.

Name	Issued	Validity	Issued To
Ada Lovelace	2019-01-01	2020-01-01	Ada Lovelace
Berta Boss	2019-01-01	2020-01-01	Berta Boss
g10 Code TEST CA 2019	2019-01-01	2020-01-01	g10 Code TEST CA 2019
Berta Boss	2019-01-01	2020-01-01	Berta Boss
Berta Boss	2019-01-01	2020-01-01	Berta Boss
Edward.Tester	2019-01-01	2020-01-01	Edward.Tester
Edward.Tester	2019-01-01	2020-01-01	Edward.Tester
Ted Tester	2019-01-01	2020-01-01	Ted Tester
Intevation Root CA 2016	2016-01-01	2020-01-01	Intevation Root CA 2016
Intevation Test Root CA 2016	2016-01-01	2020-01-01	Intevation Test Root CA 2016
Not Compliant	2019-01-01	2020-01-01	Not Compliant
Ted Tester	2019-01-01	2020-01-01	Ted Tester
Ted Tester	2019-01-01	2020-01-01	Ted Tester
Tester Edward R.S.	2019-01-01	2020-01-01	Tester Edward R.S.
Testuser 1	2019-01-01	2020-01-01	Testuser 1

VS-NFD Compliant

Details View


OpenPGP Certificate — Kleopatra


User IDs:

Email	Name	Trust Level
ada@example.net	Ada Lovelace	<input checked="" type="checkbox"/> ultimate

[Add User ID](#) [Flag as Primary](#) [Certify User IDs](#) [Show Certifications](#) [Revoke Certifications](#) [Revoke User ID](#)

Valid from: 12.07.22

Valid until: 12.07.24 

Fingerprint: E676 179A AA24 1E2B B064 1E83 AF32 AE91 2BF7 7880 

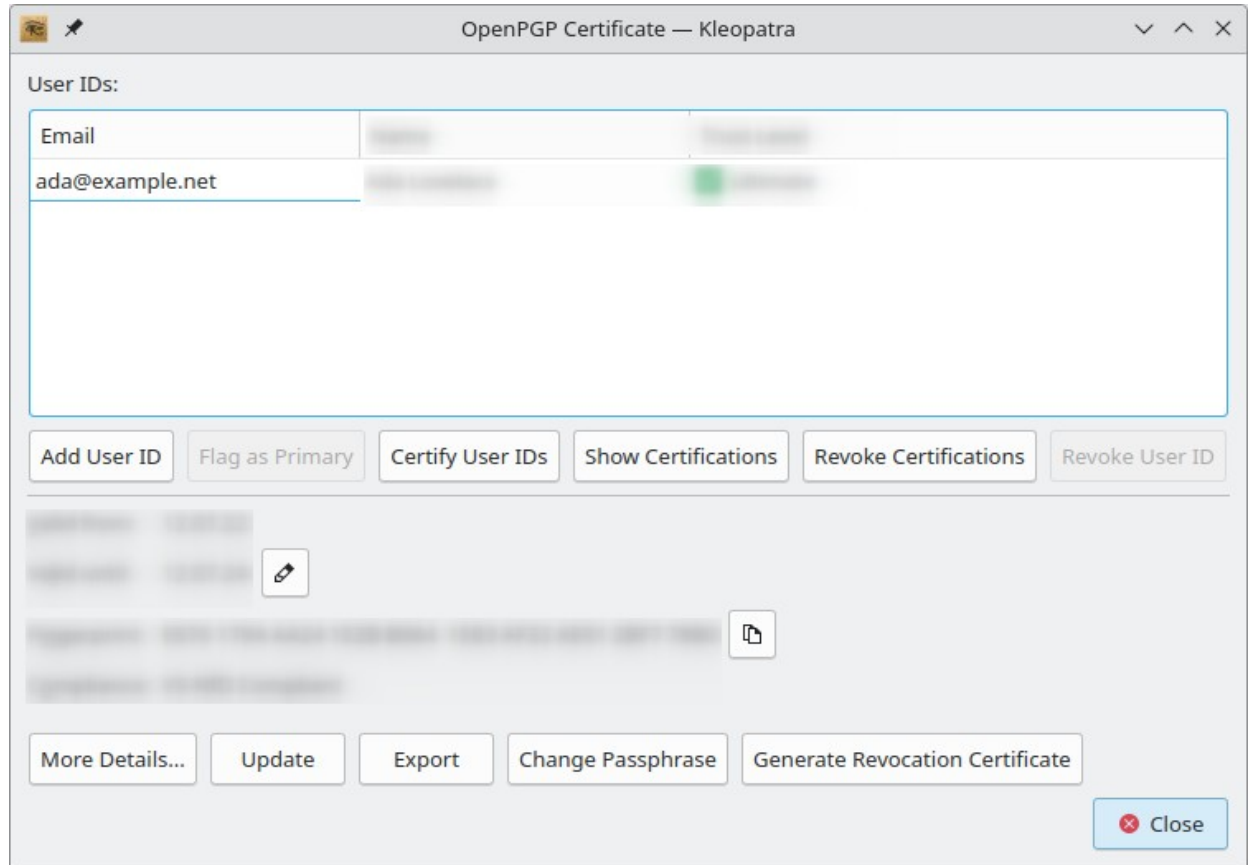
Compliance: VS-NfD Compliant

[More Details...](#) [Update](#) [Export](#) [Change Passphrase](#) [Generate Revocation Certificate](#)

[Close](#)

Details View

as seen by assistive tools (in January 2022)



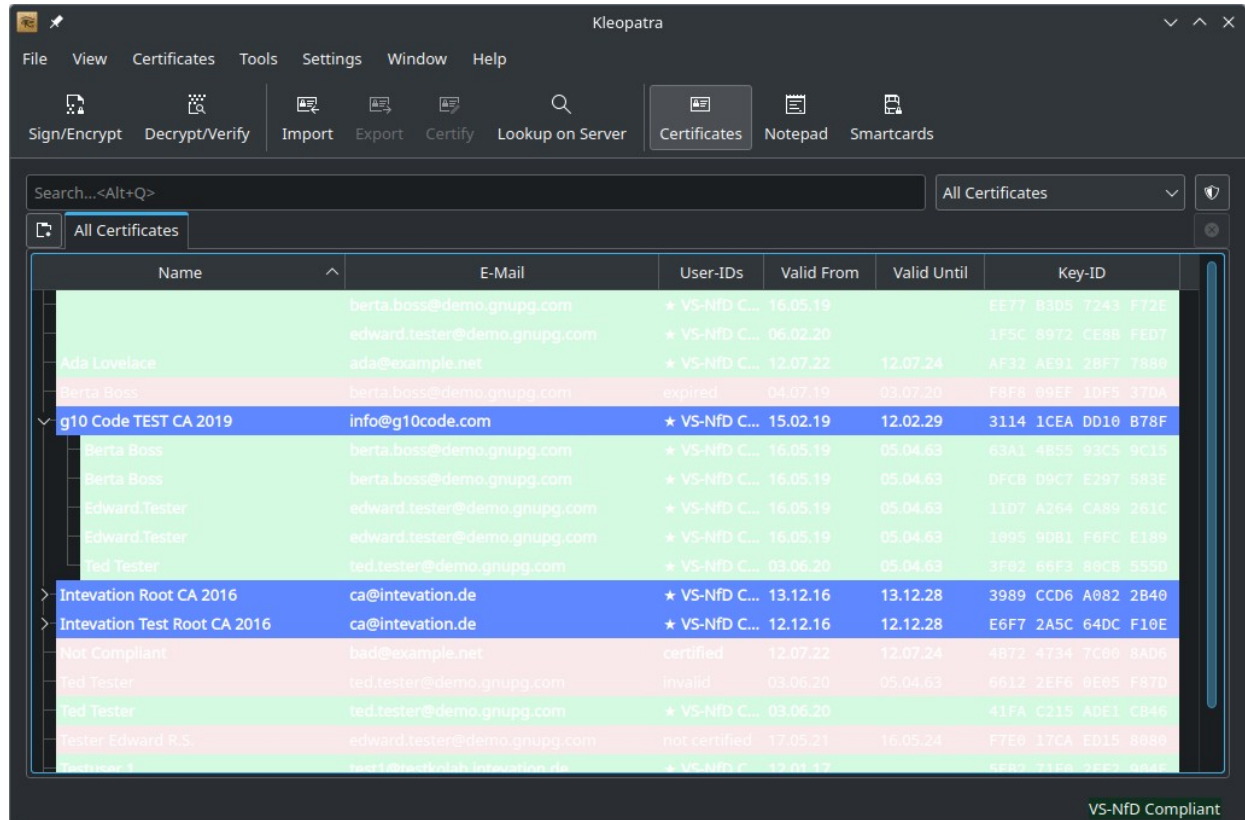
Colors & Contrast

Dark high contrast mode on Windows
(mock-up, January 2022)

Problems

Bad contrast where colored background is used

Dark icons on dark background (not shown on mock-up)



Colors & Contrast

Dark high contrast mode on Windows
(image shows simulation on Linux)

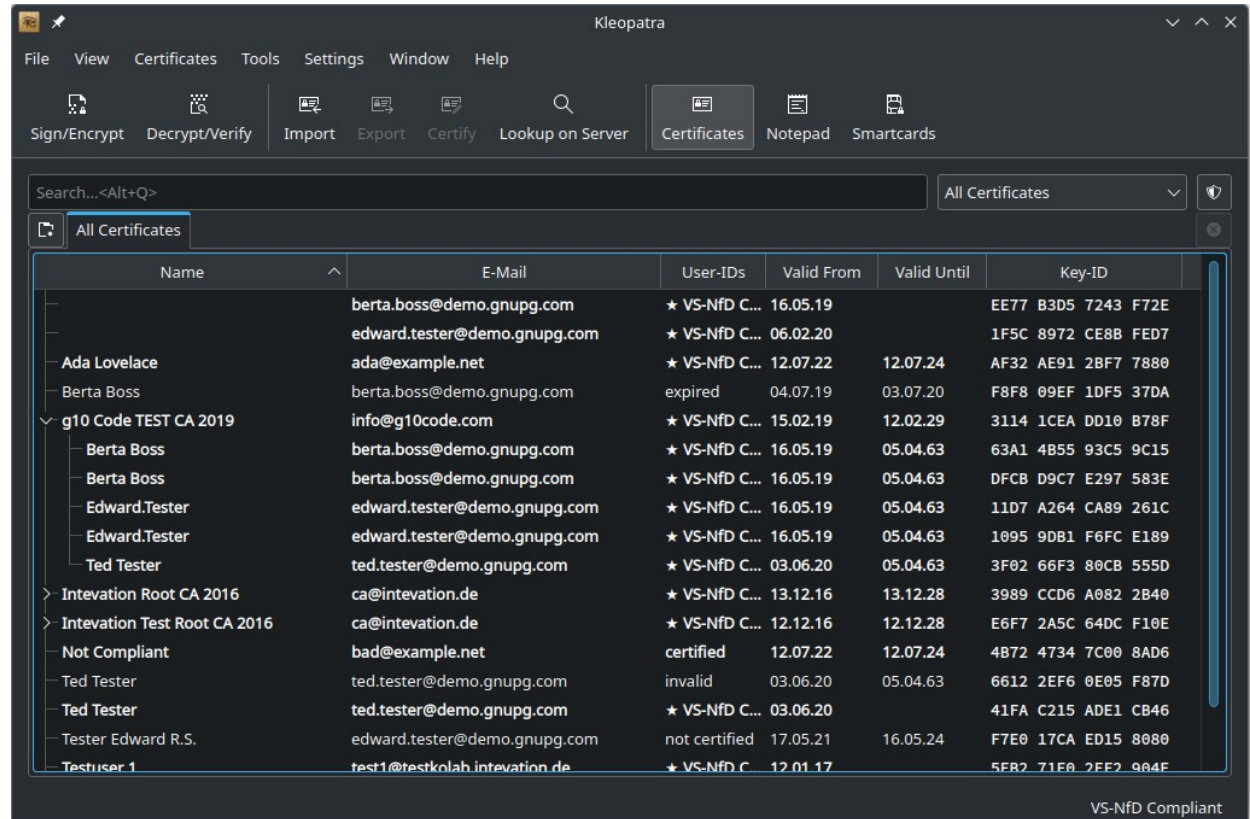
Changes

Don't use colors if high contrast mode is
enabled on Windows

Use Breeze-dark icons if dark high contrast
mode is enabled on Windows

Open

Requires a restart of Kleopatra



Tool Bars

Tool bar should be usable with the keyboard

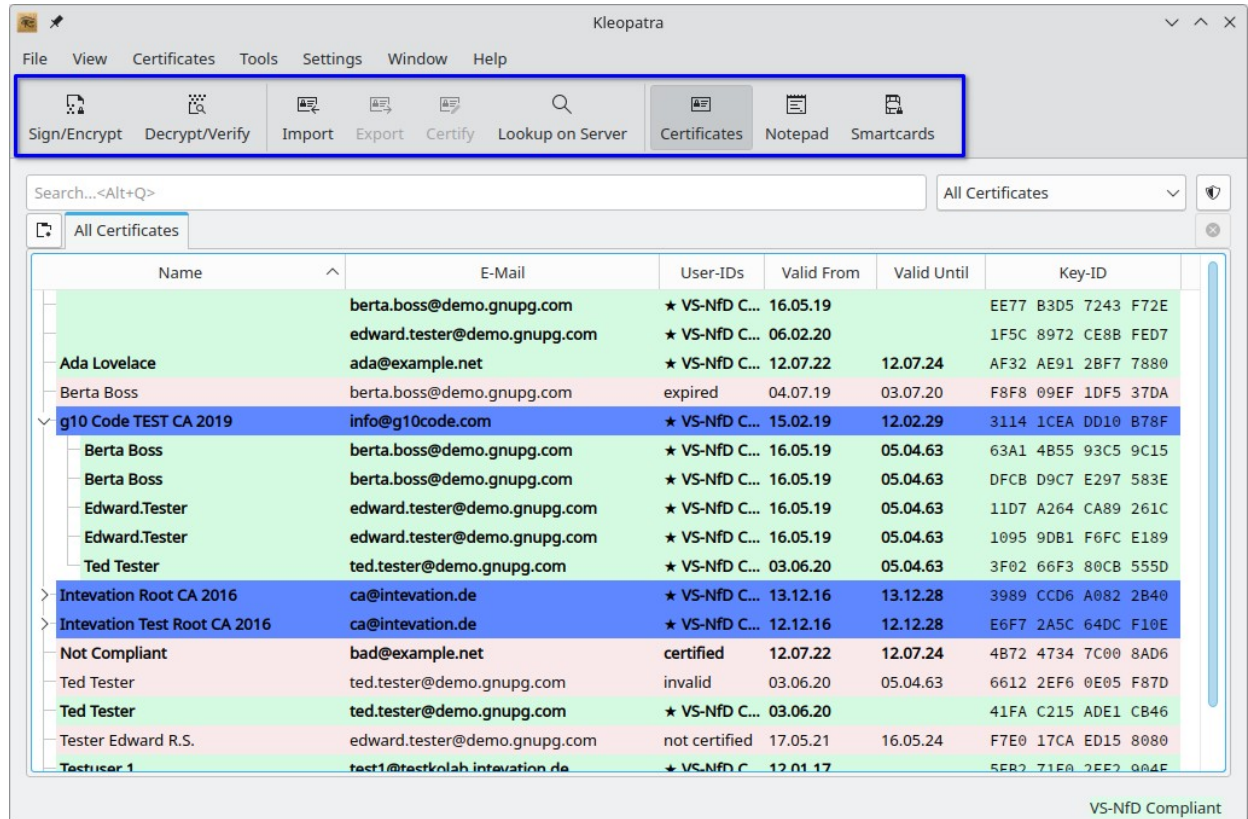
Changes

Allow all tool bar buttons to get focus

Fix tab order

Open

Upstream to KXMLGui?



Labeling

All form elements should be labeled

Changes

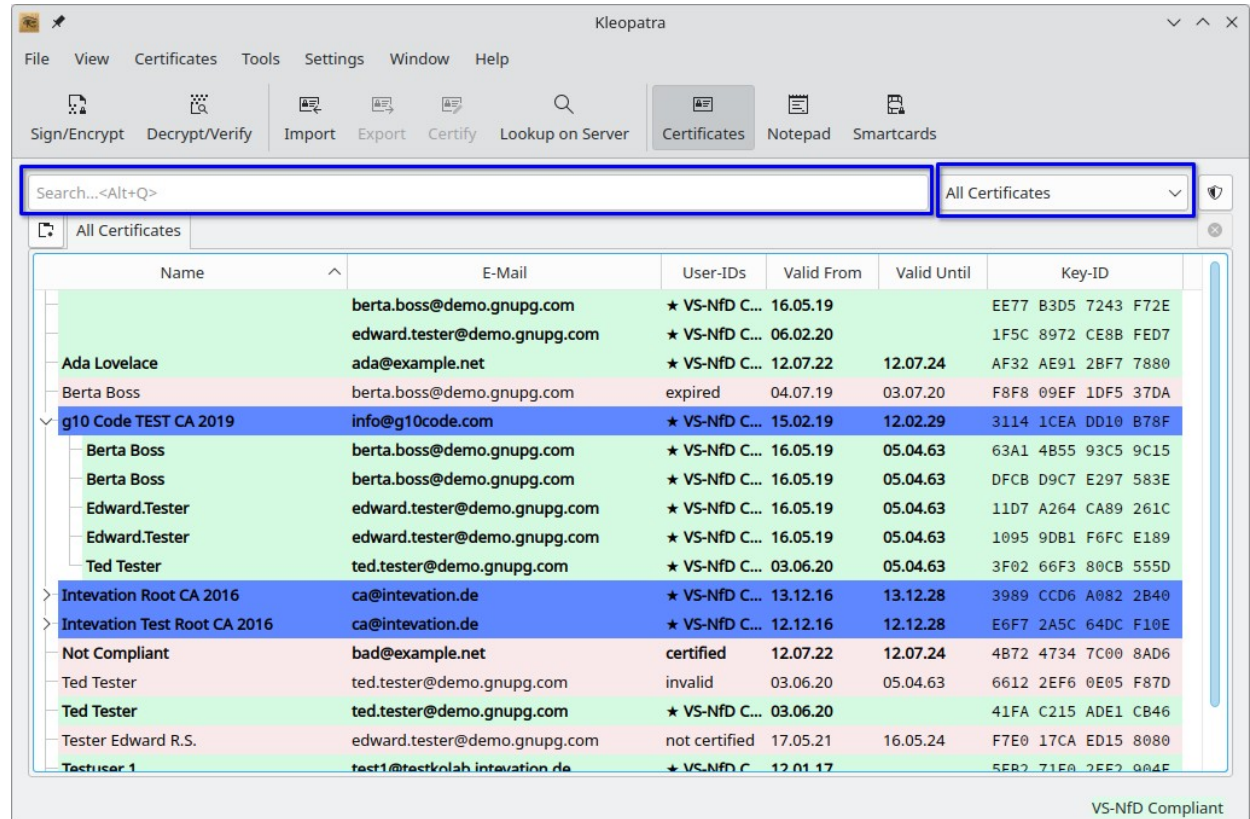
Set accessible names on search field and filter drop down

Add some labels to other form elements

Set buddy of all labels

Open

On Linux, Qt reports the value of the combo box as accessible name instead of the label or the accessible name (AT-SPI spec bug?)

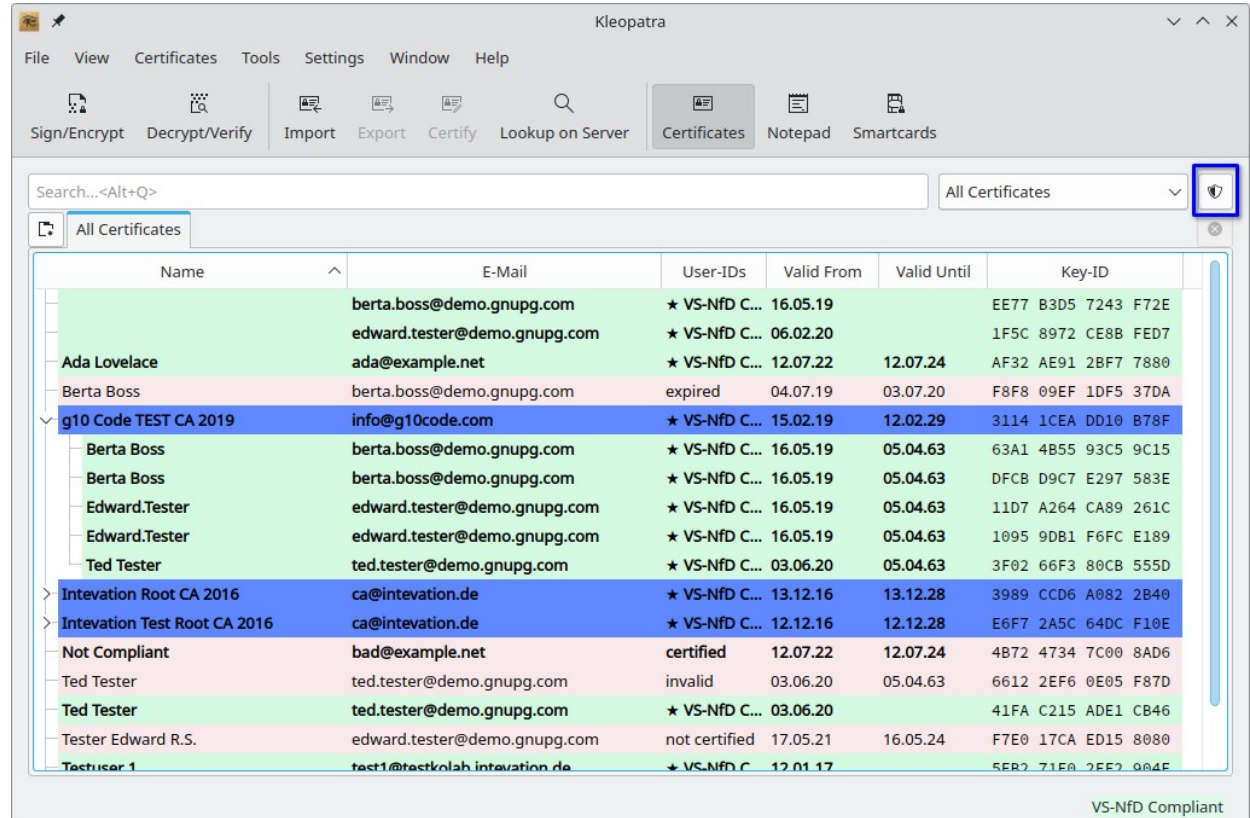


Icon Buttons

Icon-only buttons must have an accessible name

Changes

Set accessible name for all icon-only buttons



Tab Bars

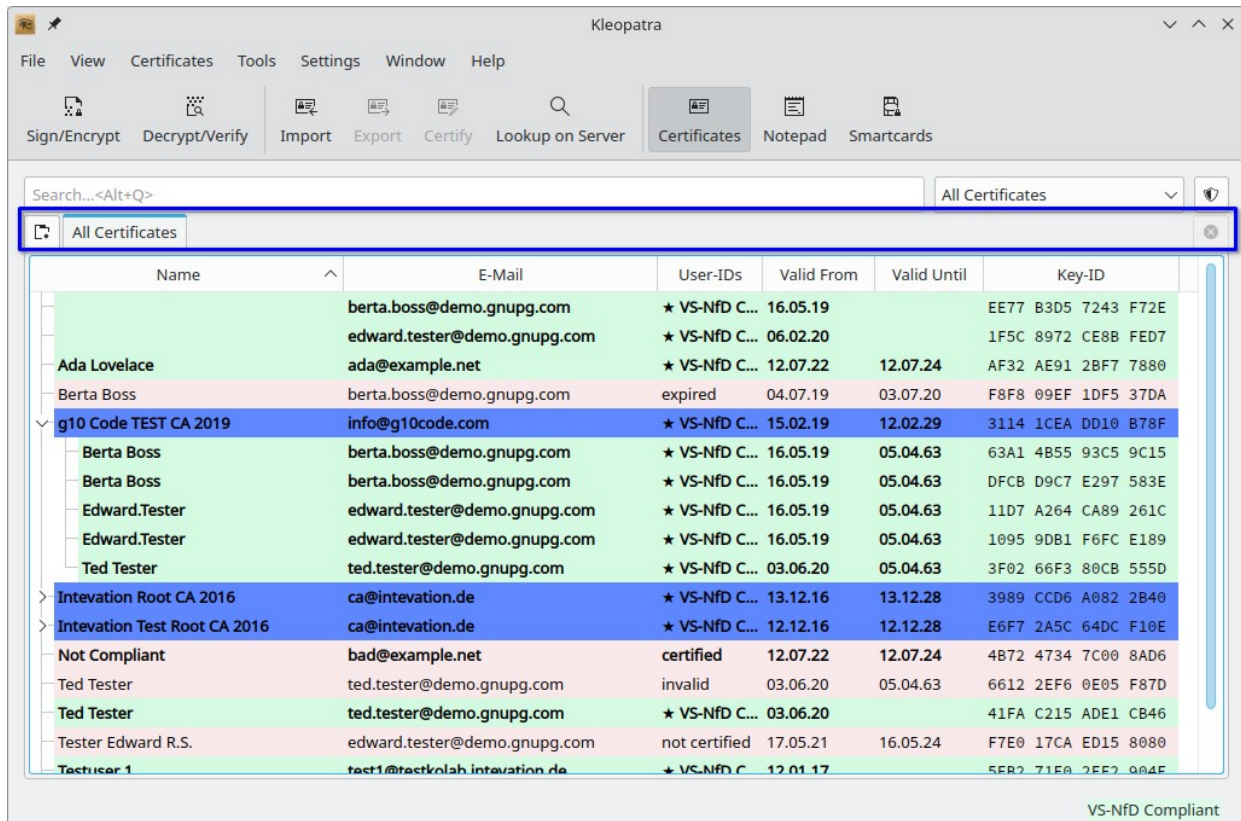
Changes

Create top-left corner widget, then tab widget, then top-right corner widget for correct tab order

Do not (auto-)hide tab bar with less than 2 tabs (breaks keyboard navigation)

Open

Report and fix in Qt



Tree Views

Cell-by-cell keyboard navigation for assistive tools

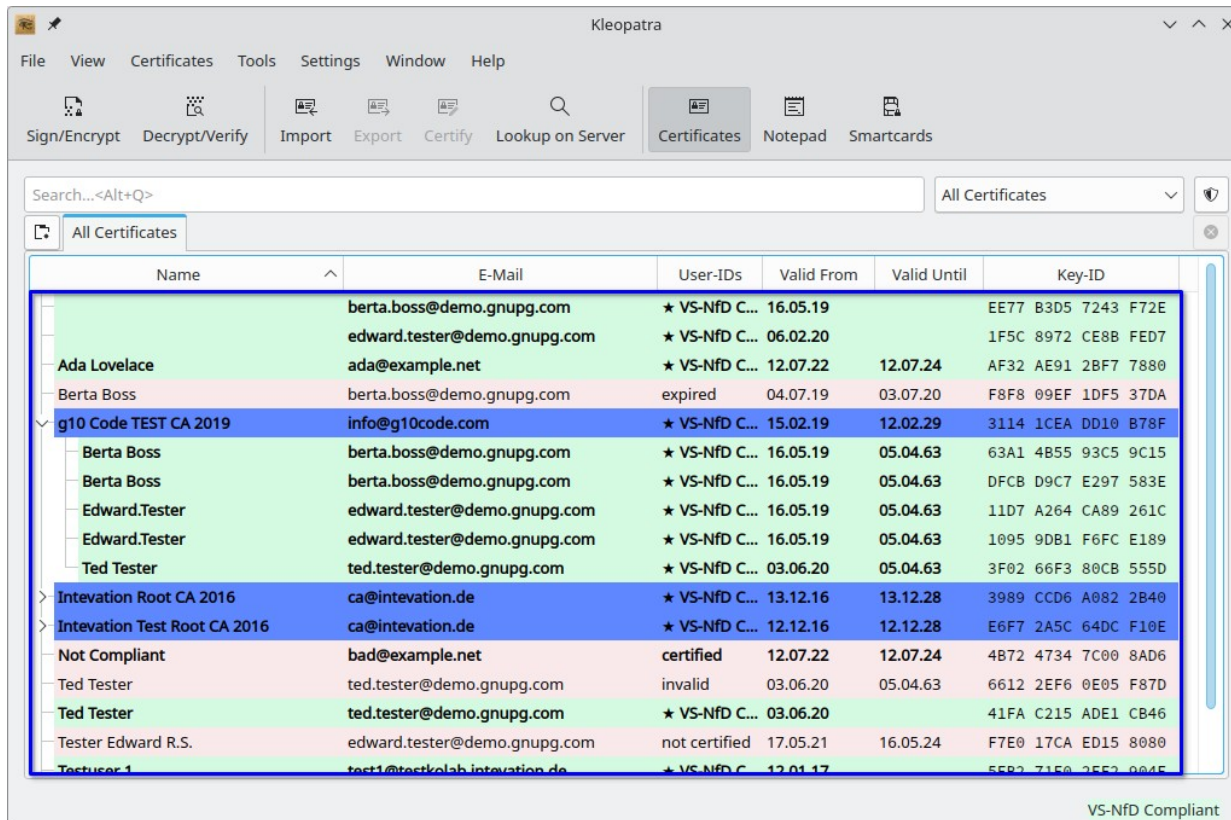
Changes

Set accessible name for list/tree views

Allow column-by-column navigation with keyboard despite full-row selection mode; disable parent-child navigation with arrow keys

Announce current item when tree view gets focus (workaround for accessible event order problem in QTreeView)

Skip QListView's currentChanged in override (workaround to prevent accessible focus event when list view doesn't have focus)



Tree Views

Cell-by-cell keyboard navigation for assistive tools

Open

Upstream full-row selection with cell-by-cell navigation (?)

Report and fix problems in Qt

New findings in second test

Changing the sort order not possible with the keyboard

Showing additional columns not possible with the keyboard

Name	E-Mail	User-IDs	Valid From	Valid Until	Key-ID
	berta.boss@demo.gnupg.com	★ VS-NfD C...	16.05.19		EE77 B3D5 7243 F72E
	edward.tester@demo.gnupg.com	★ VS-NfD C...	06.02.20		1F5C 8972 CE8B FED7
Ada Lovelace	ada@example.net	★ VS-NfD C...	12.07.22	12.07.24	AF32 AE91 2BF7 7880
Berta Boss	berta.boss@demo.gnupg.com	expired	04.07.19	03.07.20	F8F8 09EF 1DF5 37DA
g10 Code TEST CA 2019	info@g10code.com	★ VS-NfD C...	15.02.19	12.02.29	3114 1CEA DD10 B78F
Berta Boss	berta.boss@demo.gnupg.com	★ VS-NfD C...	16.05.19	05.04.63	63A1 4B55 93C5 9C15
Berta Boss	berta.boss@demo.gnupg.com	★ VS-NfD C...	16.05.19	05.04.63	DFCB D9C7 E297 583E
Edward.Tester	edward.tester@demo.gnupg.com	★ VS-NfD C...	16.05.19	05.04.63	11D7 A264 CA89 261C
Edward.Tester	edward.tester@demo.gnupg.com	★ VS-NfD C...	16.05.19	05.04.63	1095 9DB1 F6FC E189
Ted Tester	ted.tester@demo.gnupg.com	★ VS-NfD C...	03.06.20	05.04.63	3F02 66F3 80CB 555D
> Intevation Root CA 2016	ca@intevation.de	★ VS-NfD C...	13.12.16	13.12.28	3989 CCD6 A082 2B40
> Intevation Test Root CA 2016	ca@intevation.de	★ VS-NfD C...	12.12.16	12.12.28	E6F7 2A5C 64DC F10E
Not Compliant	bad@example.net	certified	12.07.22	12.07.24	4B72 4734 7C00 8AD6
Ted Tester	ted.tester@demo.gnupg.com	invalid	03.06.20	05.04.63	6612 2EF6 0E05 F87D
Ted Tester	ted.tester@demo.gnupg.com	★ VS-NfD C...	03.06.20		41FA C215 ADE1 CB46
Tester Edward R.S.	edward.tester@demo.gnupg.com	not certified	17.05.21	16.05.24	F7E0 17CA ED15 8080
Testuser 1	test1@testkolab.intevation.de	★ VS-NfD C...	12.01.17		5582 7150 25E2 0045

VS-NfD Compliant

Special Values

Help screen readers reading structured text

Changes

Return more accessible text representations (Qt::AccessibleTextRole) for some model entries, e.g. dates and hex strings

Return more accessible text representations for empty model entries (workaround for orca saying nothing)

Name	E-Mail	User-IDs	Valid From	Valid Until	Key-ID
	berta.boss@demo.gnupg.com	★ VS-NFD C...	16.05.19		EE77 B3D5 7243 F72E
	edward.tester@demo.gnupg.com	★ VS-NFD C...	06.02.20		1F5C 8972 CE8B FED7
Ada Lovelace	ada@example.net	★ VS-NFD C...	12.07.22	12.07.24	AF32 AE91 2BF7 7880
Berta Boss	berta.boss@demo.gnupg.com	expired	04.07.19	03.07.20	F8F8 09EF 1DF5 37DA
g10 Code TEST CA 2019	info@g10code.com	★ VS-NFD C...	15.02.19	12.02.29	3114 1CEA DD10 B78F
Berta Boss	berta.boss@demo.gnupg.com	★ VS-NFD C...	16.05.19	05.04.63	63A1 4B55 93C5 9C15
Berta Boss	berta.boss@demo.gnupg.com	★ VS-NFD C...	16.05.19	05.04.63	DFCB D9C7 E297 583E
Edward.Tester	edward.tester@demo.gnupg.com	★ VS-NFD C...	16.05.19	05.04.63	11D7 A264 CA89 261C
Edward.Tester	edward.tester@demo.gnupg.com	★ VS-NFD C...	16.05.19	05.04.63	1095 9DB1 F6FC E189
Ted Tester	ted.tester@demo.gnupg.com	★ VS-NFD C...	03.06.20	05.04.63	3F02 66F3 80CB 555D
> Intevation Root CA 2016	ca@intevation.de	★ VS-NFD C...	13.12.16	13.12.28	3989 CCD6 A082 2B40
> Intevation Test Root CA 2016	ca@intevation.de	★ VS-NFD C...	12.12.16	12.12.28	E6F7 2A5C 64DC F10E
Not Compliant	bad@example.net	certified	12.07.22	12.07.24	4B72 4734 7C00 8AD6
Ted Tester	ted.tester@demo.gnupg.com	invalid	03.06.20	05.04.63	6612 2EF6 0E05 F87D
Ted Tester	ted.tester@demo.gnupg.com	★ VS-NFD C...	03.06.20		41FA C215 ADE1 CB46
Tester Edward R.S.	edward.tester@demo.gnupg.com	not certified	17.05.21	16.05.24	F7E0 17CA ED15 8080
Testuser 1	test1@testkolab.intevation.de	★ VS-NFD C...	12.01.17		5E93 7150 2F50 804F

Labeled Values

Static text like labeled values should be accessible with the keyboard

Changes


Add InfoField class to make name-value pairs displayed with two labels accessible; requires a custom accessible role for the value label to make it work as intended on Windows


Show focus indicator for value that has focus

The screenshot shows the 'OpenPGP Certificate' window in Kleopatra. At the top, there is a table titled 'User IDs:' with three columns: 'Email', 'Name', and 'Trust Level'. The first row contains 'ada@example.net', 'Ada Lovelace', and a green checkmark followed by the text 'ultimate'. Below the table are several buttons: 'Add User ID', 'Flag as Primary', 'Certify User IDs', 'Show Certifications', 'Revoke Certifications', and 'Revoke User ID'. A blue rectangular box highlights a section of the interface containing the following text: 'Valid from: 12.07.22', 'Valid until: 12.07.24' (with an edit icon), 'Fingerprint: E676 179A AA24 1E2B B064 1E83 AF32 AE91 2BF7 7880' (with a copy icon), and 'Compliance: VS-NfD Compliant'. At the bottom of the window, there are buttons for 'More Details...', 'Update', 'Export', 'Change Passphrase', and 'Generate Revocation Certificate', along with a 'Close' button in the bottom right corner.

Email	Name	Trust Level
ada@example.net	Ada Lovelace	✓ ultimate

Valid from: 12.07.22

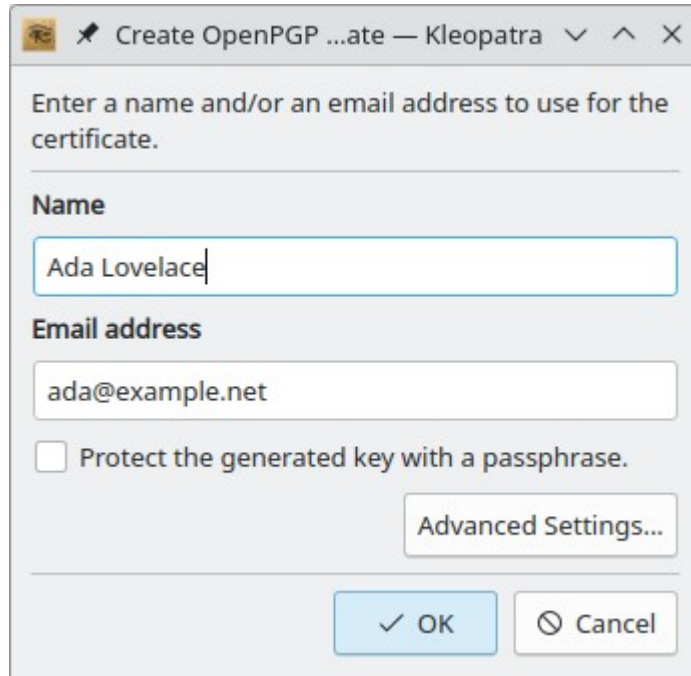
Valid until: 12.07.24 

Fingerprint: E676 179A AA24 1E2B B064 1E83 AF32 AE91 2BF7 7880 

Compliance: VS-NfD Compliant

Input Forms

New form for creating OpenPGP certificate



Create OpenPGP ...ate — Kleopatra

Enter a name and/or an email address to use for the certificate.

Name

Ada Lovelace

Email address

ada@example.net

Protect the generated key with a passphrase.

Advanced Settings...

✓ OK ⓧ Cancel

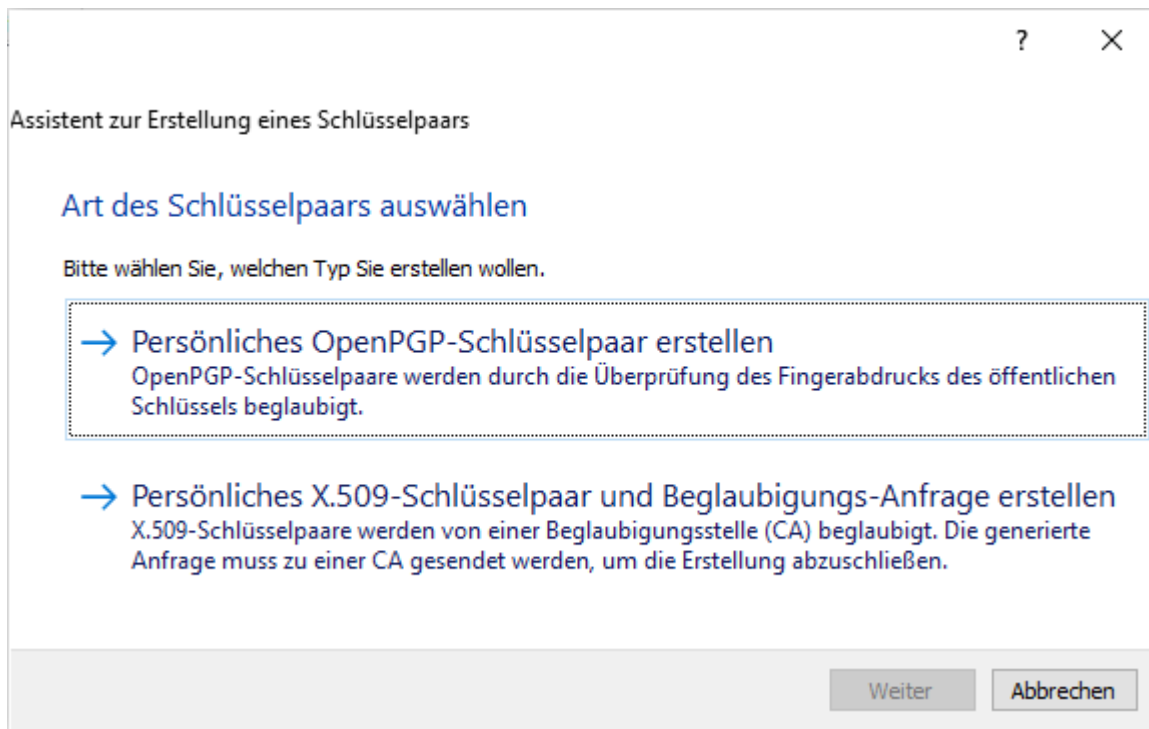
Kill your darlings

Fancy is the enemy of usable and accessible

Changes

Replace wizard with normal dialog (QWizard has too many accessibility issues)

Replace "Choose type of certificate" step with two separate actions (QCommandLinkButton has accessibility issues, e.g. appears as radio button and secondary text is not accessible)



S/MIME Dialog

OpenPGP dialog looked like this

Key Pair Creation Wizard — Kleopatra

Enter Details
Please enter your personal details below. If you want more control over the parameters, click on the Advanced Settings button.

Common name (CN): (required)

Your Email Address: (required)

Location (L): (optional)

Organizational unit (OU): (optional)

Organization (O): (optional)

Country code (C): (optional)

CN=Ada Lovelace,L=London,C=UK

[Advanced Settings...](#)

[Create](#) [Cancel](#)

Required Values

How not to do it

Assistive tools cannot provide useful information to their users

orca doesn't read "required"/"optional" because of less-than-3-words-heuristic for static text

In OpenPGP dialog, name and email address were both marked as optional although one of them has to be given

Key Pair Creation Wizard — Kleopatra

Enter Details

Please enter your personal details below. If you want more control over the parameters, click on the Advanced Settings button.

Common name (CN):	<input type="text" value="Ada Lovelace"/>	(required)
Your Email Address:	<input type="text" value="ada@example.net"/>	(required)
Location (L):	<input type="text" value="London"/>	(optional)
Organizational unit (OU):	<input type="text"/>	(optional)
Organization (O):	<input type="text"/>	(optional)
Country code (C):	<input type="text" value="UK"/>	(optional)

CN=Ada Lovelace,L=London,C=UK

Advanced Settings...

Create Cancel

Error Reporting

How not to do it

Error is displayed far from the corresponding input field

Assistive tools cannot provide useful information to their users

Challenging for users with cognitive or visual impairments

The screenshot shows a dialog box titled "Key Pair Creation Wizard — Kleopatra". The dialog has a title bar with standard window controls. The main content area is titled "Enter Details" and contains a text instruction: "Please enter your personal details below. If you want more control over the parameters, click on the Advanced Settings button." Below this are several input fields:

- Common name (CN): Ada YubiKey5 Lovelace (required)
- Email address (EMAIL): adaexample.net (required)
- Location (L): London (optional)
- Organizational unit (OU): (optional)
- Organization (O): (optional)
- Country code (C): UK (optional)

Below the input fields, a summary line displays "CN=Ada YubiKey5 Lovelace,L=London,C=UK". At the bottom left, a red error message is displayed: "Email address (EMAIL) is incomplete." This message is positioned far to the left of the email input field. To the right of the error message is a button labeled "Advanced Settings...". At the very bottom of the dialog are two buttons: "Create" and "Cancel".

Optional Values

Instruct users what they are expected to do

Changes

No superfluous and confusing “optional”

Word the description as easily understandable instruction

Create OpenPGP ...ate — Kleopatra

Enter a name and/or an email address to use for the certificate.

Name

Ada Lovelace

Email address

ada@example.net

Protect the generated key with a passphrase.

Advanced Settings...

✓ OK ⓧ Cancel

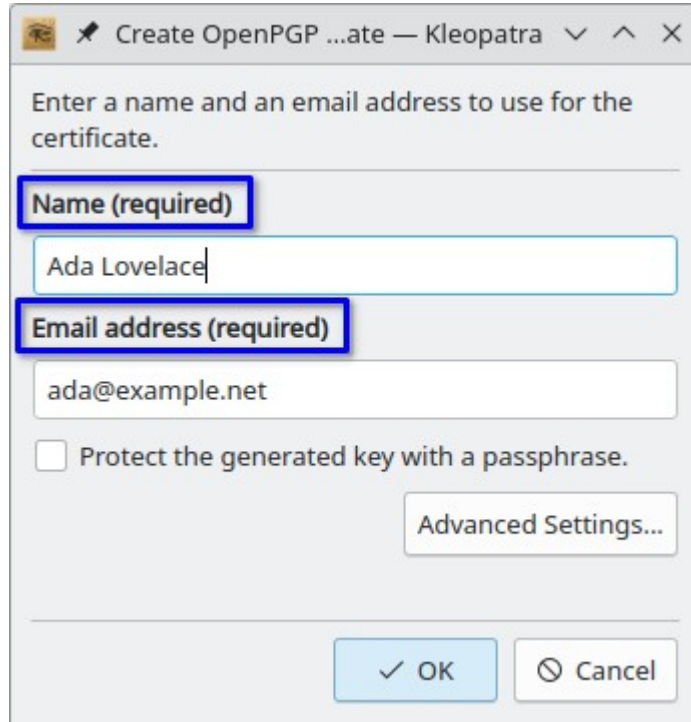
Required Values

How to do it

Changes

Mark labels of required inputs

Side note: HTML has special attributes for required inputs which allows marking with * and still being accessible; could be emulated by adding "required" to the accessible name if orca didn't prefer the label over the accessible name



Create OpenPGP ...ate — Kleopatra

Enter a name and an email address to use for the certificate.

Name (required)

Ada Lovelace

Email address (required)

ada@example.net

Protect the generated key with a passphrase.

Advanced Settings...

✓ OK ⓧ Cancel

Error Reporting

A better solution

Changes

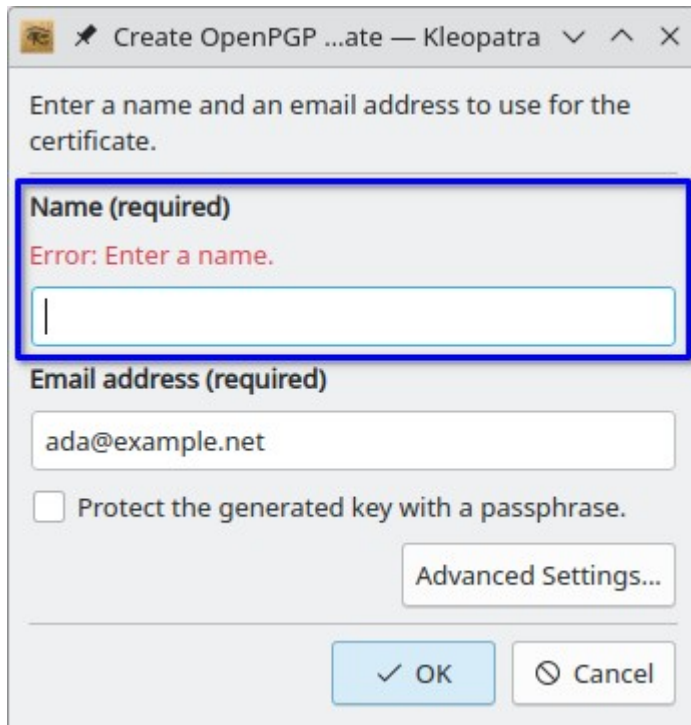
Append “, invalid data” to the accessible name of the input field (emulates handling of IA2’s “invalid entry” state by screen readers)

Set error message as accessible description of the input field (emulates handling of “described by” relations by screen readers)

Word error messages as instructions if appropriate, e.g. “Enter a name.” instead of “A name is required.”

Open

Extend Qt to support the “invalid entry” state



The screenshot shows a dialog box titled "Create OpenPGP ...ate — Kleopatra". The main text reads: "Enter a name and an email address to use for the certificate." Below this, there are two input fields. The first field is labeled "Name (required)" and contains a red error message: "Error: Enter a name." This field is highlighted with a blue border. The second field is labeled "Email address (required)" and contains the text "ada@example.net". Below the email field, there is a checkbox labeled "Protect the generated key with a passphrase." which is currently unchecked. To the right of the checkbox is a button labeled "Advanced Settings...". At the bottom of the dialog, there are two buttons: "OK" (with a checkmark icon) and "Cancel" (with a close icon).

Error Reporting

Another example

Changes

Again: The error message is worded as an instruction and gives an example.

Create OpenPGP ...ate — Kleopatra

Enter a name and/or an email address to use for the certificate.

Your Name
Enter your name as "Firstname Lastname".
Ingo Klöcker

Your Email Address
Enter your example.com email address.

Error: Enter an email address in the correct format, like name@example.com.

adaexample.net

Protect the generated key with a passphrase.

Advanced Settings...

✓ OK ⊘ Cancel

Bonus: Hints

Tell the users what is expected

Changes

Similar to error messages the hints are worded as instructions

Set hint as accessible description of the input field (emulates handling of “described by” relations by screen readers)

Open

Add support for “described by” relations to Qt (currently Qt supports “labeled by”)

Create OpenPGP ...ate — Kleopatra

Enter a name and/or an email address to use for the certificate.

Your Name
Enter your name as "Firstname Lastname".
Ingo Klöcker

Your Email Address
Enter your example.com email address.
ada@example.net

Protect the generated key with a passphrase.

Advanced Settings...

OK Cancel

Links in Labels

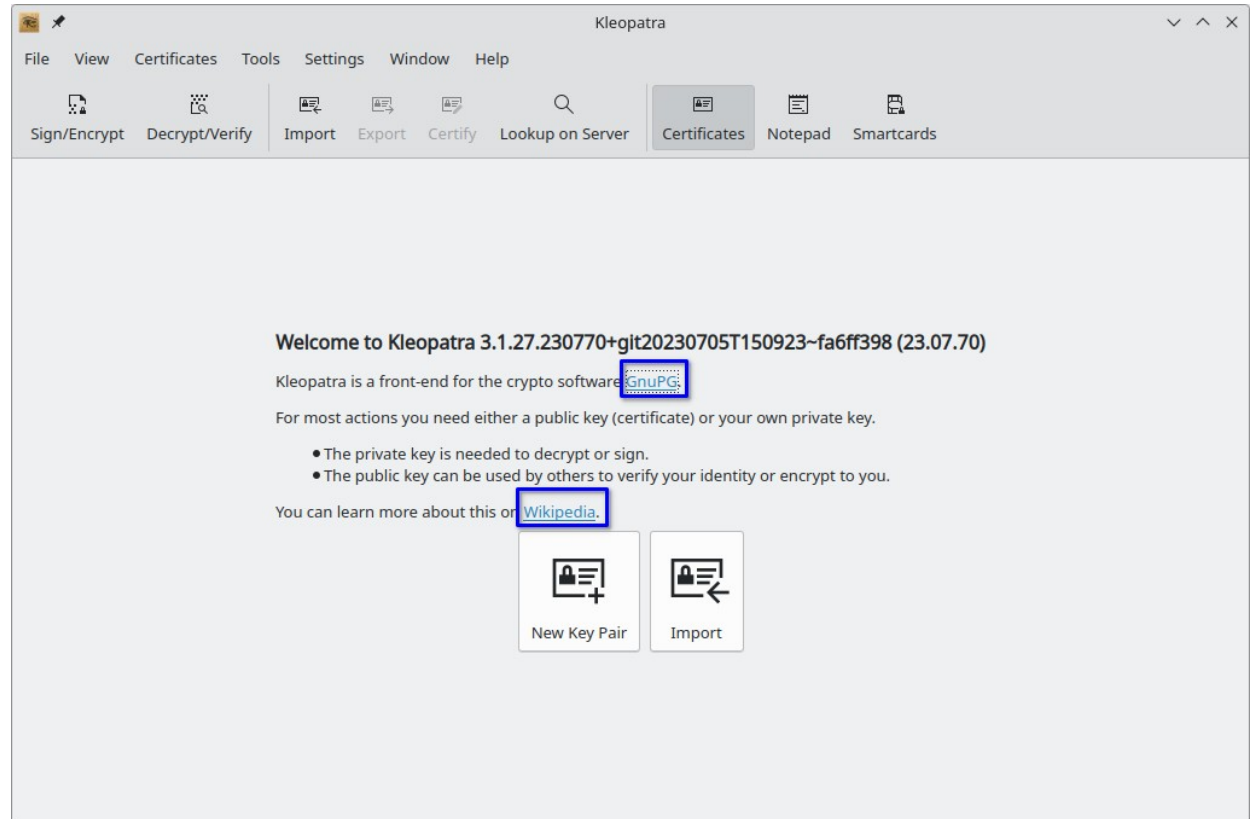
Make them more accessible

Changes

Add subclass of QLabel, corresponding AccessibleWidget subclass and AccessibleLink class (with role Link) representing links of rich text labels to make the links displayed by the label accessible in the same way as links displayed by a web browser

Open

Add support for accessible links to QLabel



Line Edit Actions

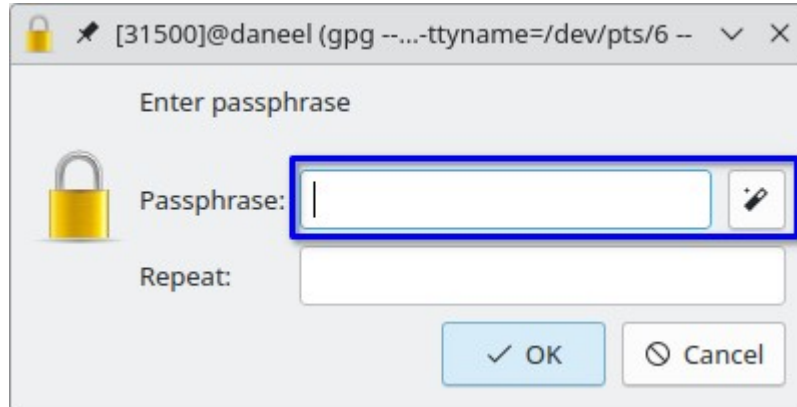
Use them with care

Custom QLineEdit actions (like Show/Hide Password or Clear) are unreachable with the keyboard and invisible for assistive tools; avoid them or ensure that there is an easily accessible alternative way to achieve the same result

Changes

Replace some custom QLineEdit actions with buttons next to the input field

Show a message box instead of an error label if the two passwords do not match (orca ignores labels that become visible)



Focus for Text

For more accessible errors and other static text

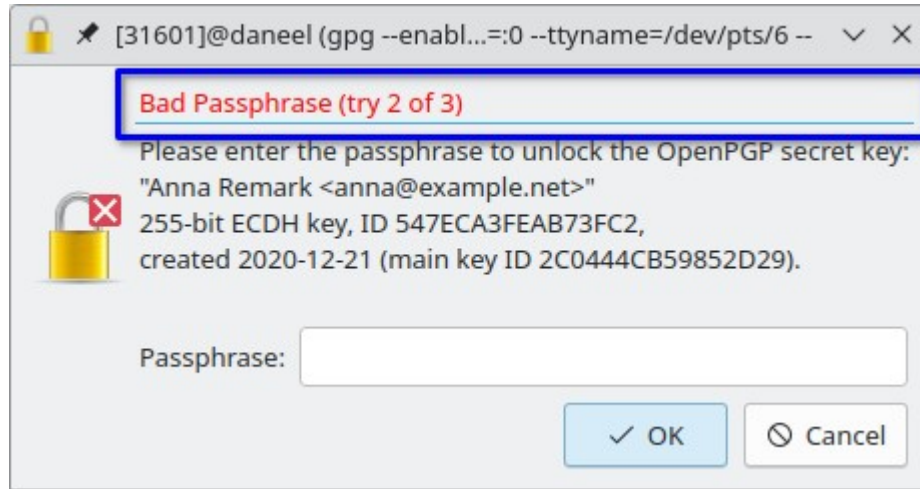
Changes

Add a helper that allows labels to receive keyboard focus if an assistive tool is active

Show focus indicator for static text that has focus

Open

Make all static texts (all QLabel) accessible





Thank you!

Questions?



Links

[Parent ticket for many accessibility tickets](#)

[Accessibility for QWidget Applications \(Qt 5\)](#)

Source code of [gui/accessible](#) and [widgets/accessible](#)



More Changes

These didn't fit on the slides

Ensure that empty line edits that get focus are announced by orca (workaround for an event order problem in QLineEdit that makes orca not announce the line edit)

Fix tab order problems everywhere

Set accessible name and/or description where appropriate

Send a state-change event if a checkable list item is checked or unchecked

Emulate setting accessible name of a QAction with a custom property (workaround for lack of accessible name in QAction)

Make dialogs work on narrow displays resp. with large magnification

Take the added scroll areas out of the tab order (there is no focus indicator and the screen readers also give no useful hint which element has focus)

Ensure that screen readers correctly read a list of disallowed characters like '<' and '>' in email addresses

Ensure that a QLabel showing just a link can be left with Shift+Tab

Make multi-column models used with combo boxes or as completion model work correctly for screen readers