# Quest® Client Profile Updating Utility 5.8.5 

## Release Notes

March 2022
These release notes provide information about the Quest® Client Profile Updating Utility release.
Topics:
New features and resolved issues
Known issues
System requirements
Product licensing
Upgrade and installation instructions

## About this release

The Client Profile Updating Utility (CPUU) is used to update end-user Microsoft Outlook profiles settings, migrate additional features of user mailboxes and finally switch the profiles from the source to the target Exchange server once the user's mailbox is migrated and switched either manually or by the Migration Manager's Mail Agent.
CPUU supports Microsoft Outlook 2010/2013/2016/2019 and Outlook for Office 365. It can be used only in conjunction with the following products:

- Migration Manager 8.15 or later
- On Demand Migration for Email

Refer to the Supported Configurations for details

## Supported Configurations

## Mail Clients

- Microsoft Outlook 2010
- Microsoft Outlook 2013
- Microsoft Outlook 2016
- Microsoft Outlook 2019
- Microsoft Outlook for Office 365
i NOTE: Microsoft Outlook for Office 365 (installed as a part of Office 365 ProPlus suite) is also supported.


## Operating Systems

- Microsoft Windows 7
- Microsoft Windows 8
- Microsoft Windows 8.1
- Microsoft Windows 10
- Microsoft Windows 11


## Additional Software Requirements

- The Client Profile Updating Utility Configuration wizard requires Microsoft .NET Framework 4.7.2 or later to be installed.


## Important Considerations

- Processing profiles for Microsoft Virtual Desktop Infrastructure (VDI) environments is not supported.
- CPUU does not support Outlook installed using application virtualization systems such as Microsoft App-V.
- Outdated versions of Outlook 2010/2013 which do not support MAPI Over HTTP (KB3085604 and KB3114349) should be updated for migration to Office 365 or to Exchange 2016/2019


## New features and resolved issues

This release introduces the following new feature:

- Added Microsoft Windows 11 to Supported Configurations.


## Release History

## New in 5.8.4 version

IMPORTANT: After this update is installed, CPUU.ini should be recreated for existing projects due to deprecation of the following configuration parameters:

- BypassModernAuthentication
- CleanupCredentialManager

Or the parameters mentioned above should be removed from existing $\operatorname{INI}$ file.

The following known issues are fixed in this release:

| Defect ID | Issue Description |
| :--- | :--- |
| CPUU-1541 | Addresses two cases where CPUU would fail to open the mailbox store even with - <br> LogonThroughOutlook: |
|  | - where UPN was not equal to the user's SMTP address |
| - when admin credentials were used instead of the user's own credentials. |  |

## New in 5.8.3 version

This release introduced the following new feature:

- Support for migration to Microsoft Office 365 tenants with modern authentication enabled and optionally Multi-Factor Authentication (MFA) enabled.

Previously this functionality was partially supported by means of disabling modern authentication in Outlook settings for the time of profile processing, but this method cannot be used now due to recent changes made by Microsoft in updates for Microsoft Outlook for Office 365 / Outlook 2016 and in Outlook 2019. Now authentication process can be delegated to Outlook that allows Client Profile Updating Utility to access target mailbox with modern authentication and MFA. To enable this behavior the -LogonThroughOutlook command line parameter is introduced in this release. If this parameter is specified in Client Profile Updating Utility command line, Client Profile Updating Utility is allowed to initiate start of Outlook for prompting target user credentials and performing authentication process. Some restrictions may apply. Refer to the Workaround 1 specified in Known Issue CPUU-1266 for details.

The following known issues are fixed in this release:

CPUU-1415 Source display name may retain in switched profile on the target in the account properties and in From field.

Fix: Now correct target email address is displayed.
CPUU-1426 Profile cannot be processed, when the Prompt for credentials option is selected in case of source and target user passwords does not match.

Fix: Now profile will be processed in the case of source and target user passwords does not match.

CPUU-1416 In case of unsuccessful access to the target in case the Prompt for credentials option is selected, rollback will be started and CPUU asks for source credentials again.
Fix: Now rollback does not require credentials for the case.

## New in 5.8.2 version

This release introduces the following new feature:

- Quest Migration Manager version 8.15 support.


## New in 5.8.1 version

This release introduces the following enhancements for CPUU:
\(\left.$$
\begin{array}{ll}\text { Defect ID } & \text { Enhancement } \\
\hline \text { CPUU-1360 } & \begin{array}{l}\text { CPUU disables Autodiscover SCP lookup for all Outlooks by default. } \\
\text { DoNotModif yExcludeSCPLookup (previously ExcludeScpLoo kupNewer) parameter } \\
\text { can be used to turn off this behavior, if necessary. }\end{array} \\
\hline \text { CPUU-1319 } & \begin{array}{l}\text { Now the Switch Message handling procedure has been optimized, and CPUU uses the } \\
\text { following parameters retrieved from the message: }\end{array}
$$ <br>

\& \quad - Version of the Switch Message\end{array}\right]\)| - Target mailbox DN |
| :--- |

| CPUU-1343 | Switch Message section format in SwitchResMB.ini is now simplified. It is recommended to <br> re-create configuration files from previous versions of the product, but obsolete <br> SwitchResMB.ini is still workable, you can use whatever you want. |
| :--- | :--- |
| CPUU-1269 | Client Profile Updating Utility is now enhanced to pre-check if MAPI is disabled on the target to <br> stop profile processing in this case. As a result, time is saved and redundant errors in log are <br> prevented. |
| CPUU-1265 | Client Profile Updating Utility Configuration wizard may not preserve some advanced tuning <br> settings in case these settings were selected and then cleared. Configuration wizard is now <br> enhanced to avoid the issue. |
| CPUU-1371 | If UseLocalAutodiscoverXMLs=1, target user mailbox and public folders SMTP domain part <br> names are not specified in ProcessedDomainsFQDNs, CPUU now stop processing and the <br> error is reported. |
| The following known issues are fixed in this release: |  |

that this module is missing.
Fix: If Prompt for credentials or Manually provide credentials are selected, before profile processing is started, CPUU checks if DlgHookHandler.dll ( or DlgHookHandler_x64.dll for Outlook x64) is located in the CPUU installation folder (ClientProfileUpdatingUtility.exe/ ClientProfileUpdatingUtility_x64.exe). In case this module not found, CPUU stops and the error is reported.

## New in 5.8 version

This release introduces the following new features and enhancements for CPUU:

- Microsoft Outlook 2019 is now supported by CPUU.
- CPUU can now process profiles across Microsoft's cloud offerings, including tenants in Germany and China.
- MAPI over HTTP support for Outlook 2010/2013 for on-premises migration scenarios
- Validity of provided service account's credentials is now checked by CPUU before attempting to log to the profiles. The validity check result is reported to log file for troubleshooting purposes.
- CPUU.ini usability is now improved due to extended Autodiscover usage, the following settings are no longer required because CPUU gets necessary data automatically:

$$
\begin{aligned}
& \text { RPCOverHTTP section: } \\
& \text { ConnectUsingHTTP } \\
& \text { ProxyServer } \\
& \text { SSLOnly } \\
& \text { MutualAuth } \\
& \text { PrincipalName } \\
& \text { HTTPFirstOnFast } \\
& \text { HTTPFirstOnSlow } \\
& \text { AuthType } \\
& \text { FirstLogonOverTCP } \\
& \text { DomainCfg section: } \\
& \text { PublicFolderPrimarySmtpAddress } \\
& \text { PublicFolderPrimaryMailboxGuid } \\
& \text { TargetO365AutodiscoverEndpoint } \\
& \text { Domain } \\
& \text { Servers }
\end{aligned}
$$

IMPORTANT:Configuration files created in previous versions of CPUU are no longer supported and should be re-created.

- New configuration parameter ProcessedDomainsFQDNs is now used instead the following obsolete parameters:
- AutodiscoverDomainsFQDNs
- ApprovedSMTPAddressDomainParts
- T2TDomainNamesOfMailboxesAllowedToSwitch

Now profiles with Multiple Exchange accounts can be configured for processing in configuration wizard.For details see Configuration Parameters section of Client Profile Updating Utility Administrator Guide.

- New management parameter -SkipAutodiscoverChecking is now added to prevent CPUU from checking that an autodiscover URL is on a source domain and a target autodiscover URL is on a target domain. For details see Management Parameters section of Client Profile Updating Utility Administrator Guide.
- RPC over HTTP limited support ( Public Folders processing is not supported) for migration to Office 365 in case of Outlook 2010/2013. For details see Known issues.

This release introduces the following new features and enhancements for Switch Resource Mailboxes utility (SwitchResMB):

- Microsoft Outlook 2019 is now supported by SwitchResMB.
- New configuration parameter LeaveTemporaryProfiles is now added for troubleshooting purposes to prevent deleting of MAPI temporary profiles created by SwitchResMB utility for CPUU. For details see Using the Utility section of Client Profile Updating Utility Administrator Guide.

The following known issues are fixed in this release:

## Defect ID Issue Description

CPUU-1234 AutoComplete list (formerly Nicks) processing is now enhanced to support migration in rare 4397567-1 case of duplicated nick properties

CPUU-1058, Tenant to tenant migration scenario with domain name transfer does not work due to incorrect 4334806-1 server name handling

CPUU-1056, CPUU does not restore EnableADAL to original value after Cleanup.
CPUU-1210
CPUU-1030, Failed to access Autodiscover URL if Negotiate and NTLM are not specified as the first CPUU-1179, entries in the supported authentication method list returned by the Autodiscover service CPUU-1129 server

Scope : Scenarios where Use the currently logged in user option is selected

## New in 5.7.9 version

IMPORTANT: Henceforth, we terminate the support of Microsoft Outlook 2007 due to the fact that Microsoft does not support Microsoft Office 2007 since October 2017, but we do not limit the use of Client Profile Updating Utility for Microsoft Outlook 2007 profile switching.

This release introduces the following new features:

- CPUU-867: ApprovedExchangeDomains parameter is now replaced with ApprovedSMTPAddressDomainParts parameter to process profiles containing multiple Exchange accounts. ApprovedSMTPAddressDomainParts parameter contains selected domain parts of source SMTP addresses in space-separated list to specify which primary accounts are allowed to be switched. See Configuration Parameters for details.
- CPUU-1026: Modern Authentication for Outlook 2013 and 2016 is now bypassed by default while Client Profile Updating Utility process Outlook profiles. See BypassModernAuthentication parameter in Configuration Parameters for details.

Defect ID Enhancement

| CPUU-699 | Though shared folder matching was unsuccessful, Calendar feature can be displayed as OK. <br> Now the case is handled correctly. |
| :--- | :--- |
| CPUU-431 | Client Profile Updating Utility may not preserve last logged on account name in case User <br> principal name (UPN) doesn't match the email address. Now Client Profile Updating Utility <br> preserves the last logged on account name in such user environments. |
| CPUU-108 | Client Profile Updating Utility may hang in case of incorrect credentials for target service <br> account. |
| CPUU-1017 | In rare cases additional mailbox matching may fail and the following message is displayed: <br> Cannot match the folder. ... |
| Reason: Source StoreIDS matching failure. |  |

## Known issues

The following is a list of issues, including those attributed to third-party products, known to exist at the time of release.

Table 1: General known issues

| Known Issue | Issue ID |
| :--- | :--- |
| When Basic Authentication is disabled on the Microsoft Office 365 target tenant, CPUU fails trying | CPUU- |
| to connect to the target Autodiscover service with a 401 unauthorized error. | 351476 |
| Scope: Microsoft Outlook 2016/ Microsoft Outlook for Office 365/Microsoft Outlook 2019 installed |  |
| on the local computer and target mailbox located in Microsoft Office 365 tenant with Modern |  |
| Authentication enabled and Basic Authentication fully disabled. |  |
| Root-cause: Client Profile Updating Utility requires information from the target Autodiscover |  |
| service to update the user profile. |  |
| Workaround: In the target tenant, under Settings > Org Settings, on the Services tab, select |  |
| "Modern Authentication", and then under "Allow access to basic authentication protocols" enable |  |
| Autodiscover by checking the corresponding check box and then using the "Save" button at the |  |
| bottom of the panel to save the new setting. |  |

Client Profile Updating Utility failed to process profile. The following events are logged:

## - MAPI_E_LOGON_FAILED error

- Outlook could not logon error after failed attempt to open the store

Scope: Microsoft Outlook 2016 / Microsoft Outlook for Office 365/ Microsoft Outlook 2019 installed on the local computer and target mailbox located in Microsoft Office 365 tenant with Modern Authentication enabled
Root-cause: Client Profile Updating Utility cannot log on to the target mailbox using Outlook MAPI due to changes made by Microsoft in recent updates for Microsoft Outlook for Office 365 / Outlook 2016 and in Outlook 2019.
The following workarounds can be used to fix the issue:
Workaround 1: Use new command line parameter-LogonThroughoutlook to start Client Profile Updating Utility in the case. This parameter initiates start of Outlook to prompt for target user credentials during first access to target mailbox and to perform authentication process..
i NOTE: Consider the following behavior changes in case the LogonThroughOutlook command parameter usage:

- If Manually provide credentials option is selected, standard behavior is now changed and profile processing cannot be performed without requesting user credentials. Microsoft Outlook will be automatically started by CPUU to request user credentials for target mailbox and perform authentication process.
- If Manually provide credentials option is selected and UPN of target user does not match with primary SMTP address, CPUU fails to process profile.
- If Prompt for credentials option is selected, Microsoft Outlook will be automatically started to request user credentials for target mailbox. In case the source and target passwords do not match, or UPN of target user does not match with primary SMTP address, the target user credentials may be requested twice during profile processing.

Workaround 2: Turn off Modern Authentication in the target Microsoft Office 365 tenant.
The value of the stored Autodiscover URL may not be updated if the CPUU is redirected to another CPUU-1321 Autodiscover URL using Autodiscover response.

Configuration file cannot be changed and the following message is displayed when Use existing N/A configuration file option is selected on the Welcome step of configuration wizard: Unknown key "AutodiscoverDomainsFQDNs' in section "Parameters" in configuration file.
Root-cause: Configuration files created in previous versions of CPUU are no longer supported and should be re-created.
Workaround: Select Create a new configuration file option on the Welcome step of configuration wizard to re-create configuration file.

Profiles cannot be updated in case RecreateSwitchMsg is set to 1 in SwitchResMB configuration file.

Scope:Microsoft Outlook 2016/2019
Workaround: Use management parameter -SkipAutodiscoverChecking to prevent CPUU from checking that an autodiscover URL is on a source domain and a target autodiscover URL is on a target domain. For details see Management Parameters section of Client Profile Updating Utility Administrator Guide.

In case of mailbox switch under Tenant to tenant migration scenario with domain name
transfer, additional mailboxes connected to the main mailbox may not work at the first attempt to open them after Outlook profile switching.
Workaround: To restore the accessibility of additional mailboxes restart Outlook.
CPUU does not support Outlook profiles with any third-party Add-ins installed.
TF351792
After the switch of a profile with multiple Exchange accounts, a list of address books of a nonTF319769 default account may not contain the local contacts
If the primary SMTP address of an Office 365 user contains the onmicrosoft.com suffix, Client TF318923 Profile Updating Utility may not be able to log on to the target if the target is the hybrid Exchange organization with Single Sign-On. In this case, this profile cannot be switched.

After the switch of a profile that contains multiple Exchange accounts, the Move option from the TF318234 shortcut menu of the profile messages may not be displayed on the target.
During processing of a profile that contains multiple Exchange accounts, Client Profile Updating TF318648 Utility disables all rules that belong to the switched account. This may happen if links to the folders in these rules point to the folders in another account.
CPUU cannot be installed via Migration Manager suite if the Exchange MAPI Collaboration Data TF218851 Objects 1.2.1 or later is not installed on the workstation.

In Microsoft Outlook 2010, the list of rules is not displayed in the target profile after migration. This TF211724 problem arises if you never perform the Send/Receive operation for this profile. To view the rules, press F9.

Client Profile Updating Utility does not support Citrix terminal connections.
Client Profile Updating Utility cannot roll back changes to Microsoft Outlook profiles that were TF213587 made by the earlier versions of CPUU.

After the switch, the Auto-reply to people outside my organization option in the Automatic
Replies dialog becomes selected on the target even if this option is deselected on the source. This may happen if the schedule is not set and the text message fileld is empty in the Automatic Replies dialog on the source.
Client Profile Updating Utility stops all processes that lock Microsoft Outlook profiles. If the process ST80424, was not stopped immediately, you may receive the following warning: "Microsoft Outlook (or ST80301 another MAPI client) is using a dialog box for selecting a profile to log on. Please close this dialog box before Migration Manager for Exchange Client Profile Updating Utility starts processing the profile(s)."
Outlook Address Book (OAB) contacts lose their Distribution List membership after the migration, if they were added to OAB from the Global Address List.

After the utility switches profile of a user migrated in a Remote User Collection, a message containing switch log with error may appear in the Sync Issues folder after first synchronization.

If the account used by the utility to log on to the target is configured to change password after the first logon, such profile will not be switched.
If you run the utility locally or by a logon script, Windows Firewall displays a warning. However, the warning does not interfere with profile updating.

After the switch, Out of Office Assistant works only if you log on to the mailbox using the same credentials, as you use to log on to your computer.

After migrating to Microsoft Exchange 2007, users may experience errors during the Offline Address Book download. To resolve the issue, open the Offline Address Book Properties dialog in the Exchange Management Console and select the Outlook 98 SP1 or earlier (Version 2) option on the Distribution tab. Note that the issue is applicable to all Microsoft Outlook versions.

During the rollback, changed public folder favorites are not restored to the initial state.
CPUU does not support localized versions of Microsoft Outlook, Microsoft Exchange Server, or the Microsoft Windows operating system. CPUU may fail to update a profile if the corresponding code page is not supported by the target Exchange server. For details, see the Microsoft Knowledge Base article at http://support.microsoft.com/default.aspx?scid=kb;en-us;251719.

CPUU may fail to update a profile if Microsoft Outlook is not the default mail client on the computer.
The DIgHookHandler.dII library must be located in the same folder as ClientProfileUpdatingUtility.exe.

If any message boxes are displayed when the user starts Microsoft Outlook, the same message boxes may appear when CPUU processes the user's profile.

CPUU performs automatic Undo only if Migration Manager Console supports this operation. To rollback a profile manually, use the Rollback mode of the CPUU Configuration Wizard.

If you enable updating of offline profiles even if the target mailbox was not recreated by the Migration Manager or Exchange Migration Wizard agents, in cases when the mailbox could not be recreated, CPUU will remove the OST files for the updated profiles. The OST files will be automatically re-created by Microsoft Outlook when the user logs on to the Microsoft Exchange 2000/2003 mailbox for the first time.

Profiles with authentication set to Distributed Password are not updated.
Microsoft Outlook Search Folders are created as disabled folders. Click on the folder to enable it.
Rolling back a profile update may not work correctly if the same PST file is assigned to several profiles.

If the Exception List rules are set in a Microsoft Outlook XP/2003 profile, no rules will be updated.
The filters created for the offline folder copy synchronization are not preserved while updating the profile.

If a user uses offline profile with the cached mode turned on but the mailbox is not migrated in a Remote Users Collection, it is recommended to synchronize the offline folder (OST) file before CPUU updates the profile. Otherwise CPUU may rewrite the unsynchronized changes in the OST file with the newer information contained in the online profile.

If the Synchronize forms option in the Send/Receive Settings is selected for a source offline profile, a Microsoft Outlook error may appear after the profile has been updated by CPUU and the user has performed OST file synchronization with the target profile. To resolve the issue, clear the Synchronize forms option in the target profile's Send/Receive Settings.

If after a mailbox was migrated in a Remote Users Collection and the OST file was successfully preserved after profile update you delete the $\times 500$ address that is equal to the distinguished name of the source mailbox from the proxy addresses of target mailbox, the OST file is no longer accessible. You will need to re-create and re-synchronize the whole OST file from the target server.

Even if a mailbox was migrated in a Remote Users Collection and the OST file was successfully preserved, the offline address book (OAB) file is not preserved and is automatically downloaded from the target server when a user logs on to the target mailbox for the first time after profile
update. Note that download of the address book may take considerable time.
In Windows 7 and Outlook 2010 (or later) configurations, logon by RPC over HTTP is always used, ST77809 even if you disable it by setting the FirstLogonOverTCP configuration property to 1.

Currently, the following Outlook 2013 features are not processed by CPUU: linked contacts, favorite contacts.

## System requirements

Before installing Client Profile Updating Utility 5.8.5, ensure that your system meets the following minimum hardware and software requirements.
Table 2: System requirements

| Requirement | Details |
| :--- | :--- |
| Platform | $\mathrm{x} 86, \mathrm{x} 86-64$ |
| Operating system | Any of the following: |
|  | - Microsoft Windows 7 |
|  | - Microsoft Windows 8 |
|  | - Microsoft Windows 8.1 |
|  | - Microsoft Windows 10 |
| - Microsoft Windows 11 |  |

Any of the following:

- Microsoft Outlook 2010
- Microsoft Outlook 2013
- Microsoft Outlook 2016
- Microsoft Outlook 2019
- Outlook for Office 365


## Product licensing

Use of this software is governed by the Software Transaction Agreement found at www.quest.com/legal/sta.aspx. This software does not require an activation or license key to operate..

## Upgrade and installation instructions

Client Profile Updating Utility 5.8 .5 supports upgrade from version $5.2,5.3,5.4,5.5,5.6$ and 5.7.

To upgrade Client Profile Updating Utility, run the CPUU 5.8 .5 setup and follow the Configuration wizard. If you are not use the CPUU configuration file with Use the following user account option selected, no action is required, otherwise you might need to perform the additional steps:

## - For CPUU user profile processing

It is recommended to switch to Prompt for credentialsoption for migration from / to Microsoft Office 365. For all other migration processes it is recommended to switch to Use the currently logged in user or Prompt for credentials options. Those options ensure much safer credential handling.

In case you still need to use Manually provide credentials option (previously named Use the following user account), it is necessary to reenter the previously saved passwords on Credential step of Configuration wizard.

## - For mailbox processing using SwitchResMB

Please, pay attention, now you have Manually provide credentials option (previously named Use the following user account option selected on Credential step of Configuration wizard. It is necessary to reenter the previously saved passwords here. We recommend to select one of the restricted encryption modes (Restricted to current user and host or Restricted to current host). While we have implemented the reliable encryption algorithm, it is theoretically possible to reverse-engineer CPUU code and use the knowledge to decrypt credentials data stored in CPUU configuration file when Unrestricted (not recommended, security risks should be reviewed) encryption mode is used. Thus, using Unrestricted (not recommended, security risks should be reviewed) encryption mode has a chance that your credentials might be compromised. We strictly not recommend to use this mode in the production environment and for administrative credentials. It is only acceptable for evaluation purposes in the test environment.

For more details about encryption modes see Encryption modes section of CPUU Administrator Guide.

## Contents of the Release Package

The Client Profile Updating Utility release package contains the following products:

1. Client Profile Updating Utility 5.8 .5
2. Product Documentation: Administrator Guide
3. ClientProfileUpdatingUtility_5.8.5_ReleaseNotes.pdf-this file.

## Installation Instructions

To install Client Profile Updating Utility, run the CPUU.5.8.5. ${ }^{*}$.msi installation package provided in your distribution of the product.
The latest version of the product is available for download at https://support.quest.com/download-installdetail/6117163

## Globalization

This section contains information about installing and operating this product in non-English configurations, such as those needed by customers outside of North America. This section does not replace the materials about supported platforms and configurations found elsewhere in the product documentation.

This release is Unicode-enabled and supports any character set. In this release, all product components should be configured to use the same or compatible character encodings and should be installed to use the same locale and regional options. This release is targeted to support operations in the following regions: North America, Western Europe and Latin America, Central and Eastern Europe, Far-East Asia, Japan.

## About us

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## Technical support resources

Technical support is available to Quest customers with a valid maintenance contract and customers who have trial versions. You can access the Quest Support Portal at https://support.quest.com.
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- Submit and manage a Service Request
- View Knowledge Base articles
- Sign up for product notifications
- Download software and technical documentation
- View how-to-videos
- Engage in community discussions
- Chat with support engineers online
- View services to assist you with your product


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## Legend

! CAUTION: A CAUTION icon indicates potential damage to hardware or loss of data if instructions are not followed.

## Third-party contributions

This product contains the following third-party components. For third-party license information, go to https://www.quest.com/legal/license-agreements.aspx. Source code for components marked with an asterisk (*) is available at $\mathrm{https}: / /$ opensource.quest.com.

Table 3: List of Third-Party Contributions

| Component $\quad$ License or Acknowledgement |
| :--- |
| Loki $2001 \quad$ Copyright (c) 2001 by Andrei Alexandrescu |
| Copyright Notice - Loki 2001 |
| Copyright (c) 2001 by Andrei Alexandrescu |
| This code accompanies the book: |
| Alexandrescu, Andrei. "Modern C++ Design: Generic Programming and Design |
| Patterns Applied". Copyright (c) 2001. Addison-Wesley. |
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