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# KEYnote 45

THE WIBU-MAGAZINE

## Integrating Resellers – Two Routes, One Destination

**Highlights**

- AxProtector with Obfuscation
- CodeMeter Security
- Divide and conquer: Modular Licensing

WIBU SYSTEMS

## Content










# Dear Clients and Partners!

It is a tough competition: Every year, the most ground-breaking and pioneering small and medium enterprises in Germany are selected for the TOP 100 innovation award, organized by the renowned innovation researcher Nikolaus Franke. In 2023, Wibu-Systems will be counted among that great crowd for the first time, after we were able to show our innovative qualities in five categories, from our management team, climate, processes and organization to our outward-looking / open innovation mindset, and practical successes with innovative products.

For us, this achievement does not mean time to rest on our laurels, but an incentive to continue to make Wibu-Systems even more innovative, to add our contribution to current standards like the DIN's NA 043-01-41-02 AK "Generic API for IoT and Industrial Devices", and to keep registering new patents. By working with our partners, including top research institutions, we are bringing our expertise to bear on new flagship technologies like Post-Quantum Cryptopgraphy (PQC) or Artificial Intelligence (AI). All of this so you can rest assured that our solutions will always include the best and newest innovations for your products.

This issue of our KEYnote magazine includes a look at the level of security offered for your software courtesy of CodeMeter security and the AxProtector obfuscation capabilities; the means to integrate CodeMeter in your installers; the Software Activation Wizard that makes it easier for your users to get their licenses; and the License Portal that lets your clients manage their own licenses. Additionally, you can read more about how to create new business opportunities with feature-on-demand licensing, and the success story of our Japanese client Leader Electronics.

I wish all of you success and wise decision-making for your business in the year ahead, and I would love it if our solutions contributed a little bit to that success for you. Will we see you at one of the upcoming expos or at the June and September INNO DAYS at our Karlsruhe head offices?

Best regards,

Oliver Winzenried

CEO

# Software Activation Wizard Examples

In software licensing, providing licenses should be simple and secure. That goes for software developers who want to create new licenses on a central license server and it goes for end users who need to get the licenses on their devices. If the system in question has an Internet connection, at least temporarily, this can be done very easily and elegantly with a Software Activation Wizard. Called SAW for short, this can be a separate application or another feature in the end user application that takes care of:

- Transferring the initial license from CodeMeter License Central to the local system
- Creating a CmContainer, if required, on the local system
- Checking regularly whether there are any changes to the ticket or CmContainer on CodeMeter License Central

## Gateways

To conduct license checks from within an application, Wibu-Systems provides the gateways as part of the CodeMeter License Central Internet Extensions. Gateways are PHP scripts that can be called with the right parameters and return the required data in a JSON format. This results in two main requirements for a license check in the application:

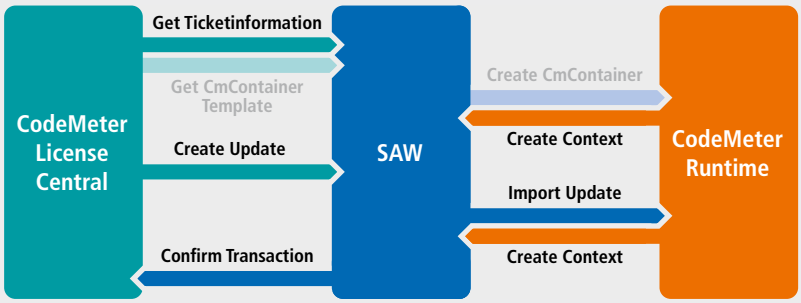
- Communication via https must be possible
- JSON objects must be interpreted

Beyond accessing the gateways, the application in question only has to be able to communicate with the local CodeMeter Runtime to provide the license data on the system.

## Software Activation Wizard Samples

Wibu-Systems has prepared a number of sample implementations for different programming languages in the developer section of its website to make integrating SAW functionalities as simple as possible. There are samples for different use cases.

What all implementations have in common is that they have a central module that takes care of communicating with the gateways and linking up with CodeMeter Runtime. The module is either a library or a standalone file and can be integrated as is or changed to suit each software's needs.




## C#

The central module used by all samples is the WibuLcGatewaysAPI library.

- *SimpleWizard* is the fundamental example that simply shows which functions need to be called to activate licenses.
- *Wizard* is a standalone application that handles most license management operations on the basis of tickets or CmContainers.
- *AutoUpdate* is an example of how a check can be run for auto-update licenses for all local CmContainers.
- *SingleTicket* shows how the ticket number stored in a license can be used to check whether new licenses have been provided.
- *Renew* is a simple example to explain how renew licenses work for service engineers.
- *Cloud* shows how a new user and CmCloudContainer can be created through the License Portal or how a CmCloudContainer can be provided for an existing user on a local system.
- *LicensePortalUserTickets* demonstrates how all available tickets for a user can be accessed and checked for new licenses.
- *ActivationInformation* is a simple example that explains how additional information can be written into a license with activation-specific parameters.

## Java

The central module used by all examples is the library jaw-core-x.xx.xxx.xxx.jar.

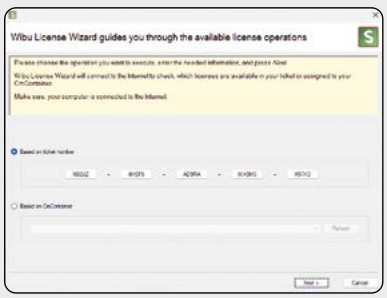
- *ActivateFromTicket* is a simple application that shows how licenses are transferred from a central server to a local system.
- *DeactivateFromTicket* demonstrates how licenses activated on a local system can be returned to the central server.

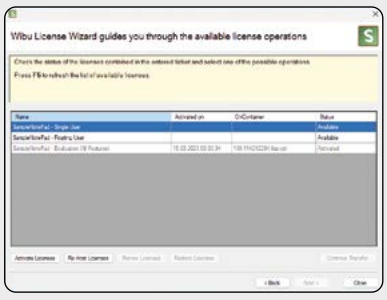
## C++

For C++, a command line application is provided that can handle different operations via the right parameters. The central module is the file WibuLCGatewayAPI.cpp. libcurl is used as a library for https communication and jsmn.h for handling JSON objects.

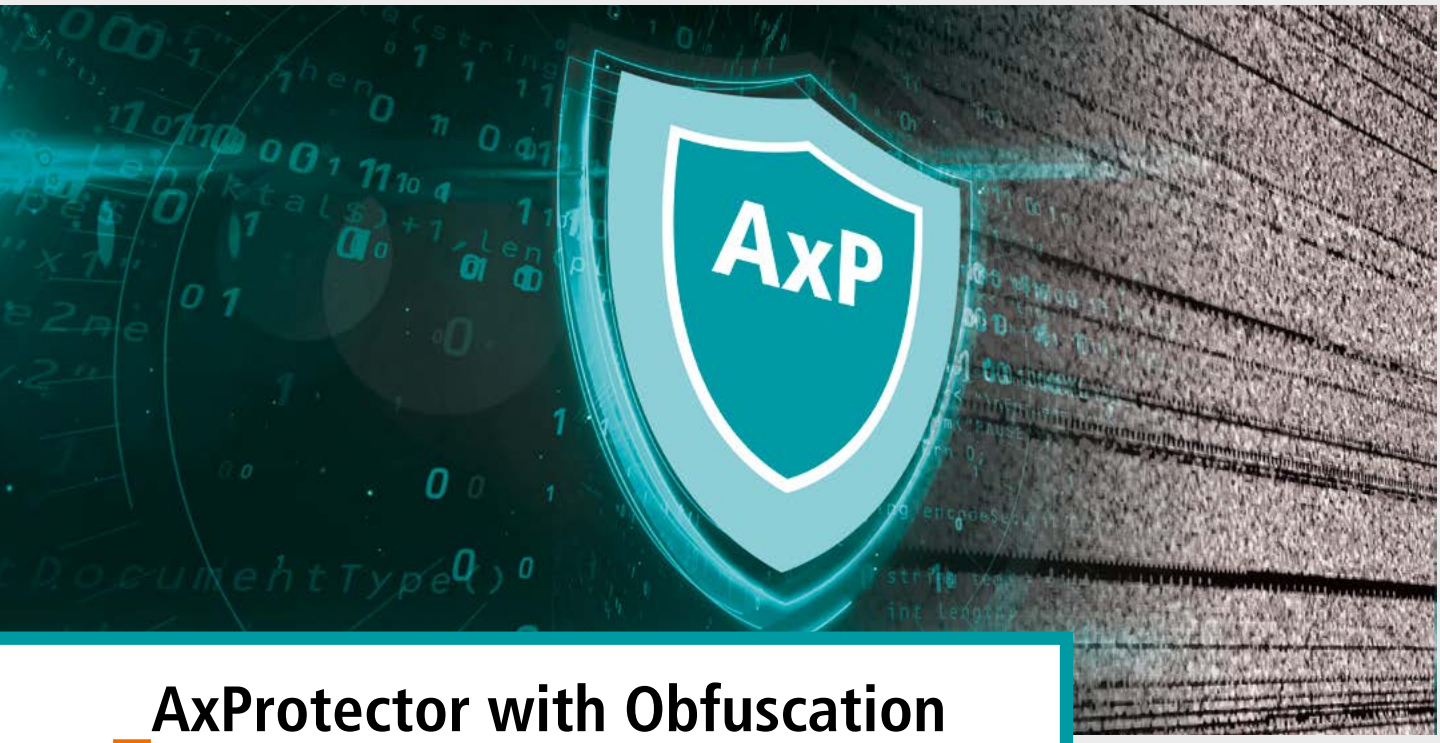
## Conclusion

If the system can handle the basic requirements, integrating a SAW into an application is not complicated. Should the programming languages and samples listed here not be enough for your needs, the consultants of Wibu-System's Professional Services are always available to support you.




Screenshots from the C# sample "Wizard"




# AxProtector with Obfuscation

Wibu-Systems has developed a completely new variant of its popular AxProtector for native applications on Windows, Linux, and macOS.

## AxProtector Compile Time Protection (CTP)

AxProtector CTP is available for Windows, Linux, and macOS and introduces a new handling and new protection technology for these operating systems.

AxProtector CTP is available for download as of February 2023 alongside the release of AxProtector 11.20. AxProtector CTP can be used with existing licenses for AxProtector Windows, Linux, or macOS. Its automatic protection, modular license, license free (IP Protection) mode, file encryption features and the all-new Compile Time Obfuscation feature can be used with native applications for all three operating systems.

AxProtector CTP's protection mechanisms are integrated in the compile process of the build system.

## Why AxProtector CTP?

Apple has made changes to its macOS operating system on the ARM platform with toughened code signing guidelines in force as of macOS version 12.3. It becomes harder to run protected software, especially plugins, that need to be decrypted during runtime.

This does not yet affect the ability to run protected software on Intel or Intel-emulated (Rosetta) systems.

Another reason for AxProtector CTP is the opportunity to increase the level of protection for intellectual property, especially for software that is only secured against reverse engineering, but without requiring a license (license free or IP Protection mode). The traditional IP protection approach used by Wibu-Systems relies on encrypting and temporarily decrypting executable code in the memory of the user's device. This means that the executable code has to switch into its plaintext form, albeit only for a brief moment in time.

## How Does It Work?

Our newest innovation works by obfuscating the code of native applications. This native code obfuscation works in a way related to traditional obfuscation methods. During compiling in a specially adjusted LLVM compiler, functions are protected in three steps. First, the function name and text strings are made unreadable by encryption (image 1). Secondly, the blocks of code are obfuscated. Additional code blocks and sequence branches make the code even less evident (image 2). This increases the size of the executable code.

Finally, the logical connections between the code blocks are replaced by indirect calls (image 3).

The logical connection of the executable code in the binary cannot be recognized anymore with the broken branches, making it securely protected against reverse engineering.

The approach adds excellent protections against reverse engineering, as the executable code never enters the working memory other than in fragmented and obfuscated form. An analysis of the code is essentially impossible.

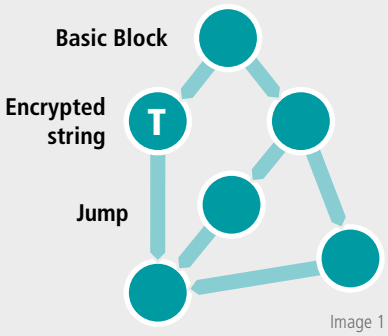



Image 1

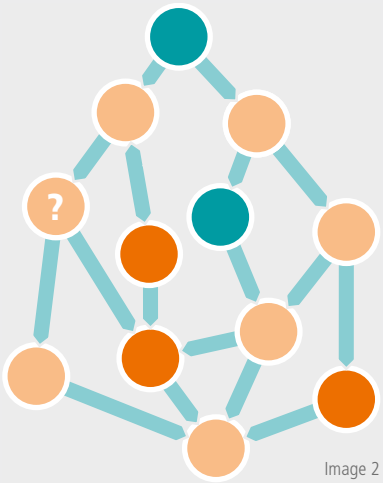



Image 2

## Licensing

The new technology does not only include protection for intellectual property, but also licensing for software and its components. All license configuration options available with AxProtector .NET NC are available here.

The license checking code injected by AxProtector is hard to distinguish from the original application code. It can only be executed with the right license key.

## Requirements

The protection offered by the new AxProtector CTP requires special build environments, compatible with a modified Clang compiler and an additional plugin made by Wibu-Systems. Only minimal adjustments to the compiler are needed; they can be made by software developers with the setup guide provided by Wibu-Systems. Their purpose is simply to activate the use of plugins.

AxProtector CTP is currently delivered with the compiler Clang 14.05.

As the Clang compiler is supported in most common development environments like Visual Studio and Xcode, the capabilities of AxProtector CTP are immediately available, including cross-platform protection as provided by the standard AxProtector. AxProtector supports Windows, Linux, and macOS systems and Intel, ARMHF, and AARCH64 platforms.

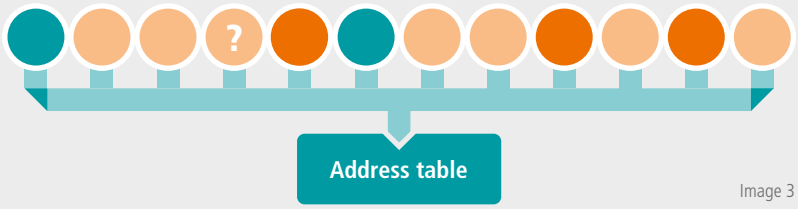



Image 3

## Recommended Use Cases

Wibu-Systems continues to support and develop AxProtector Windows, AxProtector Linux, and AxProtector macOS. Software developers can continue to use these versions.

## macOS

Software developers who plan to produce and protect plugins for macOS with CodeMeter should use the new protection mechanism. This applies, in particular, if the host application that loads the protected plugin is not protected by AxProtector. Developers of macOS applications should also consider AxProtector CTP, as this will become the standard protection system for macOS.

## Windows and Linux

AxProtector CTP offers efficient protection for intellectual property with the additional security for the code afforded by obfuscation. A switch can be recommended if the system requirements can already be met or can be fulfilled in the future.

## Performance

Experience tells us that applications protected with AxProtector or AxProtector CTP run at similar levels of performance. When obfuscation is used with critical runtime functions, there can be certain effects, depending on the system. We recommend running a test with the integrated profiler of the AxProtector CTP.

## Practical Use

Wibu-Systems can provide a preconfigured Clang compiler and compiler plugin for the protection process for a first evaluation.

The compiler can be easily integrated into a build system. Instructions for the plugin are available for developers who want to adjust the compiler themselves.

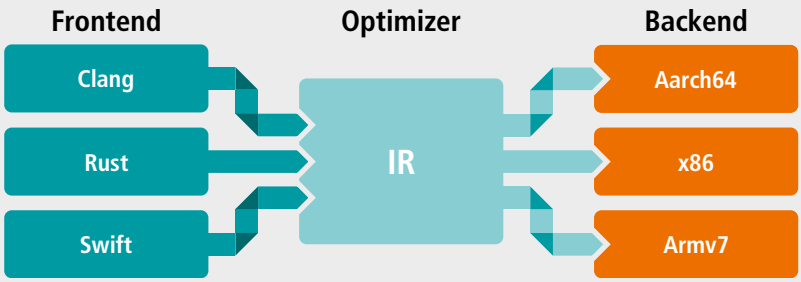
The configuration of AxProtector CTP is virtually identical to AxProtector .NET NC or AxProtector Python NC.

AxProtector includes a selection of powerful functions, including automatic protection, modular licensing (license lists), license-free use (IP Protection mode), and file encryption. AxProtector CTP adds the option of Compile Time Obfuscation that can easily be activated with the configuration. An additional license is required to access this feature.

AxProtector CTP uses the intermediate file format of the LLVM compiler. That means support for many programming languages and platforms, including C, C++, Rust, and Swift, which are supported by the LLVM compiler infrastructure.

## Looking Ahead

Wibu-Systems will continue to refine and improve both AxProtector and AxProtector CTP for Windows, Linux, and macOS. Software developers and vendors can pick and choose the right protection mechanism to match their applications' needs. The next step will add CodeMoving as a separately licensed feature in AxProtector CTP.



# Integrating Resellers – Two Routes, One Destination

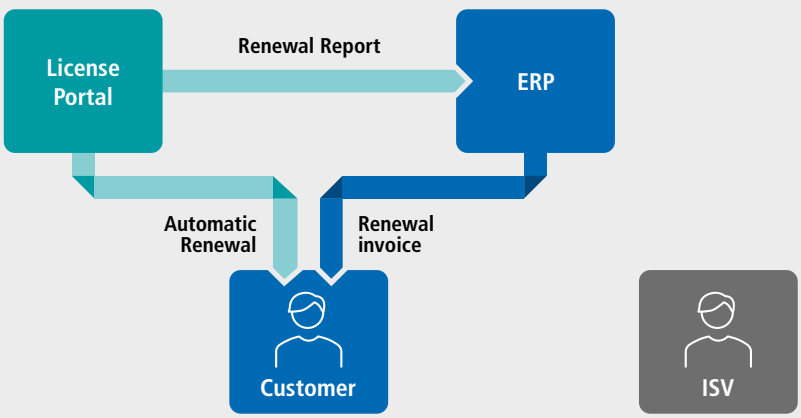
CodeMeter License Portal is a powerful tool for managing individual users or groups of users in a smart, tiered hierarchy that can cover most of your workflows and procedures' needs. Administering the licenses of large corporate clients becomes as easy as sharing educational licenses on a campus. One typical use case for this is the ability to integrate resellers and distributors in your sales processes: The better and easier this is, the happier your partners will be and the more motivated to sell your products. This article tells you more about the two fundamental ways to do so: One, with an ERP system taking the lead, or two, with CodeMeter License Portal as the system in charge.

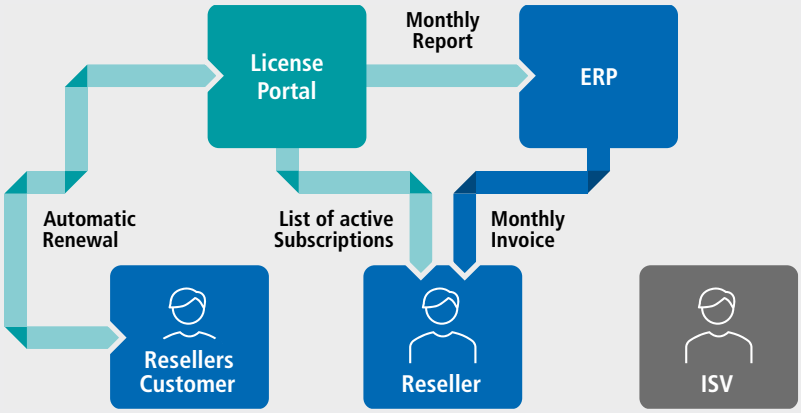
## ERP System in the Lead

In this case, the licenses and the tickets required for them are created through the ERP system; direct sales would follow the same exact workflow. In parallel, each partner is entered as a reseller in the CodeMeter License Portal, and for each reseller, a user is created with admin rights. This user can then create more users in his/her group or, depending on the hierarchy, create additional subgroups. As the admin acting for the reseller, the user has access to all data and information on his/her branch, but cannot access any other resellers or the higher branches of the hierarchy, that is, the original software vendor.

Now, the newly created licenses are assigned to the reseller's pool, which would ideally be done by an automatic mechanism in the ERP system. As is the case for creating licenses, CodeMeter License Portal has an API function that can take care of this immediately after creating the tickets. Alternatively, more conventional routes are available (by email, delivery note, license mail etc.). In these cases, the resellers would add the tickets manually to their pools. Whichever option you choose for the process, the best practice recommendation holds: A separate ticket for every license.

And this would be all the effort required from






you as the original software vendor. Your resellers can now go out into the market with their pool of licenses. Again, the Portal gives them full flexibility: The resellers could create a new client and one or more users per client to allocate tickets to from their pool, and the resellers can also choose their preferred route: A printed ticket, a ticket per mail, a ticket assigned to a user, etc.

## License Portal in the Lead

If you are not using an ERP system or prefer simpler logistics, you can also create tickets and licenses directly through CodeMeter License Portal. Our Professional Services Team is available to tailor this option to your specific needs: You define the product groups and assign items from CodeMeter License Central to each group. You could even define specific properties, like the maximum length of time that a trial license can be used for.

Next, you need to put your retail partners in place as resellers, as you would with an ERP system. You can give the admin account of each reseller the right to use a certain selection of product groups or configurations, which enables the reseller to create licenses. In turn, the resellers' admin users can create new users, whose rights would be limited to the rights that the reseller has as well.

For the next step, the reseller can then create clients and the right number of licenses for them. The main difference to working with a mainstream ERP system is that the resellers are not given a pool of tickets. Instead, each license is created just-in-time for them. As the original vendor, you define which licenses and which license options can be created.

## License Reporting

In particular, when you work without a mainstream ERP system, reporting is essential for the licenses created by your resellers. Again, our Professional Services Team is ready to help you tailor the reporting mechanisms to your interfaces and your specific needs.

The simplest reporting system would create a list of licenses, including full, trial, and subscription licenses. You could export this list regularly, e.g. once per month, and process the data in your back office systems. Alternatively, you could source the data automatically via SOAP, REST, or email to a defined recipient, e.g. for an automated billing process.

## Best Practices for Subscriptions

One popular use case in the real world are subscription licenses. In certain cases, these can be hard to implement with typical ERP systems, making CodeMeter License Portal a welcome alternative. Subscriptions would be created through the CodeMeter License Portal and set to run until these are cancelled or revoked. A cancellation would prevent the automatic renewal, while leaving the users the ability to use their software until the end of the subscription period they had paid for. When a subscription license is revoked, the license is set to be deleted at the next possible time. This is used e.g. when a client goes back on their purchase or when they decide to switch to a different type of license.

When selling subscriptions through resellers, monthly group billing is the way to go. The Portal can create a list of active (i.e. not cancelled or revoked) subscription licenses, either for a set threshold date or, for newly started or recently cancelled licenses, with accurate day-by-day information. You can then bill these licenses separately through your ERP system and include a list of active subscriptions as an "itemized bill" for your reseller.

For direct sales, subscriptions can be billed on an annual basis. Automatic renewals would be included in the report for the month they happen in, which again allows you to create a bill separately through your ERP system. An automatic import mechanism is a great relief in this case; one best practice in this case would be to handle your internal sales unit like a reseller on the Portal, but to create end user bills, instead of the summary bill for a regular reseller.

## Customer-Facing Processes

On the client side, you have all of the functions at your disposal that you know and love from CodeMeter License Portal. A client's admin has the ability to create additional users, manage license pools, or assign individual tickets or licenses to individual users. Further down the line, users can activate and move their licenses or recover lost licenses through the Portal.

## Where is the Data Kept?

As the original vendor, you should work with your partners to define which data is collected about your end clients. The options would range from pseudonymized IDs to a full address database, always mindful of the EU's GDPR requirements: Clients must be informed about which data is collected, and what it is collected for. Since the data is used to recover licenses in the case of loss or failure, you should, in principle, have a legitimate reason to collect such data.

CodeMeter License Portal gives you the opportunity to delete data from the database in compliance with the GDPR requirements. Optionally, a License Portal could also be located in a local network or a private cloud at the reseller or an enterprise client. In that case, you, as the original vendor, only have access to information that is fed through to your CodeMeter License Central.

## Internal Licenses (NFR)

It happens quite frequently that employees need internal demo licenses (NFR – Nor For Resale). As always, CodeMeter License Portal has the perfect solution for them: You can create dedicated NFR licenses, which would typically be time-limited, but set to renew automatically like subscriptions. The renewal period can differ from that of subscriptions. One best practice for NFR licenses is to allow them to activate all features, which would work via a separate Product Code that can set all software features to be active at once.

# Installing CodeMeter on End User Systems

Software developers who intend to integrate CodeMeter into their applications will, sooner or later, have to think about how they can get CodeMeter onto their users' systems. The key to success is knowing all of the features of the installer and understanding how it can be used most effectively. This article will look at the fundamental approach to installing CodeMeter on Windows systems and at everything else you should know about CodeMeter installation.

## The CodeMeter Architecture In Brief

For licensed software to run on your users' systems, they need an active CodeMeter License Server. Only CodeMeter Embedded can run without it on e.g. industrial controllers. The CodeMeter License Server receives and processes the queries from applications and libraries protected and licensed with CodeMeter and sends the necessary commands to the right CmContainers. In the case of the hardware container CmDongle, this would mean encrypted commands sent to the connected dongle; for the software option CmActLicense, the cryptographic operations are run in the CodeMeter License Server itself; and for the new online option, CmCloudContainer would receive the commands via a secure https connection with the cloud system operated by Wibu-Systems.

To store and process CmActLicenses, the target system needs certain additional rights to create the binding with the system and to securely store information on that system. In this case, the CodeMeter License Server must be given administrator rights and be installed as a service or daemon on the system.

With CmDongles and CmCloudContainers, commands are executed in a secure environment, that is, either on the secure hardware developed by Wibu-Systems or the secure servers running in Wibu-Systems' data centers. In this case, the CodeMeter License Server could also be run with simple user rights.

## Why Install CodeMeter?

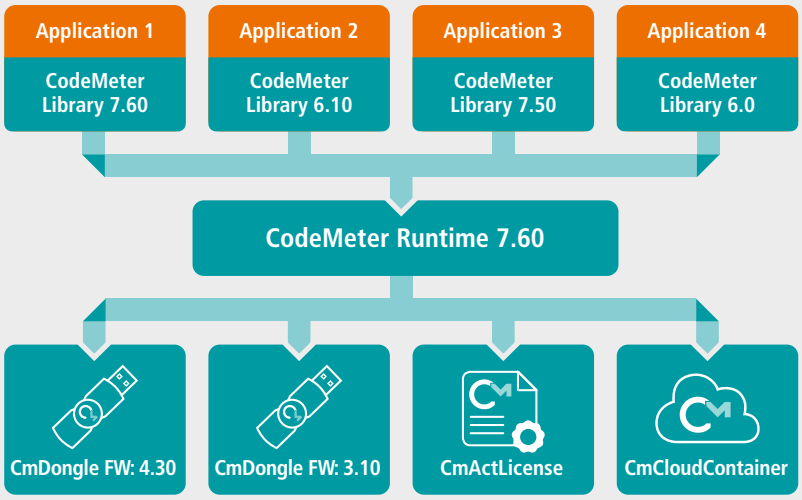
The installer for CodeMeter Runtime will install the CodeMeter License Server and CodeMeter WebAdmin as a service or daemon. Since every protected and licensed application needs to be able to reach a CodeMeter License Server, this puts in place the right conditions for your software to work reliably and correctly on the system. Alongside the two services, the installer also includes several key libraries and applications for using CodeMeter. This comprises of the tool to visualize the available CmContainer and the means to interact with the License Server, e.g. to import updates to the connected CmContainers. Alternatively, the command line tool cmu can do the same jobs.

On Windows systems, the installer will also configure the Windows Firewall to match your needs concerning CodeMeter. If you want CmContainers connected to the system to be accessible by other systems, it can open the necessary port 22350.

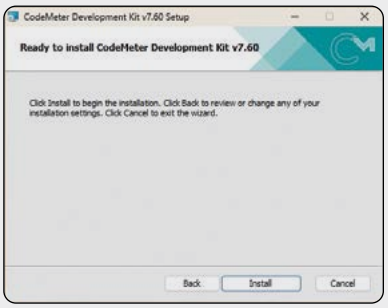
## The Compatibility Promise

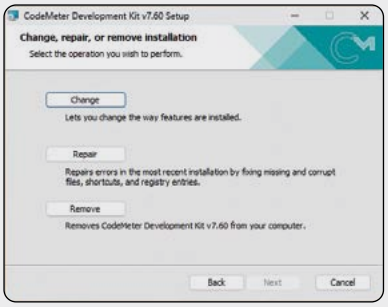
All applications that use CodeMeter will be using CodeMeter Core API. This API allows software developers to make CodeMeter an integral part of their software. Applications and libraries protected with AxProtector from CodeMeter Protection Suite will also be relying on the same API.

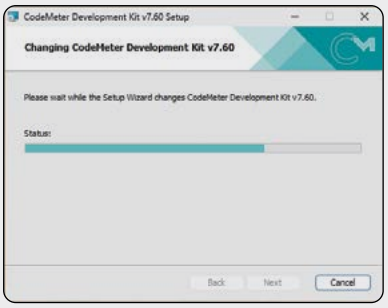
Wibu-Systems can make a compatibility promise for its CodeMeter Core API: Once a call is available in the Core API, it will stay available in future CodeMeter versions and always produce the same result. This promise is the reason why different software vendors have








been and are using CodeMeter effectively and reliably on the same system. All they need is the newest version of CodeMeter Runtime in place on that system.

## Always Up To date

When used on Windows systems, the CodeMeter installer has a very special ability: It can make sure that the newest version of CodeMeter on the system is always kept in place. This can be helpful if different software vendors include different versions of CodeMeter in their installers. It does not matter when or in which sequence these are installed: In the end, the version of CodeMeter on the system will always be the most recent one of the bunch, and thanks to our compatibility promise, all software will work perfectly with it.

If your users have more than one application with CodeMeter installed, the newest version of CodeMeter will be kept in place even when the application that came with that version is removed. CodeMeter would only be fully removed from the system when the very last application that came with a CodeMeter installer is deleted from the computer.

## A Choice of Installtion Options

As software vendor, you have a choice of options for getting CodeMeter Runtime onto your users' systems.

You can require your clients to organize the runtime environment's installation. Some enterprises already consider CodeMeter Runtime as middleware, that is, as something that the clients should provide on their systems when needed. They do this to make sure that the installed version of CodeMeter has been tested and works in their environment.

However, you cannot rely on all of your clients to think like this. In that case, you should deliver the CodeMeter installer together with your software so that the end users can install the runtime environment they need without too much effort on their part.

For many target groups, it can make sense to download the installers as MSI packages and include them as a regular part of your installation routine. With the MSI package accessed with right parameters, you can decide how the CodeMeter installer behaves and, for instance, allow the users to pick the right configuration in your dialogues without confusing them with a different-looking design. The CodeMeter developer manual goes into depth about these options.

## Skip the Installation Altogether?

There can be scenarios in which you might consider forgoing the CodeMeter installer: If your application needs no separate installation and can simply run on the users' system, you can copy and run the CodeMeter License Server like that. This works with CmDongles and soon, with CmCloudContainers; CmActLicenses with their activation-based mechanism are not an option in this case. You should also make sure that your application is the only software using CodeMeter on the system in question, or at the least, check whether a prior installation is already residing on it.

## Always The Best Choice

The CodeMeter installer is the best way to get CodeMeter installed and updated in the fastest and simplest way possible. It ensures optimum compatibility with other software from other makers or older applications from your own developers. Our recommendation: Integrating the CodeMeter installer in your routines is always the best choice.

# CodeMeter Security

The blinds weren't drawn and there was no bright light glaring right in my face. But it all still felt a bit like an interrogation. Here I was, sitting on one side of the table with two executives from a potential client facing me from the other side. After two hours of this, I heard those words I had hoped for: "Mr Kuegler, I know that nothing is 100% secure, but CodeMeter seems to be the best option on the market."

Let's go back two hours.

**Q** Mr X: So, tell us, Mr Kuegler: How exactly does AxProtector encrypt our software?

**A** That was easy for me to answer: With CodeMeter Protection Suite, we have reached the optimum balance of performance and security. When you want to encrypt software, one or more pseudo-random software keys are created. These keys are used to encrypt your application or parts of it with AES 256-bit. The keys are then encrypted themselves and stored in the software with multiple CodeMeter keys that are contained in the CodeMeter license.

When the application is run or an encrypted part of it accessed, one of these several CodeMeter keys is picked to decrypt the software key and, in turn, the software. If the right license is missing, there is no way to get the necessary software key, and the software cannot be decrypted or executed.

**Q** Mr X: But is a CmActLicense not more secure than a dongle? With a CmDongle, you are using a familiar USB interface, but a CmActLicense could use asymmetric procedures.

**A** My answer: To encrypt large amounts of data like an application, you always need symmetric encryption, like AES 256-bit. And if you want one installer package to work for every client, the key has to be identical for all licenses. Whether you use a CmDongle or a CmActLicense, or indeed a CmCloudContainer, the symmetric keys are transferred into in the container in an asymmetric process. They are then stored there: in the case of a CmDongle, in a smart card chip; in a CmActLicense, in the license file that is bound to certain properties of the device; or in the cloud in the case of CmCloudContainers. If you are using a CmDongle or a CmCloudContainer, the CodeMeter key never gets into the memory of the user's device. This is not the case with CmActLicenses, which have to have the key in the memory, but only for a brief moment and protected with additional anti-reverse engineering features. But you should remember: You cannot steal what was never there.

**Q** Mr X: But people could try wiretapping: Listen in on the USB interface and simulate a CmDongle.

**A** My answer: Again, CodeMeter has several mechanisms in place: First, communication between CodeMeter Runtime and the CmDongle is always encrypted. And the license always contains an asymmetric key alongside the symmetric keys. The protected one creates a random challenge that the CmDongle has to respond to with the private key. The software then checks the challenge with the public key. You cannot fake that check without the private key. But that's not all there is: As I said, we are using several CodeMeter keys to encrypt a software key. That creates a large number of possibilities, of which one is actually chosen when the software is launched. The selection process is designed to ensure that not all possible keys are used, even when the software is launched

a thousand times over. In practice, this means that a simulator created by recording all sequences would never be complete and would be severely limited in its capabilities.

**Q** Mr X: But what about software updates? Are we using the same key then? Or would it be safer to create a new license with every update, even minor ones?

**A** My answer: No it would not. You can protect each update with the same license. That is the point: CodeMeter does not only give you secure protection, it also simplifies the licensing process. Behind every license, there is a root key, the Product Item Secret Key (PISK), from which the required CodeMeter keys are created during encryption (on the CmDongle). The keys are derived from a checksum of the application that you want to protect.

Same application / Same license → Same key → Same protected application.

Different application (e.g. after a mini update) / Same license → Different key → Different protected application.

**Q** Mr X: My colleagues managed to read our own keys on one of our chips via a side channel attack. Wouldn't that work with a CmDongle as well?

**A** My answer: Again, we are using several countermeasures: We are using a secure smart card chip that is equipped with means against side channel attacks by the manufacturer. And we have some of our own tricks in the firmware. Finally, the PISK cannot be used directly, so that you could not attack the root key directly.

**Q** Mr X: And how secure is the IP Protection mode if it allows me to use the software without a CodeMeter license?

**A** My answer: To be frank, this type of protection cannot rival the level of protection offered by a CodeMeter license. With a CodeMeter license, you have the software linked to a key that is kept in secure key storage. With the IP Protection mode, the software key is encrypted, but it is kept in the protected application. Hiding the key is one of our, pardon the pun, key competences, but separating the software and the license naturally increases the level of protection.

**Q** Mr X: Did I understand it correctly that the automatic protection of a native C/C++ application is better than a .NET application? With .NET, you have intermediate code that is more easily read out than machine code.

**A** My answer: Paradoxically, the opposite is true. With AxProtector .NET, you have a far higher level of protection than with AxProtector Windows because the intermediate code is easier to read. AxProtector Windows encrypts and decrypts the entire application in one go, whereas AxProtector .NET breaks the application down into individual functions that it encrypts piece by piece. During runtime, only the pieces that are actively being used are decrypted, turned into machine code, and then immediately removed from working memory again. That raises the bar of protection massively.

**Q** Mr X: Could an attacker not simply read out and decrypt every function of a .NET application?

**A** My answer: In theory, that is possible. You call this static analysis, because the code is not being executed, as it would be with dynamic analysis. AxProtector .NET has traps built in to prevent this. These traps look like regular code, but they would lock the license when an attacker decrypts them. The license would be useless. You could not continue to decrypt the rest of the application, even by static analysis, once the trap has been sprung.

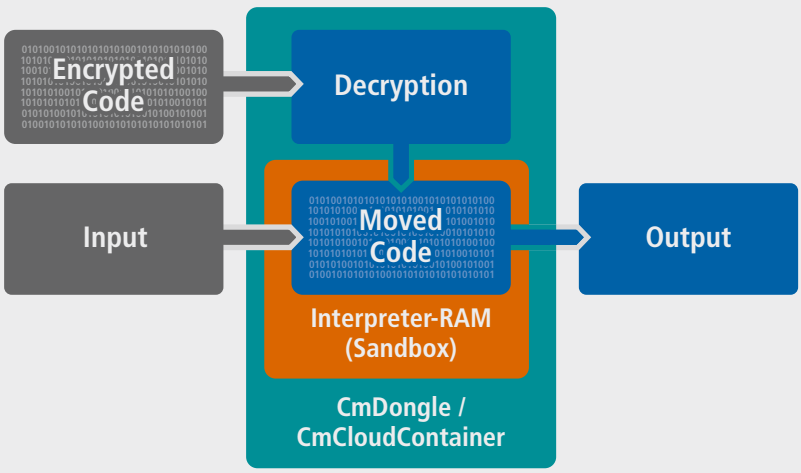
With a native application, e.g. in C/C++, Delphi, Fortran etc., you can also choose dynamic decryption during runtime and include traps, but this would force you to define those functions and traps in the application. In essence, it means a bit more work on your side.

**Q** Mr X: What would you recommend if I wanted the highest possible level of protection with CodeMeter and AxProtector?

**A** My answer: For C/C++ applications, we have introduced a new type of obfuscation in AxProtector. We call it CTP (Compile Time Protection). It works by changing the application when it is compiled so that its structure would be unrecognizable. The technology goes far beyond the IP Protection mode and it can be used with or without CodeMeter license. However, you need a Clang compiler for the purpose.

If you are using a CmDongle or a CmCloudContainer, I would then suggest that you move particularly sensitive code into the CmContainer. The code is written by you, encrypted, and moved into the CmContainer to be decrypted and executed. We call this mechanism CodeMoving, and it is our top weapon against reverse engineering, because no would-be attacker would ever get to see the code which never touches the computer's memory in unencrypted form.

The two people facing me thanked me for the complete and technically detailed explanations of CodeMeter's security capabilities, including my honest words about the potential limitations of our technology. It is Wibu-Systems' openness about these details that speaks in favor of CodeMeter. Even 140 years ago, Auguste Kerckhoff knew that real security cannot come from keeping the mechanisms and principles secret: It is the key that has to stay secret. And, as my new customers agreed, a CmDongle is the perfect place to keep a key safe and secure.




# Divide and conquer: Modular Licensing

Many enterprises in the software business want to generate additional revenue streams. The solution depends on many aspects, but one classic option is frequently mentioned: Feature-on-demand licenses.

Features-on-demand. The concept needs no explanation. The term does not even have to be translated into other languages. Everybody understands it intuitively: Software makers do not sell their work as a single, monolithic block, but instead offer individual features that can be activated for a certain fee. This relies on a modular license, which is often combined with additional licensing models like the current favorites: subscriptions and pay-per-use options. Why is this done? First, to create new, continuous revenue streams and, second, to break into more cost-sensitive markets, as the initial investment required from buyers is spread out over a longer time. One fact that should not be ignored is that the right combination of feature-on-demand and subscription concepts will generate more revenue over a product's lifecycle than a simple upfront sale would ever bring.

## Feature-On-Demand as an Aftermarket Afterburner

All of these advantages apply to software makers, but they can apply in the same way to hardware manufacturers (Intelligent Device Manufacturers, or IDMs). Most of the features and capabilities of their hardware is determined by the software that runs on it. Especially in particularly competitive markets, enterprises have to ask themselves how they can lower the entry threshold to attract more buyers, without losing sight of their overall commercial performance. And this is where modularity can be the answer.

The basic features of an application can be included in a package that allows users to enjoy the product in its essential form. Attractive add-on features can then be offered as top-up purchases. The users would originally receive a license for the basic package and can then buy additional features to match their profile and requirements.

The challenge for the vendor is to define the right separate pieces with added value that creates real demand in the market. These could be add-on modules or functions that might be particularly interesting for specific user groups or markets. These customers would be more willing to invest extra to enjoy the additional benefits.

Modular licensing also creates interesting new opportunities in the aftermarket business. There might be more demand for certain features that is only discovered once users have become accustomed to using it. Alternatively, vendors could innovate and add new features over time. Both are interesting possibilities not just for pure software developers, but increasingly also in the industrial arena. Machines are sold with the entire feature set on board, and the buyer either pays for the entire lot upfront or buys additional features in the aftermarket over time, activating the licenses for them online or offline. The automotive industry is already making use of such models in many areas, with Tesla pioneering the idea of activating features separately.

The ability to produce one standard hardware with all features theoretically on board, instead of many feature-specific variants, also reduces manufacturing costs. But even for devices that need separate hardware added, there are lots of savings to be made and successful business models to be introduced in the aftermarket if the add-on features are defined and priced intelligently.

## Realized with CodeMeter

The simplest way to integrate a feature-on-demand model in your software is to use CodeMeter Protection Suite. AxProtector, the protection tool available for a range of target plat-

forms and programming languages, offers modular licensing not just as a way to license application features separately; it also increases their level of protection with separate encryption: You can monetize your features and make them safer in the market at the same time.

AxProtector works by taking the unencrypted executable or library and turns it into encrypted, protected software. When end users want to use that software, they need the right license entries in their license containers.

It does not matter whether you as the software vendor use a hardware CmDongle, a software-only CmActLicense, a CmCloudContainer, or any combination of the three as the secure place to store your software's license entries, the structure of the entries is essentially similar and fully compatible. The Firm Code is a globally unique identifier of the license publisher, created by Wibu-Systems. As the vendor, you yourself define the Product Codes that AxProtector can assign to individual features.

Each feature is protected with its own cryptographic key for the Product Code. A simple license entry would be a combination of the vendor's Firm Code and a Product Code. This would suffice to create a feature-on-demand model without having to change anything about your software. Every feature that you can sell separately is given its Product Code, and the end users only need the right license entries in their license containers. You also have an API available as software vendor to make direct use of the information in the license container.

## Licensing Models on Top

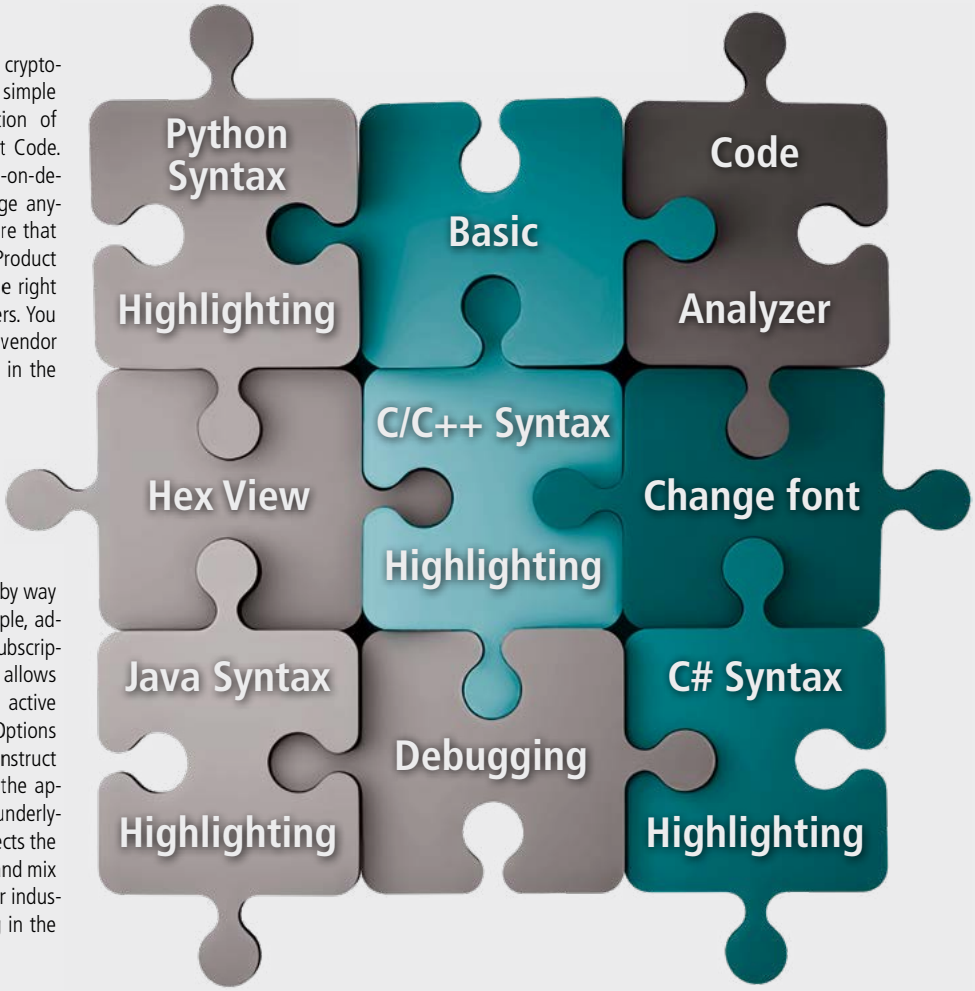
By defining the feature-on-demand licensing model, you have created the perfect foundations for more sophisticated licenses. Product Codes can be given additional properties by way of the Product Item Options. For example, adding an expiry date lets you offer a subscription model and adding a use counter allows billing by the number of uses or the active time in use. Many other Product Item Options are available to give you a toolkit to construct your chosen licensing system. Ideally, the application does not have to know the underlying licensing model at all and only expects the right Product Code. You can then pick and mix the licensing models for each market or industry without having to change anything in the software itself.

## The Route to the Client

One aspect that should never be neglected, not just for feature-on-demand licenses, is the necessary product structure in the order handling system used by your company (e.g. an ERP system like SAP, Oracle, Microsoft Dynamics, …) and the effective link between this system and the license management system, CodeMeter License Central.

Each individual marketable feature (represented by the Product Code) should be given its own product number, which would be known to both systems to form the logical bridge between both. The order management system would have all of the information about the order, and License Central would have the details about the licenses. When an order is received, the order management requests the generation of a ticket ID (activation code) and feeds it back to the lead system. The clients receive the licenses they paid for that they can then activate on their devices with the ticket ID. The process can be fully automated with the simple integration of CodeMeter License Central and the vendor's ERP system. Should the client pay for another feature at some point in the software's life, the same process springs back into life.

This gives the Latin adage "Divide et impera" a completely new meaning: You can conquer your market by dividing your software's capabilities up with CodeMeter's modular licensing.



# WIBU BLOG

**One idea at the right time can change everything.**

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# News in Brief

## TOP 100 Innovation Award


Wibu-Systems has made it into a very exclusive group of companies in Germany: As winner of the TOP-100 Seal, we have shown our innovative qualities in the five categories surveyed for the prestigious award: innovation-friendly management, climate, processes and structures, openness and outward orientation, and practical success.

## Wibu Academy

In the spirit of community and shared progress, the Wibu Academy is bringing our business and security know-how to a wider audience at the House of IT Security. Seminars will be offered in two dedicated study paths: "Cybersecurity in life applications" and "Publicly funded research projects – best practices for application and management". Classes are open to all interested participants; free places are offered to accredited students.

## CmReady

Instead of binding a CmActLicense to a device via SmartBind, it can also be bound to a removable device like an SD card or memory stick. This gives the user the ability to move licenses easily between different devices, as can be done with CmDongles. For this purpose, CmActLicense is not just bound to the removable device, but additionally stored on it. CmReady™ by Wibu-Systems and our solution partners offers a turnkey solution that is ready for use, saves you the effort of implementing it yourself, and provides ease-of-use and mobility in a lean package.

## INNO DAYS

On 14-15 June and on 20-21 September 2023, Wibu-Systems is hosting a very special event on its new campus in Karlsruhe: The INNO DAYS, with fascinating keynotes, product presentations, panel discussions, and a chance to meet the experts behind your favorite protection, licensing, and security solutions.

## DevSecOps

Two years after our DevOps and Maintenance teams joined forces, we are renaming our internal specialist team DevSecOps to reflect the shift in their professional focus towards security. Their mission: To keep our internal build and test systems safe and operational with automated and manual vulnerability checks and CVE tracking as the counterparts of our WOPS specialist team for safer external systems.

## CodeMeter License Portal 23.03

Several levels have been introduced in the License Portal. These can be used, for example, to map resellers and customers, but also universities and students or major customers, departments, and employees. Licenses can be assigned to users or groups of users. Extended support for CmCloudContainers has been included. An administrator can download the credential file for their users and import it e.g. on a headless device.

## CodeMeter Protection Suite 11.20

This release introduces the new "Obfuscation" option for AxProtector .NET NC to obfuscate the names of namespaces, classes, functions and symbols. You can define to which visibility level the obfuscation should be applied: "private", "internal", "protected" or "public". AxProtector .NET NC can also encrypt line strings contained in the program code. If a protected plugin is accessed without the correct license, an exception is thrown to which the host application can react. AxProtector .NET NC complies with the Strong Name convention of .NET.

## CodeMeter SDK 7.60

https connection for CmCloudContainers: All connections between the CodeMeter license server and CmCloud now use https instead of the previous proprietary encryption protocol over http. This is equivalent from a security perspective, but meets the compliance requirements of large customers.

Technical innovations for CmActLicenses: The fundamental change in how CmActLicenses are stored on new systems significantly improves performance, irrespective of the CmActLicenses back history. It also removes the limit to the number of containers that can be stored on a device. The changes were designed with reliable use in mind, without compromising protection against license tampering. The new version supports up to 400 active CmActLicenses at a time.

## CodeMeter Cloud 2.40

A new Enterprise CmCloudContainer is introduced. While a personal CmCloudContainer was designed for the mobile usage of one CmCloudContainer by one user at up to 3 devices, the new Enterprise CmCloudContainer is designed to host Floating Network Licenses for up to 500 concurrent users. The new CmCloudContainer type requires the usage of CodeMeter 7.60 or higher.

## CodeMeter Cloud Lite 3.0

CodeMeter Cloud Lite brings mostly technical changes under the hood, a fresh VM (Ubuntu 22.04 LTS), and a slew of updated libraries to enhance security and stability. The MySQL connector has also been replaced with the functionally identical MaraDB/J connector.

## CodeMeter License Central 4.03

The release includes an optional performance booster feature, and the upgraded web-service for reading ticket details reduces the number of web-service queries.

# WIBU NEWSLETTER

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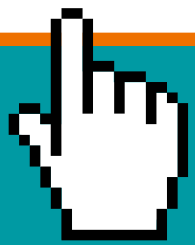

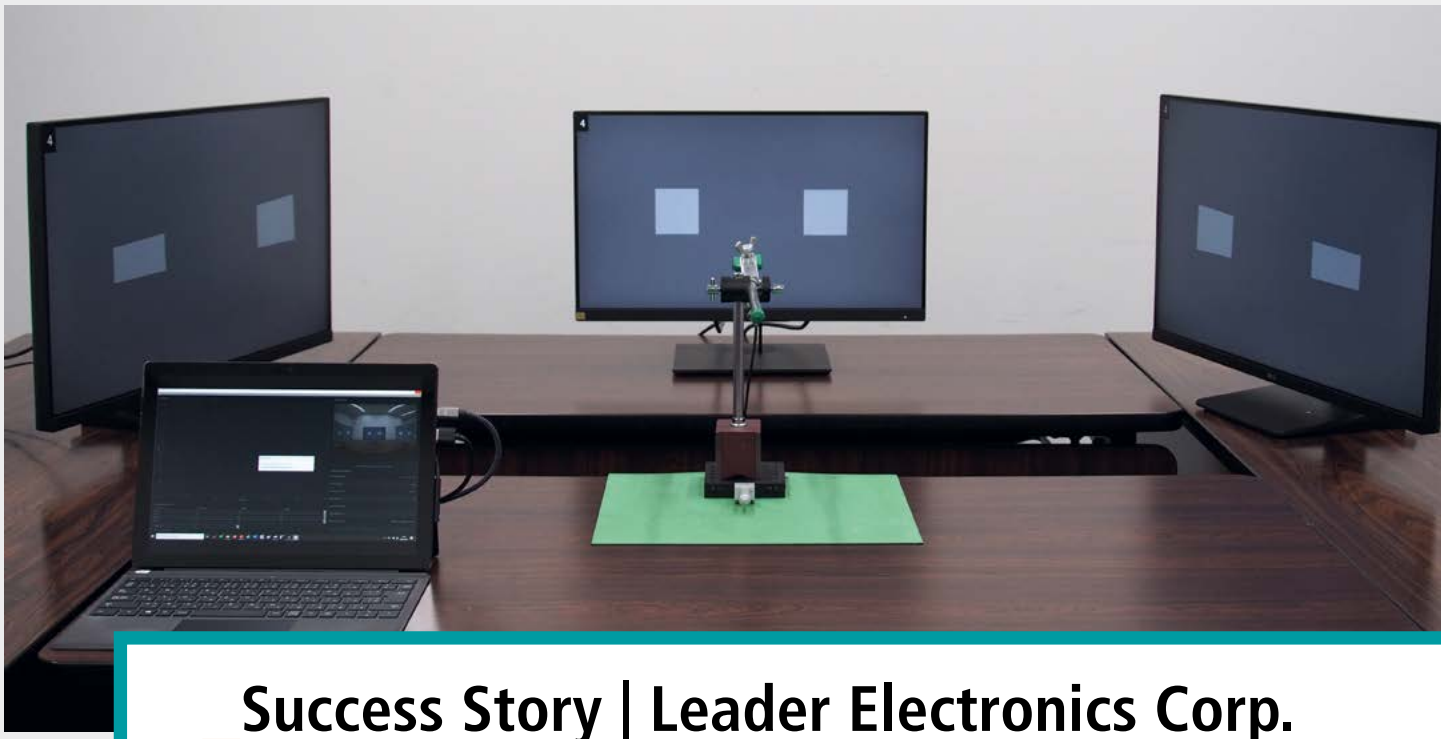

# Success Story | Leader Electronics Corp.

## The Challenge

Resolution measurement is a crucial step for precise, high-definition imaging and video equipment. But it requires careful selection of fitting test charts for each camera type, and for certain camera types, like fisheye lenses or ultra wide angle cameras, it was a labor-intensive process. The SFR-Fit software made by Leader Electronics Corp. eliminates the need for this complex process by generating and displaying the exact test chart for any given camera for easier and more precise resolution measurement. However, the choice to distribute the MATLAB-built software in the worldwide market required Leader Electronics Corp. to rethink its approach to protecting and licensing its valuable IP.

## The Solution

Leader Electronics Corp. needed a technology that could protect and license applications developed with MATLAB Compiler with the most streamlined distribution and license management infrastructure, and they found the right candidate in Wibu-Systems' CodeMeter. The convenience of CmActLicense software license containers managed through CodeMeter License Central and License Portal give Leader Electronics Corp. and its users peace of mind and great flexibility in testing, buying, and using the software, be they in the company's native Japan or in its new markets overseas.

## The Success

CodeMeter is not just the only licensing and protection solution that works perfectly with MATLAB applications. It also proved its capabilities as a real business enabler: The flexibility of the licensing models and the comfort of license distribution and activation over the Internet mean that Leader Electronics Corp. can offer its clients trial licenses to test the product, with the option to later buy full licenses without having to change anything in the installed software. By simply activating the new license through License Portal, users can continue to enjoy their products after the trial period without interruption or hassle, and Leader Electronics Corp. can spread the word about its revolutionary SFR-Fit through trial versions without compromising on the security of their IP.

**Koichi Toda – Leader Electronics Corporation**

"The SFR-Fit is a revolutionary product that uses a display to eliminate the need to select a test chart, which is the standard for conventional measurement methods. Wibu-Systems' CodeMeter met all of our requirements, especially as it is compatible with software developed in MATLAB. Therefore, the decision was made to implement the solution. We are very grateful to Wibu-Systems for their technical support during the evaluation and for sharing their knowledge for software business monetization."

## The Company

Leader Electronics Corp. is a highly specialized maker of electronic measuring equipment. Headquartered in Yokohama, the company has been constantly innovating in the fields of video and optics, including video and broadcast-related products such as 4K/8K-compatible waveform monitors, radio wave-related measurement instruments, and imaging and industrial products such as in-vehicle camera modules. In 1969, the first overseas subsidiary has been established in New York, U.S.A., and now the company has local subsidiaries in the U.S., U.K., China, and Korea, expanding their global overseas operations.

Leader

# CodeMeter Trainings

Wibu-Systems offers custom training to get you off to a running start with CodeMeter software protection and licensing. The training is offered in the form of company courses, typically hosted as in-house classes on your premises. The standard training program includes three days of courses, which can be adjusted to your needs and level of expertise. You can pick and choose the contents you need and shorten the program to 1 or 2 days. Alternatively, you can add a hands-on workshop to allow your participants to try out their own practice cases.

For an up-to-date overview of our workshops, visit mycodemeter.com/workshop/.

www.wibu.com/tr

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## Join Wibu-Systems at the following events:

**Hannover Messe**
17-21 April 2023
Hannover, Germany
Hall 16, Booth B09

**INNO DAYS - German**
14-15 June 2023
Wibu-Systems
Karlsruhe, Germany

**devSec**
12-13 September 2023
Karlsruhe, Germany

**INNO DAYS - English**
20-21 September 2023
Wibu-Systems
Karlsruhe, Germany

**formnext**
7-10 November 2023
Frankfurt, Germany

**sps**
14-16 November 2023
Nuremberg, Germany

## Wibu Academy

The Wibu Academy is a platform for courses and training delivered by Wibu-Systems top experts on hot topics that are in line with the goals of the House of IT Security: boosting IT security in research and practice. The range of sessions is split into two separate paths:

- Cybersecurity in life applications – from the basics of cryptography and secure software development to AI security and Post Quantum Cryptography
- Publicly funded research projects – best practices for application and management

www.wibu.com/wibu-academy.html

## Wibu-Systems' Masterclasses

Also, our monthly fully immersive masterclasses focus on unique content and are designed for beginner, intermediate, or advanced users of our CodeMeter technology. The 2023 season will cover areas such as obfuscation, app management on the edge, ERP integration, cloud licensing, and a lot more. Watch out for our forthcoming announcements either on our website or via newsletter and get ready to register for the sessions that are most helpful to you.

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