



07/11/2021 (Version 2.0.1)

Work with output data never been so simple!



WHAT IS METAOUTPUT?



MetaOutput is attempt to reinvent the most used tools of any **Integrated Development Environment (IDE)**.

Functionality of all these tools is moved to single tool.

Result became simpler, smaller, faster and more functional than existing equivalents.



WHY METAOUTPUT WAS MADE?



Development of standard output tool is frozen, but it's too week to be enough.

Nobody improve it and it was a reason why **MetaOutput** was created.



WHY METAOUTPUT IS DIFFER FROM ALL?



MetaOutput is based on this approach:

Output data / log files - IT'S NOT A TEXT!

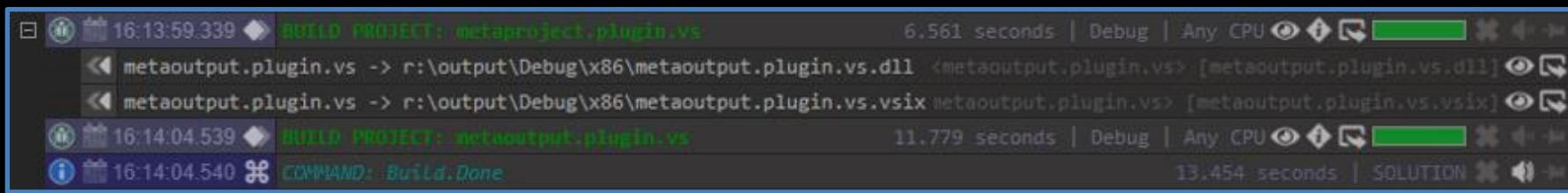
It's look strange but seems almost nobody use this idea in own software products.



WHAT IS BASE OF METAOUTPUT?



Each trace message is complicated object with own visualization:



The screenshot shows a terminal window with several trace messages. The messages are color-coded: green for build-related messages and blue for command-related messages. Each message includes a timestamp, a source identifier (e.g., BUILD PROJECT or COMMAND), the message text, and a duration. The right side of each message contains a set of small icons for operations like copy, paste, and delete.

Timestamp	Type	Message Text	Duration
16:13:59.339	BUILD PROJECT	metaoutput.plugin.vs	6.561 seconds
		<< metaoutput.plugin.vs -> r:\output\Debug\x86\metaoutput.plugin.vs.dll <metaoutput.plugin.vs> [metaoutput.plugin.vs.dll]	
		<< metaoutput.plugin.vs -> r:\output\Debug\x86\metaoutput.plugin.vs.vsix metaoutput.plugin.vs.vsix [metaoutput.plugin.vs.vsix]	
16:14:04.539	BUILD PROJECT	metaoutput.plugin.vs	11.779 seconds
16:14:04.540	COMMAND	Build.Done	13.454 seconds

It consist of next blocks:

- ❖ Content (*main text*);
- ❖ Comment (*text on the right*);
- ❖ Message source and type (*icons on the left*);
- ❖ Timestamp (*date and time of on the left*);
- ❖ Operations with message (*buttons on the right*).



WHICH GOALS SHOULD BE ACHIEVED?



MetaOutput should solve only 3 problem: simplicity, simplicity and simplicity.

- ❖ Simply to learn it;
- ❖ Simply to use it;
- ❖ Simply to change it.



GOAL: SUPPORT ANY DATA COMPLEXITY



Doesn't matter which kind of data is used, it should be visualized in natural form.

Everything must be clear without any learning and any explanations.



GOAL: SUPPORT ANY DATA TYPES



Text messages, hierarchical data, audio, video, pictures or even **HTML** pages should be visualized as is directly from **MetaOutput**.



GOAL: VISUALIZE ANY DATA SOURCES



Data from different sources should be performed and visualized in one place simultaneously.



GOAL: EVERYTHING IS POSSIBLE TO SEE



All data should have visual representation and be represented in clear form.

Everything should be obvious from first look.



GOAL: EVERYTHING IS POSSIBLE TO HEAR



Everything that requires especial attention should have possibility to be played by **Text To Speech** mechanism.



GOAL: EVERYTHING IS POSSIBLE TO FIND



Any trace message should be possible to find by text substring.

Search initiating and switching to found result should be obvious and fast.



GOAL: EVERYTHING IS POSSIBLE TO FILTER



User should have possibility to change visibility of concrete messages or even whole sources.

Don't want to see something – make it invisible...



GOAL: EVERYTHING IS POSSIBLE TO HIGHLIGHT



Everything that have special interest can be highlighted by desire of user.

Highlighted message or not highlighted should be obvious from first look.



GOAL: EVERYTHING SHOULD BE IN ONE PLACE



Many tools, much place for it, switching between it, rearrangement of it...

Forget it forever!

Only one place where all data will be collected and visualized.



GOAL: EVERYTHING IN REAL TIME



Data collecting, transforming, filtering, highlighting and visualization should work simultaneously in real time without any delays.

Compilation process in parallel or executing of debugging program should not have any influence on work of application.

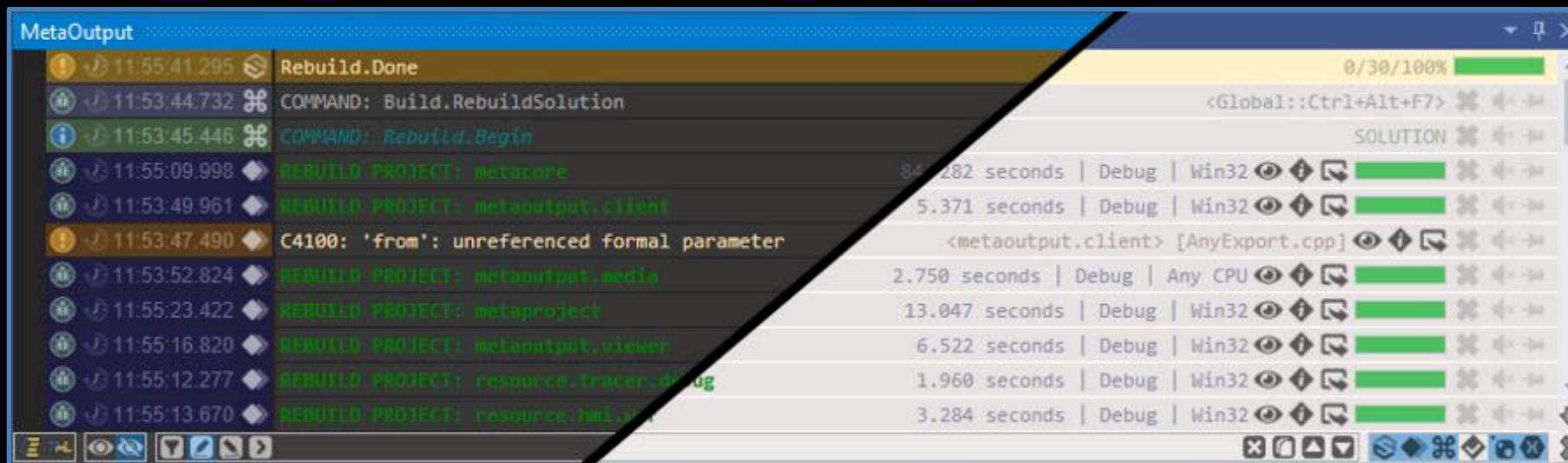
Everything must work quickly!



ADAPTATION TO COLOR SCHEMA



MetaOutput supports native for **IDE** color schemas:



This screenshot demonstrates **dark** and **light** color schemas.



ADAPTATION TO USER PREFERENCES



MetaOutput supports several message line styles (*disabled*, **half-line**, **full-line**):



This screenshot demonstrates **half-line** and **full-line** visualization.



VISUALIZATION OF DEFAULT SOURCES



MetaOutput supports these sources for all **IDEs** by default:





VISUALIZATION OF ADDITIONAL SOURCES



List of supported sources can be easily extended.

These sources are additionally available in **Visual Studio** by default:



Also, own sources can be added using **TML**.

This is example how to do it:

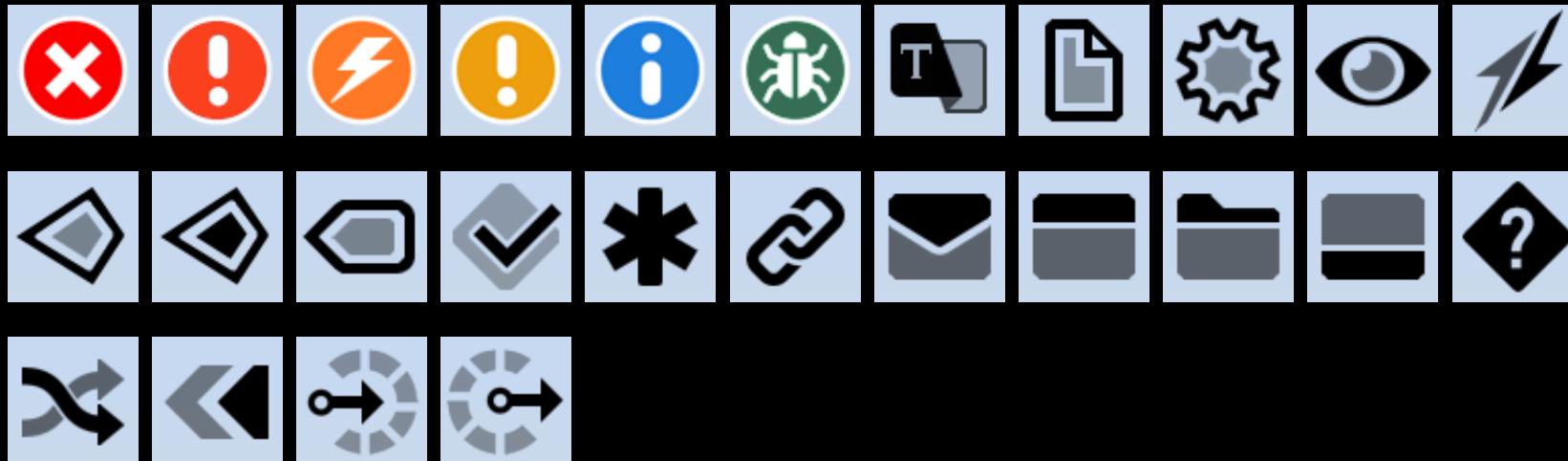
```
@@@SOURCE.APPEND <<<OWN_SOURCE_NAME>>> /some_folder/own_source_name.png
```



VISUALIZATION OF DEFAULT TYPES



MetaOutput supports these types for all **IDEs** by default:





VISUALIZATION OF SPECIFIC TYPES



List of supported types can be easily extended using **TML**.

This is example how to do it:

```
@@@TYPE.APPEND <<<OWN_TYPE_NAME>>> /some_folder/own_type_name.png
```

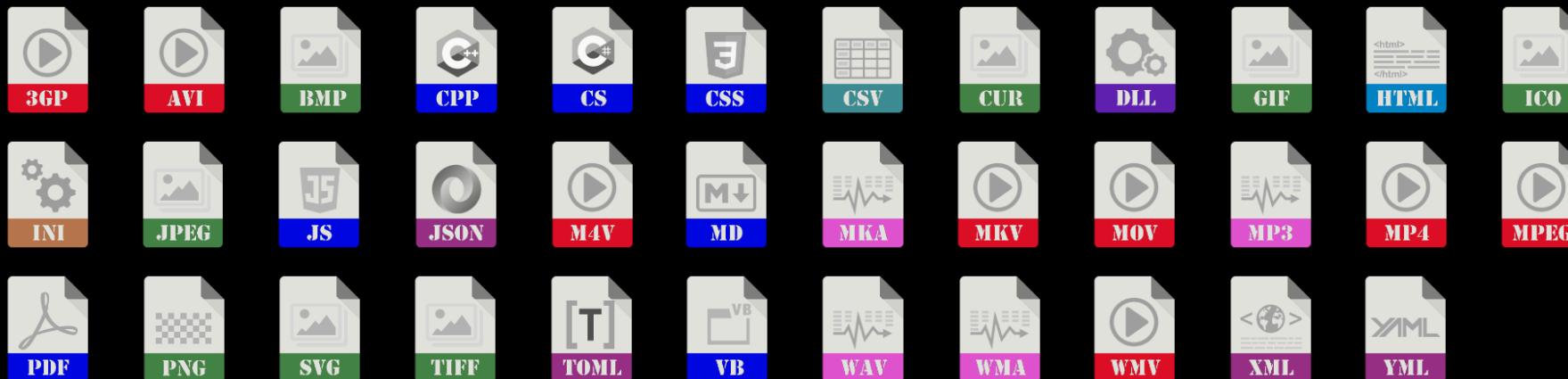


VISUALIZATION OF UNKNOWN FILE FORMATS



MetaOutput doesn't know all existing file formats, it is impossible!
However, it became possible using extensions to this product.

Now is written support for next file formats:

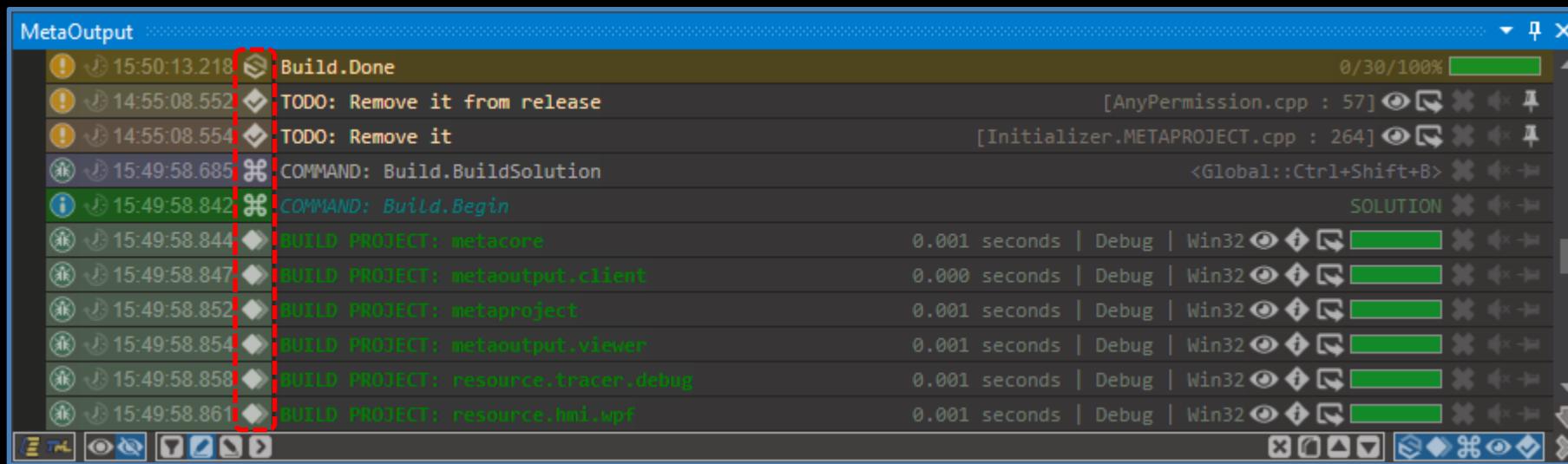




VISUALIZATION OF SEVERAL SOURCES



Trace messages can be visualized from several sources simultaneously:

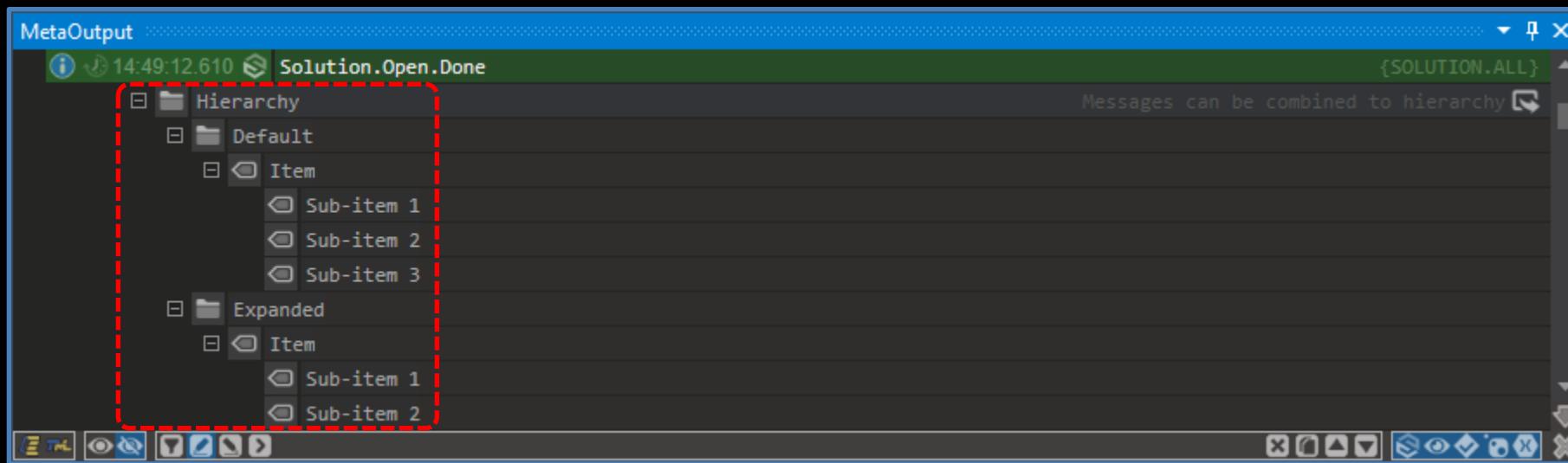




VISUALIZATION OF HIERARCHICAL DATA



Trace messages can be represented as hierarchical data with unlimited deep:

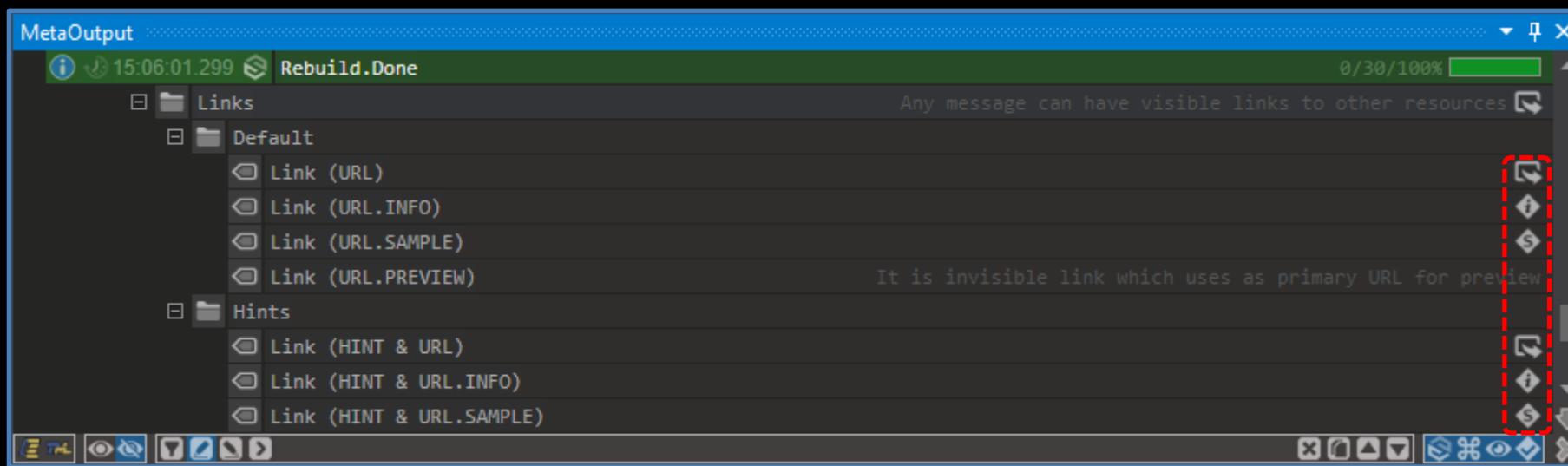




VISUALIZATION OF LINKS TO FILES



Trace messages can have different link buttons:

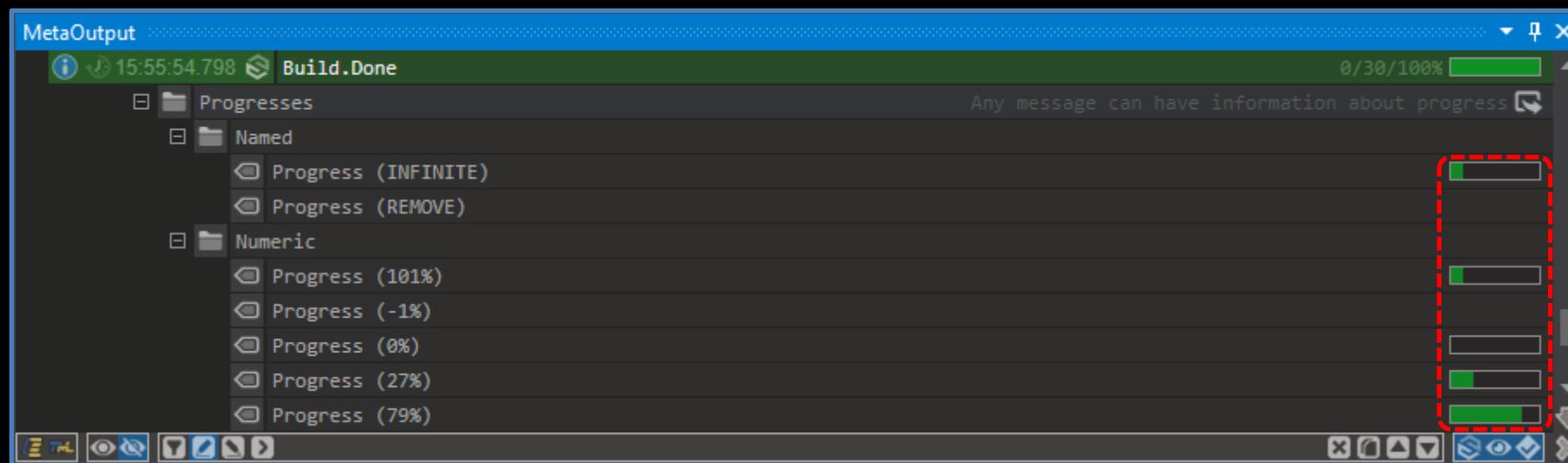




VISUALIZATION OF EXECUTION PROGRESS



Trace messages can visualize continuous operations:

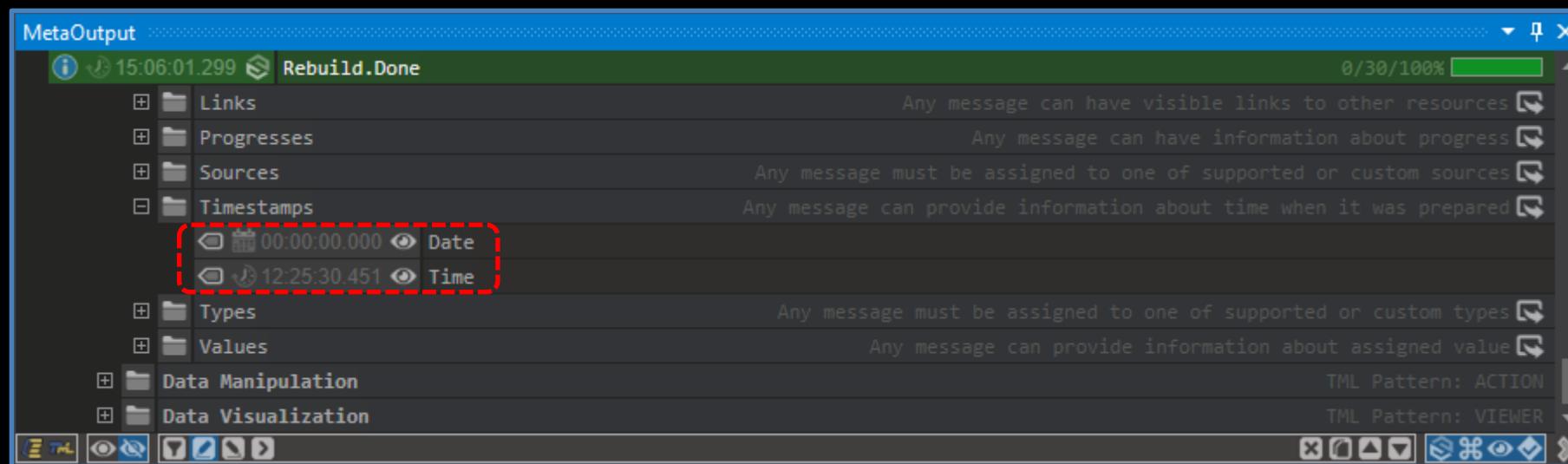




VISUALIZATION OF TIMESTAMPS



Trace messages can have timestamps with date and time:





VISUALIZATION OF NAMED VALUES



Trace messages can be represented as **NAME = VALUE**:

The screenshot shows the MetaOutput interface with a tree view of trace messages. The messages are categorized into Default, Compressed, and Specific sections. Some messages have their values highlighted with red dashed boxes:

- Default:** Value (INTEGER) = 101, Value (DOUBLE) = 10.1, Value (STRING) = SOME TEXT
- Compressed:** Value (ZIP.BINARY) = {BINARY STREAM}, Value (ZIP.TEXT) = +++VALUE.ZIP+++
- Specific:** Value (PARAMETRIC) = USER.ID: USER-BE661CBB-3EA7-4AE2-82AC-4FDC3356B99F, Value (TRANSLATED) = USER.NAME: Translated text

Annotations on the right side of the interface provide additional context for the compressed data:

- Data compressed by ZIP algorithm and transformed to text by Base64
- Data is binary stream
- Data is UTF8 string

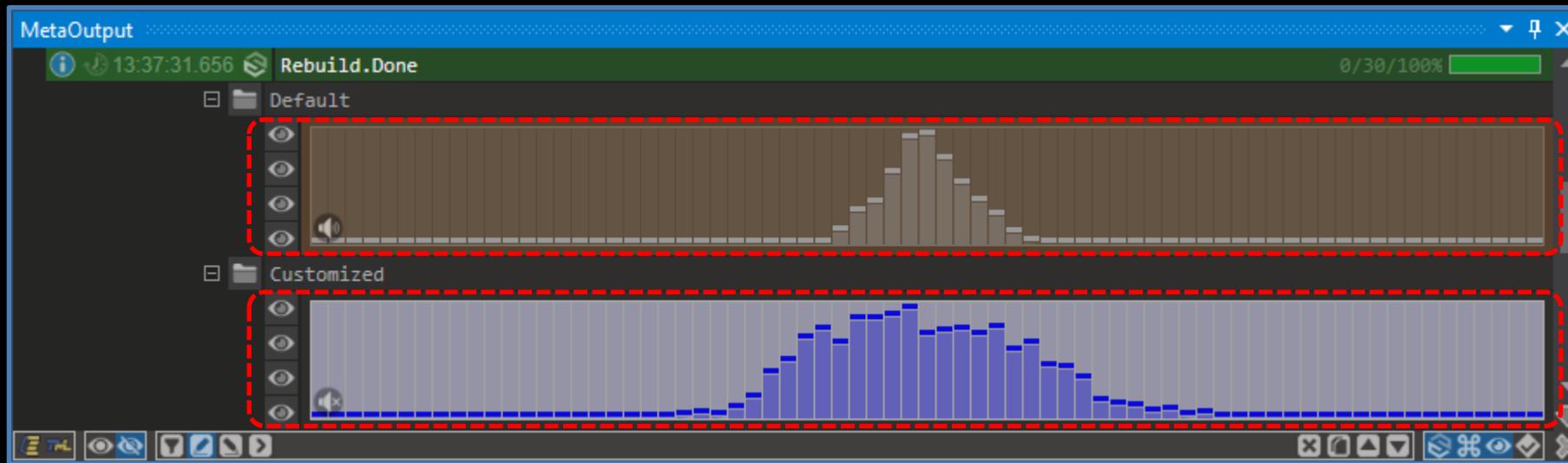
At the bottom, there are various icons for file operations and tool settings.



VISUALIZATION OF AUDIO FILES



Trace messages can visualize playing of audio files (*placed locally or remote*):

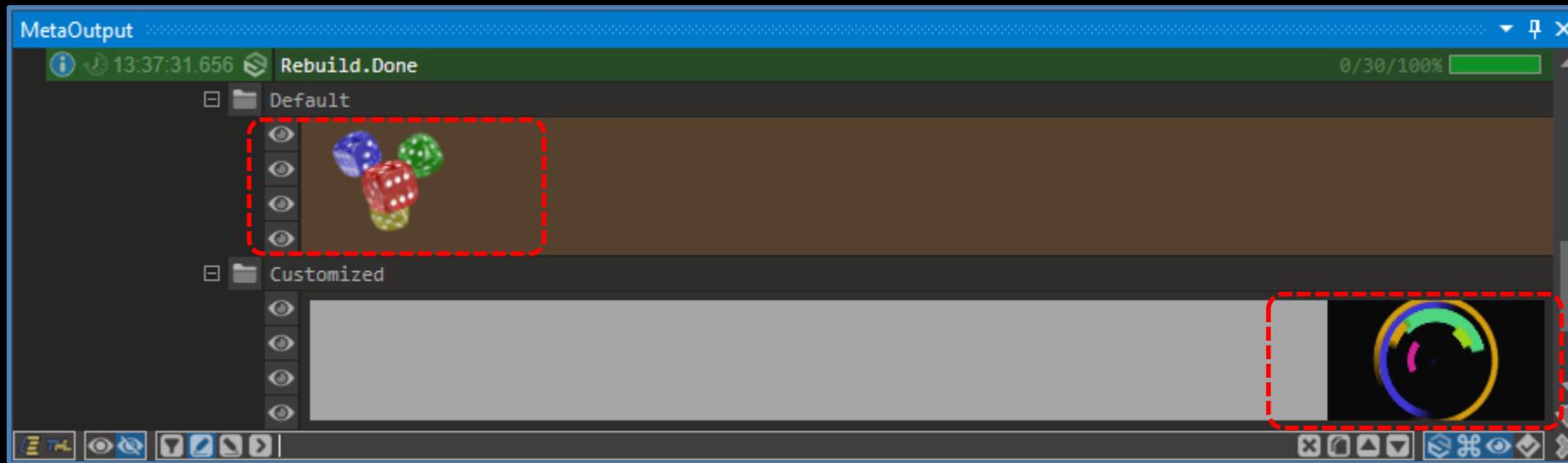




VISUALIZATION OF PICTURES



Trace messages can visualize picture files (*placed locally or remote*):

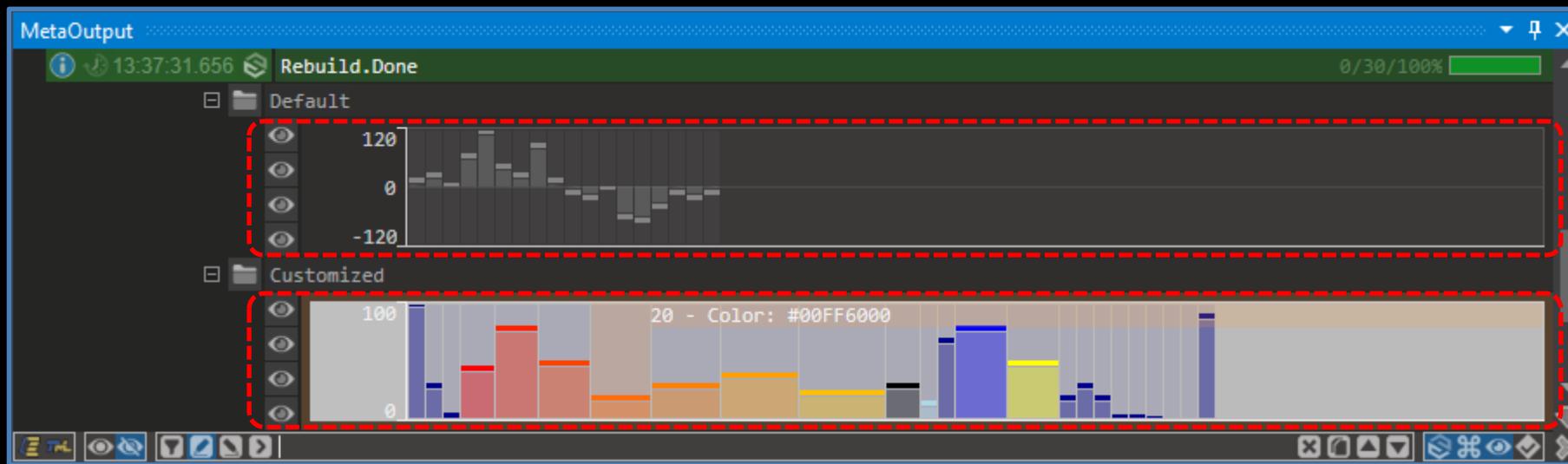




VISUALIZATION OF CHARTS



Trace messages can visualize chart diagrams:

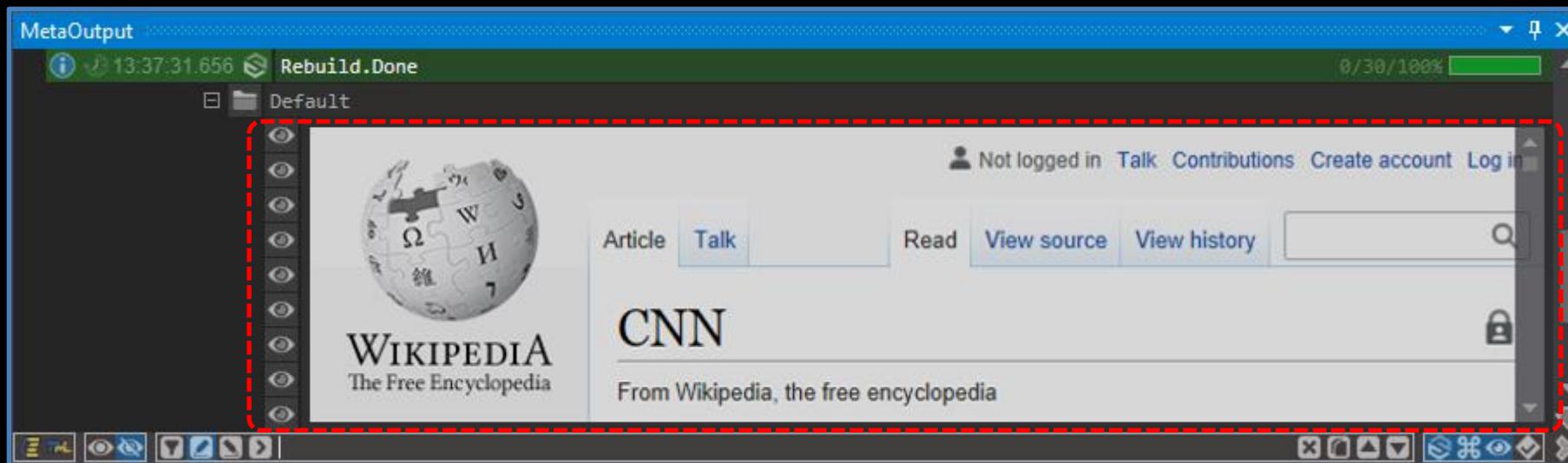




VISUALIZATION OF HTML FILES



Trace messages can visualize **HTML** files (*placed locally or remote*):

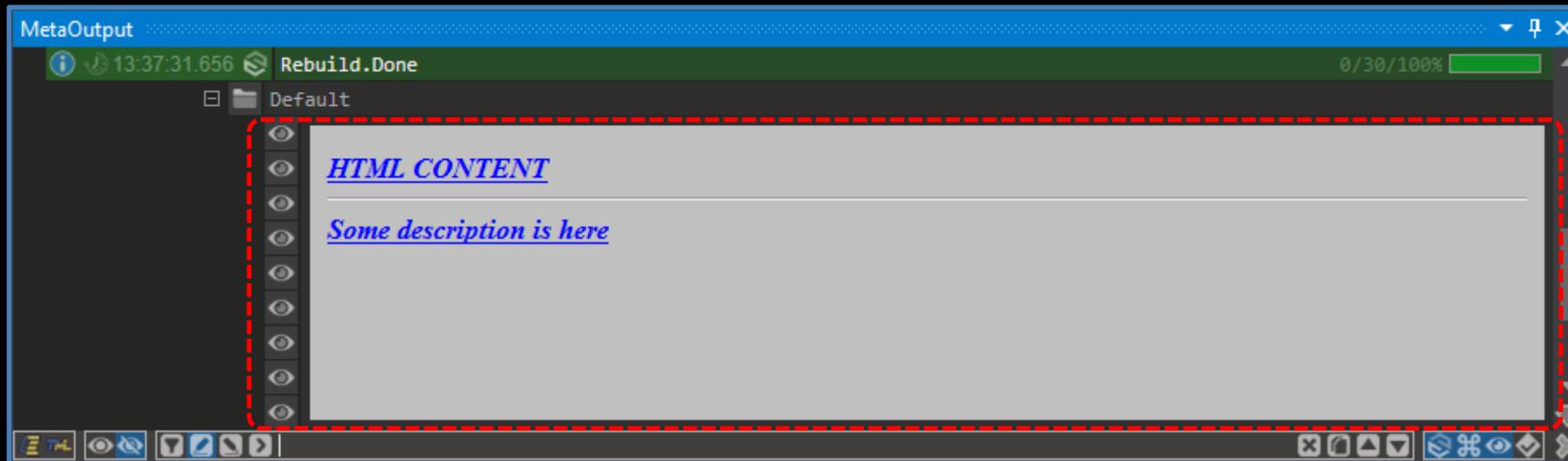




VISUALIZATION OF HTML CONTENT



Trace messages can visualize **HTML** content directly injected into the message:





VISUALIZATION OF TABLES



Trace messages can visualize data tables:

The screenshot shows the MetaOutput window with two tables displayed under the 'Default' and 'Customized' sections. Both tables have three columns labeled 'Column 1', 'Column 2', and 'Column 3'. The first table's rows are labeled 'Cell [1, 1]', 'Cell [1, 2]', and 'Cell [2, 1]'. The second table's rows are labeled 'Column 1 (LEFT)', 'Column 2 (CENTER)', and 'Column 3 (RIGHT)'. The 'Customized' table includes additional columns labeled 'Column 4 (NONE)' and 'Column 5 (NONE)'. Several cells in the 'Customized' table are highlighted with different colors and fonts. A red dashed box encloses the first table, and another red dashed box encloses the second table.

Column 1	Column 2	Column 3
Cell [1, 1]	Cell [1, 2]	Cell [1, 3]
Cell [2, 1]	Cell [2, 2]	

Column 1 (LEFT)	Column 2 (CENTER)	Column 3 (RIGHT)	Column 4 (NONE)	Column 5 (NONE)
Alignment (RIGHT)	Alignment (LEFT)	Alignment (CENTER)	Alignment (NONE)	
Foreground (RED)	Foreground (GREEN)	Foreground (BLUE)	Foreground (NONE)	
Font Name (Arial)	Font Name (Times New Roman)	Font Name (Arial Black)	Font Name (NONE)	
Font State (BLINK)	Font State (BOLD)	Font State (ITALIC)	Font State (STRIKE)	Font State (NONE)



VISUALIZATION OF TEXT FILES



Trace messages can visualize text files (*placed locally or remote*):

The screenshot shows the MetaOutput window with the title bar "MetaOutput" and a status bar indicating "14:49:12.610 Solution.Open.Done". The window displays a tree view of trace messages. A red dashed box highlights two sections of text:

- A section under the "Default" folder labeled "## DEFAULT TYPE DEFINITIONS #####". It contains several trace messages related to type definitions.
- A section under the "Customized" folder containing a license text:

THE SOFTWARE IS PROVIDED "AS IS", WITHOUT WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING BUT NOT LIMITED TO THE WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE AND NONINFRINGEMENT. IN NO EVENT SHALL THE AUTHORS OR COPYRIGHT HOLDERS BE LIABLE FOR ANY CLAIM, DAMAGES OR OTHER LIABILITY, WHETHER IN AN ACTION OF CONTRACT, TORT OR OTHERWISE, ARISING FROM

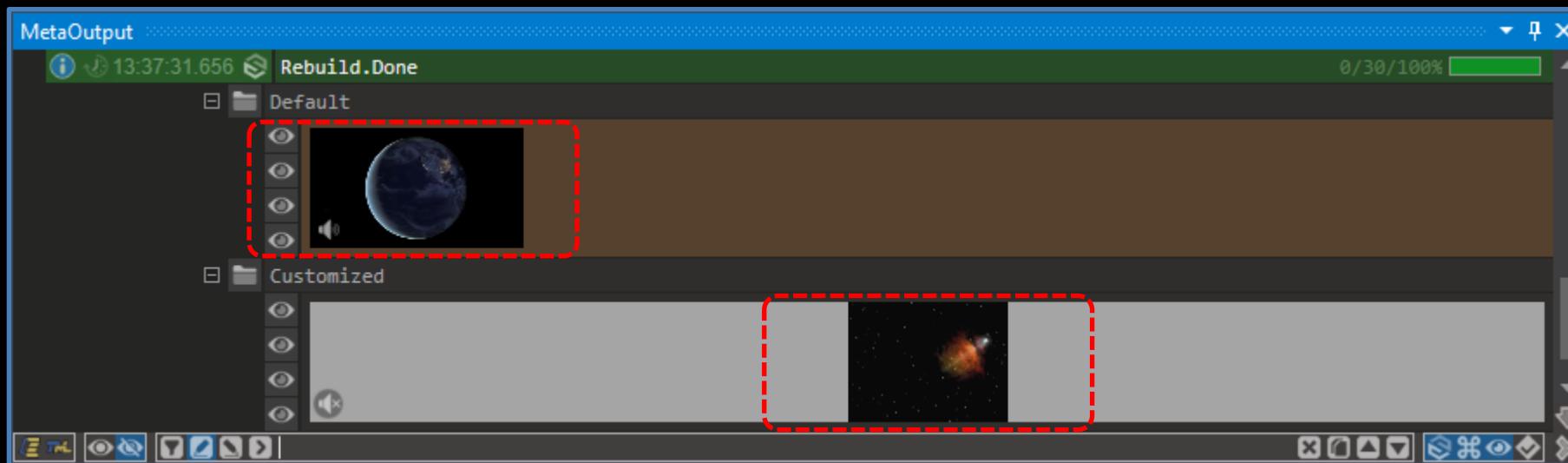
The bottom of the window features a toolbar with various icons for file operations and settings.



VISUALIZATION OF VIDEO FILES



Trace messages can visualize playing of video files (*placed locally or remote*):

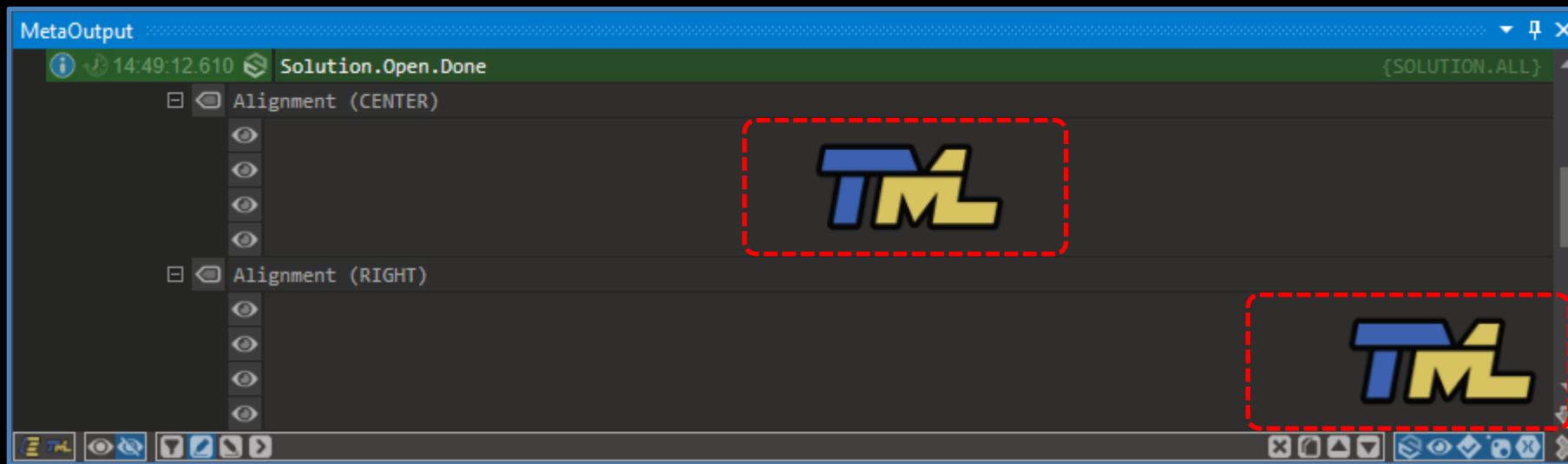




VISUALIZATION ATTRIBUTES: ALIGNMENTS



Some complex controls can have different alignments:





VISUALIZATION ATTRIBUTES: COLORS



Visual elements can have own background and foreground colors:

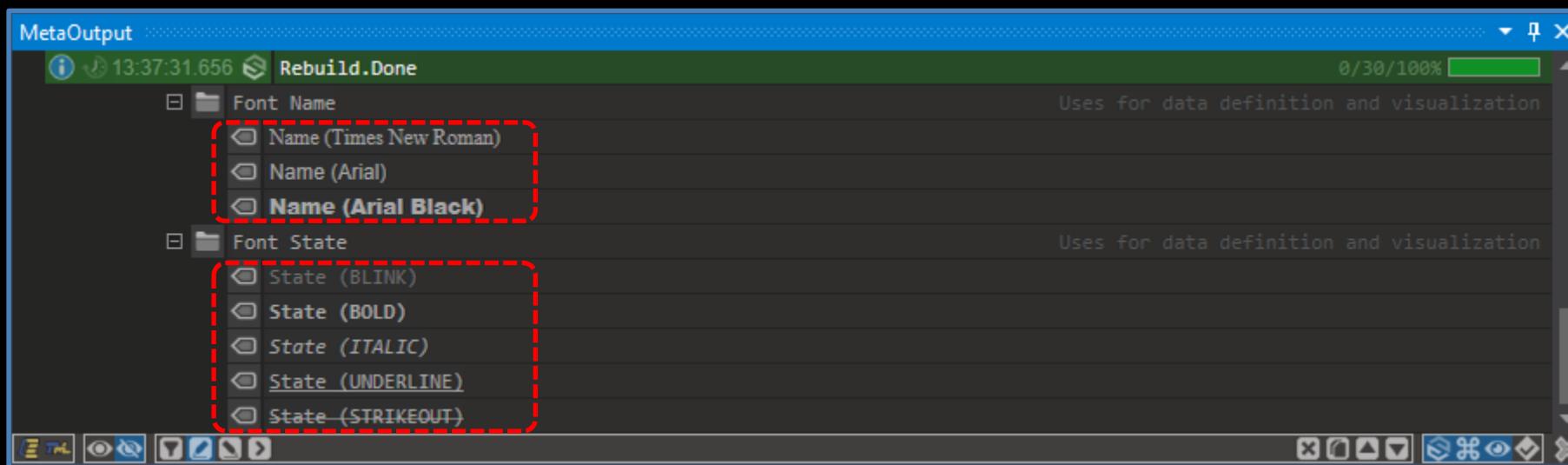




VISUALIZATION ATTRIBUTES: FONTS



Textual visual elements can use different font names and styles:

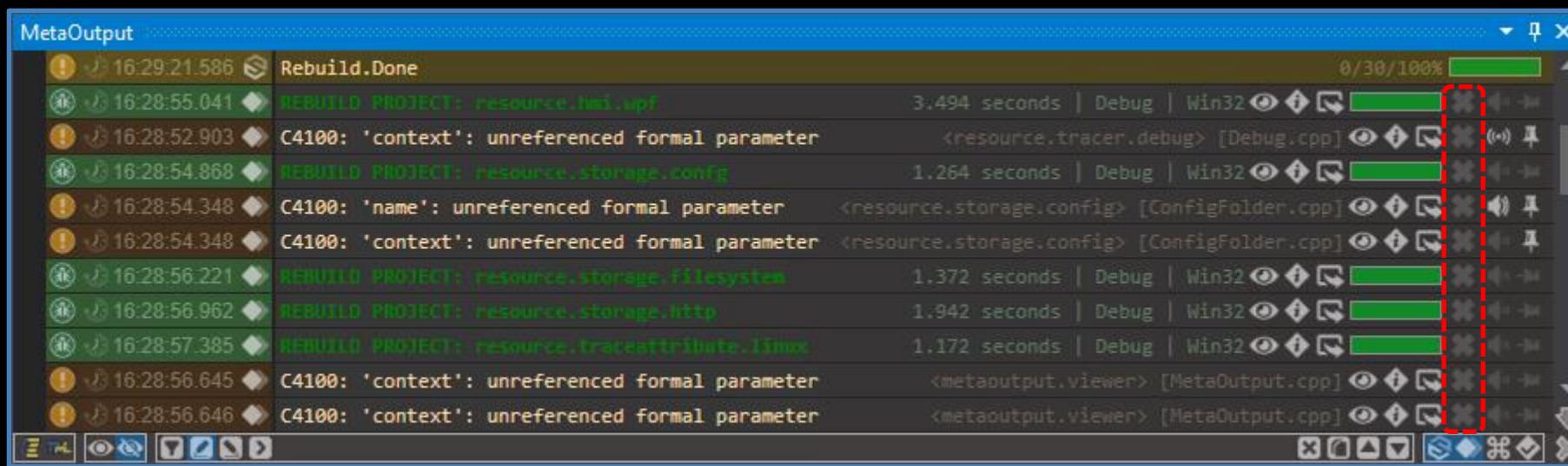




WHAT IS MESSAGE HIDING?



Any trace message can be hidden by desire of user:



```
MetaOutput
16:29:21.586 Rebuild.Done
16:28:55.041 REBUILD PROJECT: resource.hdi.ufi
16:28:52.903 C4100: 'context': unreferenced formal parameter
16:28:54.868 REBUILD PROJECT: resource.storage.config
16:28:54.348 C4100: 'name': unreferenced formal parameter
16:28:54.348 C4100: 'context': unreferenced formal parameter
16:28:56.221 REBUILD PROJECT: resource.storage.filesystem
16:28:56.962 REBUILD PROJECT: resource.storage.http
16:28:57.385 REBUILD PROJECT: resource.traceattribute.linux
16:28:56.645 C4100: 'context': unreferenced formal parameter
16:28:56.646 C4100: 'context': unreferenced formal parameter
```

By pressing of close button will be hidden all similar messages.

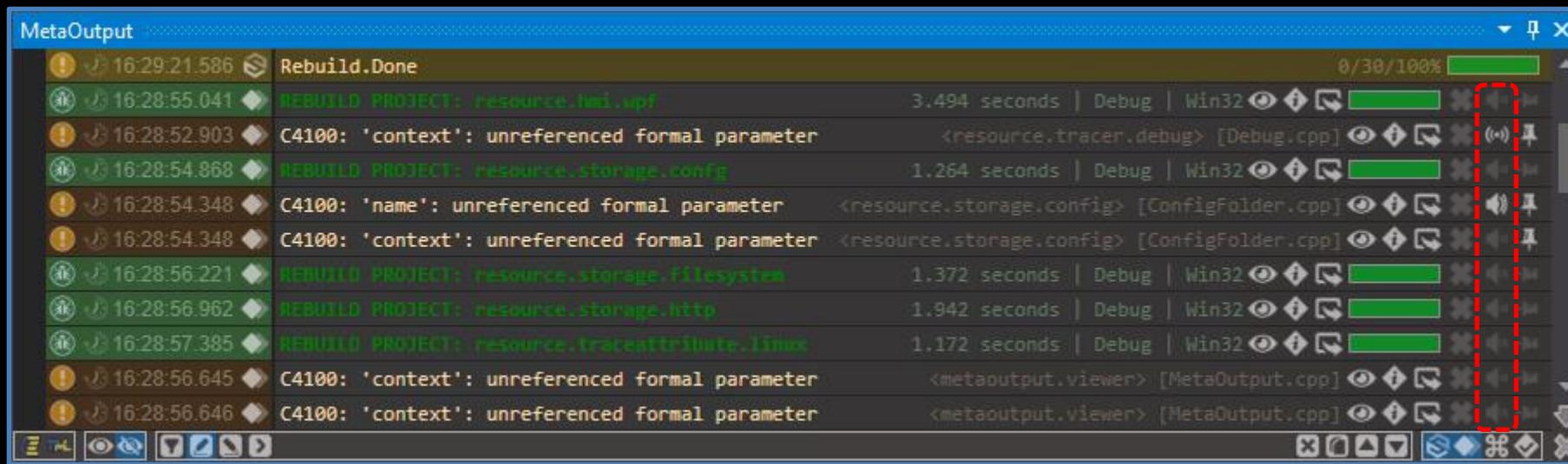
Visibility of hidden messages is possible to restore.



WHAT IS MESSAGE PLAYING?



Any trace message can be played by desire of user:



The screenshot shows the 'MetaOutput' application window with a list of trace messages. The messages are listed in a table with columns for timestamp, message text, duration, build configuration, and file path. A red box highlights the 10th message in the list, which is a C4100 warning about an unreferenced formal parameter.

Time	Message	Duration	Build Configuration	File Path
16:29:21.586	Rebuild.Done	0/30/100%		
16:28:55.041	REBUILD PROJECT: resource.hed.uf	3:494 seconds	Debug Win32	<resource.tracer.debug> [Debug.cpp]
16:28:52.903	C4100: 'context': unreferenced formal parameter			<resource.storage.config> [ConfigFolder.cpp]
16:28:54.868	REBUILD PROJECT: resource.storage.config	1.264 seconds	Debug Win32	<resource.storage.config> [ConfigFolder.cpp]
16:28:54.348	C4100: 'name': unreferenced formal parameter			<resource.storage.config> [ConfigFolder.cpp]
16:28:54.348	C4100: 'context': unreferenced formal parameter			<resource.storage.config> [ConfigFolder.cpp]
16:28:56.221	REBUILD PROJECT: resource.storage.filesystem	1.372 seconds	Debug Win32	<resource.storage.filesystem> [MetaOutput.cpp]
16:28:56.962	REBUILD PROJECT: resource.storage.http	1.942 seconds	Debug Win32	<resource.storage.http> [MetaOutput.cpp]
16:28:57.385	REBUILD PROJECT: resource.traceattribute.linux	1.172 seconds	Debug Win32	<resource.traceattribute.linux> [MetaOutput.cpp]
16:28:56.645	C4100: 'context': unreferenced formal parameter			<metaoutput.viewer> [MetaOutput.cpp]
16:28:56.646	C4100: 'context': unreferenced formal parameter			<metaoutput.viewer> [MetaOutput.cpp]

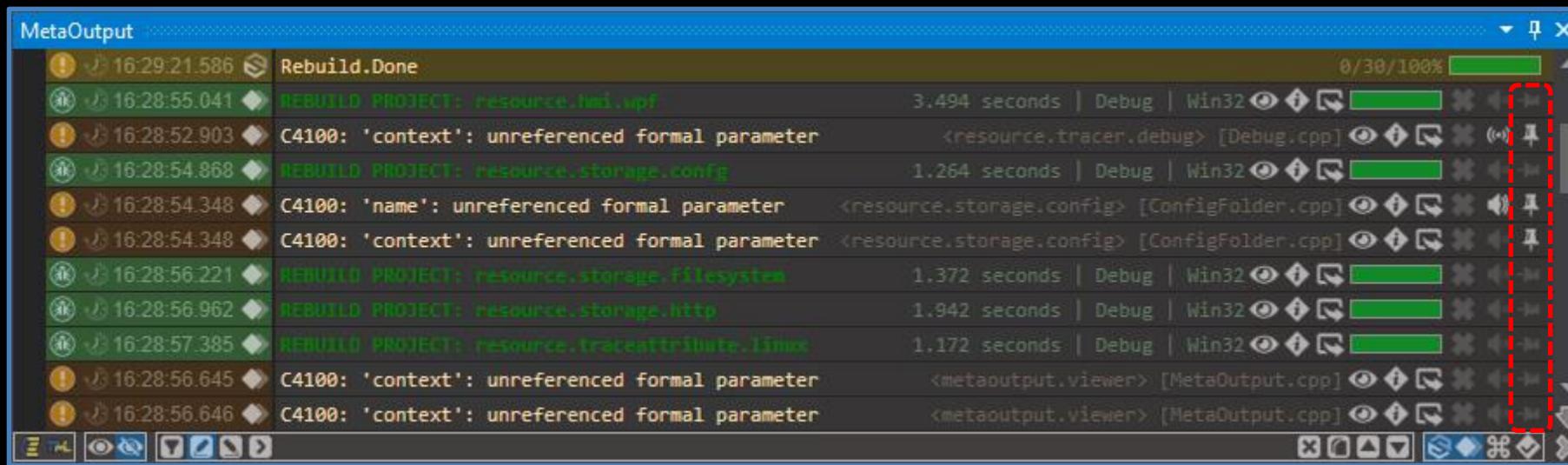
Such messages will be played by **Text To Speech** mechanism.



WHAT IS PINNED MESSAGES?



Any trace message can be pinned by desire of user:



The screenshot shows the 'MetaOutput' window with a list of trace messages. A red dashed box highlights the pinned status of the last two messages in the list.

Time	Message	Duration	Configuration	File	Pinned
16:29:21.586	Rebuild.Done	0/30/100%			
16:28:55.041	REBUILD PROJECT: resource.hed.ufi	3:494 seconds	Debug Win32	resource.tracer.debug	[Debug.cpp]
16:28:52.903	C4100: 'context': unreferenced formal parameter			<resource.tracer.debug>	[Debug.cpp]
16:28:54.868	REBUILD PROJECT: resource.storage.config	1.264 seconds	Debug Win32	resource.storage.config	[ConfigFolder.cpp]
16:28:54.348	C4100: 'name': unreferenced formal parameter			<resource.storage.config>	[ConfigFolder.cpp]
16:28:54.348	C4100: 'context': unreferenced formal parameter			<resource.storage.config>	[ConfigFolder.cpp]
16:28:56.221	REBUILD PROJECT: resource.storage.filesystem	1.372 seconds	Debug Win32	resource.storage.filesystem	[MetaOutput.cpp]
16:28:56.962	REBUILD PROJECT: resource.storage.http	1.942 seconds	Debug Win32	resource.storage.http	[MetaOutput.cpp]
16:28:57.385	REBUILD PROJECT: resource.traceattribute.linux	1.172 seconds	Debug Win32	resource.traceattribute.linux	[MetaOutput.cpp]
16:28:56.645	C4100: 'context': unreferenced formal parameter			<metaoutput.viewer>	[MetaOutput.cpp]
16:28:56.646	C4100: 'context': unreferenced formal parameter			<metaoutput.viewer>	[MetaOutput.cpp]

Such messages will not be removed on "Clear all" operation.



WHAT IS FILTERING?



Filtering its mechanism which simplify analyze of incoming data.

It can reduce amount of visible data and highlight some interesting messages.

Reducing of data is possible:

- ❖ by hiding of not interesting messages;
- ❖ by hiding of not interesting sources;
- ❖ by hiding of all messages which don't contain some substring (*like grep*).

Everything is working in real time.



FILTER MODE: FILTER



Showing only that messages which have required substring:

MetaOutput					
!	16:03:13.801	Rebuild.Done	0/30/100%		X
!	16:02:42.303	REBUILD PROJECT: resource.tracer.debug	1.705 seconds	Debug Win32	X
!	16:02:43.812	REBUILD PROJECT: resource.hmi.wpf	3.220 seconds	Debug Win32	X
!	16:02:43.656	REBUILD PROJECT: resource.storage.config	1.145 seconds	Debug Win32	X
!	16:02:45.275	REBUILD PROJECT: resource.storage.filesystem	1.625 seconds	Debug Win32	X
!	16:02:45.791	REBUILD PROJECT: resource.storage.http	1.920 seconds	Debug Win32	X
!	16:02:46.642	REBUILD PROJECT: resource.traceattribute.linux	1.332 seconds	Debug Win32	X
!	16:02:46.951	REBUILD PROJECT: resource.traceattribute.vs	1.106 seconds	Debug Win32	X
!	16:02:47.893	REBUILD PROJECT: resource.tracer.remote	0.750 seconds	Debug Win32	X
!	16:02:54.552	REBUILD PROJECT: resource.compiler.arduino	0.993 seconds	Debug Win32	X
!	16:02:54.561	REBUILD PROJECT: resource.compiler.eclipse	0.998 seconds	Debug Win32	X

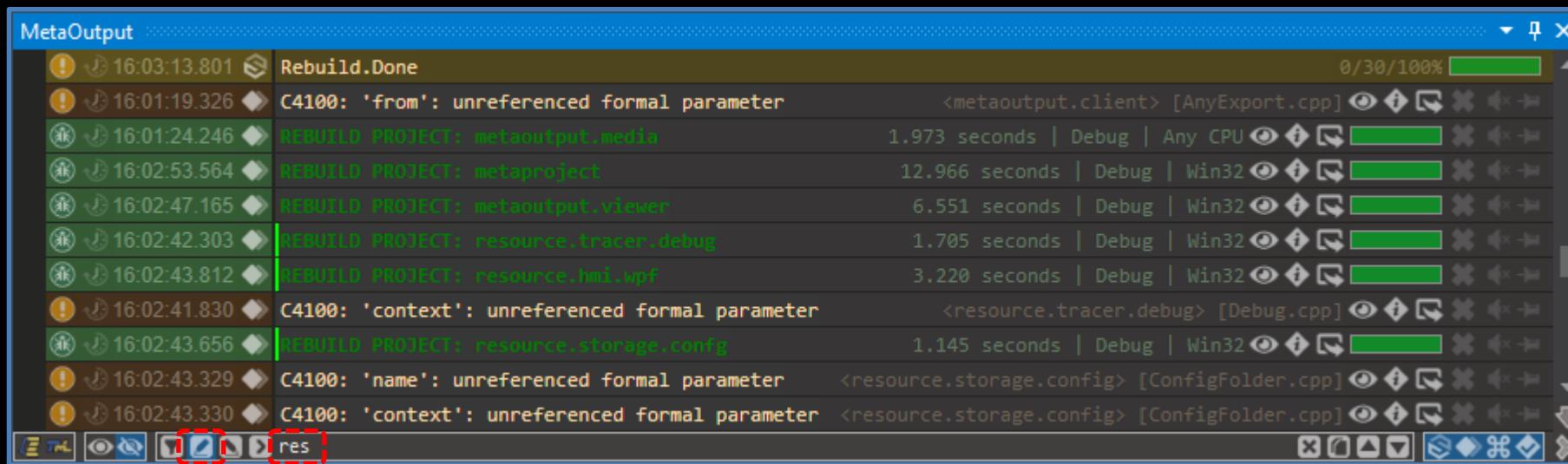
New messages will be also filtered.



FILTER MODE: CONTENT HIGHLIGHT



Highlighting all messages which have required substring in content:



Time	Message Content	Details
16:03:13.801	Rebuild.Done	0/30/100%
16:01:19.326	C4100: 'from': unreferenced formal parameter	<metaoutput.client> [AnyExport.cpp]
16:01:24.246	REBUILD PROJECT: metaoutput.media	1.973 seconds Debug Any CPU
16:02:53.564	REBUILD PROJECT: metaproject	12.966 seconds Debug Win32
16:02:47.165	REBUILD PROJECT: metaoutput.viewer	6.551 seconds Debug Win32
16:02:42.303	REBUILD PROJECT: resource.tracer.debug	1.705 seconds Debug Win32
16:02:43.812	REBUILD PROJECT: resource.hmi.ufp	3.220 seconds Debug Win32
16:02:41.830	C4100: 'context': unreferenced formal parameter	<resource.tracer.debug> [Debug.cpp]
16:02:43.656	REBUILD PROJECT: resource.storage.config	1.145 seconds Debug Win32
16:02:43.329	C4100: 'name': unreferenced formal parameter	<resource.storage.config> [ConfigFolder.cpp]
16:02:43.330	C4100: 'context': unreferenced formal parameter	<resource.storage.config> [ConfigFolder.cpp]

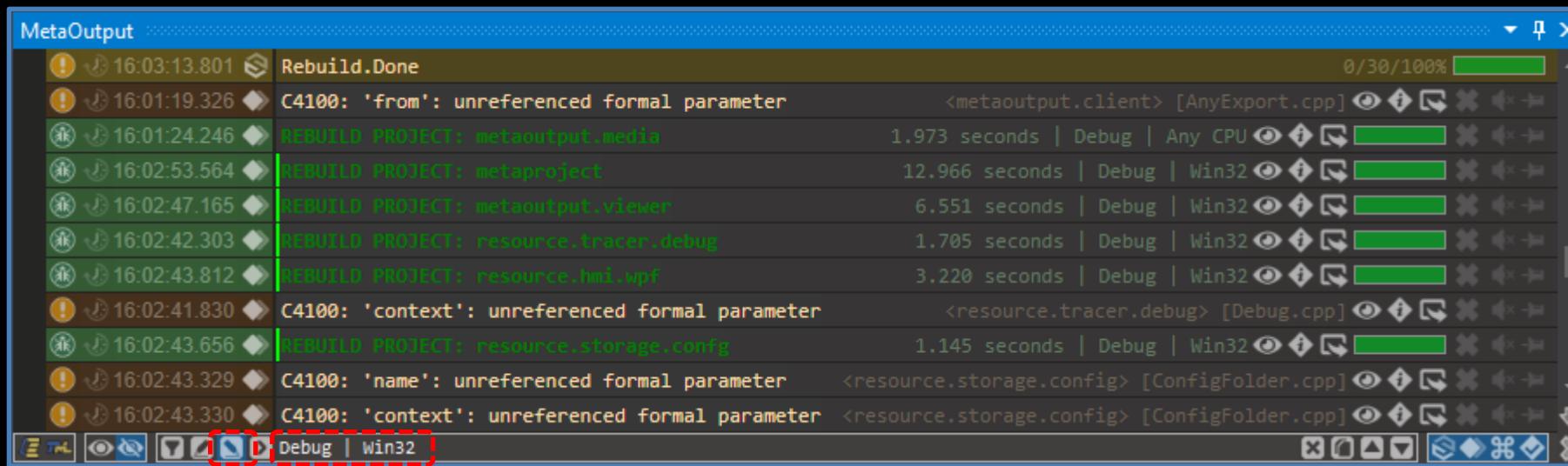
New messages will be also highlighted.



FILTER MODE: COMMENT HIGHLIGHT



Highlighting all messages which have required substring in comment:



The screenshot shows the 'MetaOutput' window displaying a list of log messages. The messages are color-coded: orange for errors, green for informational messages, and blue for warnings. The window includes a toolbar at the bottom with various icons, some of which are highlighted with a red dashed box.

Time	Message	Details
16:03:13.801	Rebuild.Done	
16:01:19.326	C4100: 'from': unreferenced formal parameter	<metaoutput.client> [AnyExport.cpp]
16:01:24.246	REBUILD PROJECT: metaoutput.media	1.973 seconds Debug Any CPU
16:02:53.564	REBUILD PROJECT: metaproject	12.966 seconds Debug Win32
16:02:47.165	REBUILD PROJECT: metaoutput.viewer	6.551 seconds Debug Win32
16:02:42.303	REBUILD PROJECT: resource.tracer.debug	1.705 seconds Debug Win32
16:02:43.812	REBUILD PROJECT: resource.hmi.upf	3.220 seconds Debug Win32
16:02:41.830	C4100: 'context': unreferenced formal parameter	<resource.tracer.debug> [Debug.cpp]
16:02:43.656	REBUILD PROJECT: resource.storage.config	1.145 seconds Debug Win32
16:02:43.329	C4100: 'name': unreferenced formal parameter	<resource.storage.config> [ConfigFolder.cpp]
16:02:43.330	C4100: 'context': unreferenced formal parameter	<resource.storage.config> [ConfigFolder.cpp]

New messages will be also highlighted.

SOURCE FILTERING



User can show or hide any data source in one click:

The screenshot shows the 'MetaOutput' window with a list of log entries. The entries include build logs for 'resource.hmi.wpf', 'resource.storage.config', 'resource.storage.filesystem', 'resource.storage.http', and 'resource.traceattribute.linux', along with several C4100 compiler warnings about unreferenced formal parameters. The window has a toolbar at the bottom with various icons, and a red box highlights the filter icon (a magnifying glass) located in the bottom right corner of the toolbar.

Time	Message	Duration	Configuration	Source
16:29:21.586	Rebuild.Done			
16:28:55.041	REBUILD PROJECT: resource.hmi.wpf	3.494 seconds	Debug Win32	<resource.tracer.debug> [Debug.cpp]
16:28:52.903	C4100: 'context': unreferenced formal parameter			<resource.tracer.debug> [Debug.cpp]
16:28:54.868	REBUILD PROJECT: resource.storage.config	1.264 seconds	Debug Win32	<resource.storage.config> [ConfigFolder.cpp]
16:28:54.348	C4100: 'name': unreferenced formal parameter			<resource.storage.config> [ConfigFolder.cpp]
16:28:54.348	C4100: 'context': unreferenced formal parameter			<resource.storage.config> [ConfigFolder.cpp]
16:28:56.221	REBUILD PROJECT: resource.storage.filesystem	1.372 seconds	Debug Win32	<resource.storage.filesystem> [Filesystem.cpp]
16:28:56.962	REBUILD PROJECT: resource.storage.http	1.942 seconds	Debug Win32	<resource.storage.http> [Http.cpp]
16:28:57.385	REBUILD PROJECT: resource.traceattribute.linux	1.172 seconds	Debug Win32	<resource.traceattribute.linux> [TraceAttribute.cpp]
16:28:56.645	C4100: 'context': unreferenced formal parameter			<metaoutput.viewer> [MetaOutput.cpp]
16:28:56.646	C4100: 'context': unreferenced formal parameter			<metaoutput.viewer> [MetaOutput.cpp]



WHAT IS METAOUTPUT BUILDING?



MetaOutput provides completely new user experience in project building.

It give possibility to see current building process together with compilation errors and warnings.

Also available compilation status for each project and overall status.



BUILDING: COMPIRATION STATUS



Summary about how many projects compiled successfully and failed is here:

The screenshot shows the 'MetaOutput' window from a build tool. The title bar says 'MetaOutput'. The main area displays a log of build events. A red dashed box highlights the top right corner of the window, which contains a progress bar labeled '0/2/100%' and some icons. The log entries are as follows:

Time	Event	Details	Status
19:16:50.407	Rebuild.Begin		Green bar (Success)
19:16:43.473	COMMAND: Build.RebuildSolution	<Global::Ctrl+Alt+F7>	Green bar (Success)
19:16:44.036	COMMAND: Rebuild.Begin	SOLUTION	Green bar (Success)
19:16:44.036	REBUILD PROJECT: metacore	Debug Win32	Green bar (Success)
19:16:48.402	REBUILD PROJECT: metaoutput.client	4.381 seconds Debug Win32	Green bar (Success)
19:16:45.986	C4100: 'from': unreferenced formal parameter	<metaoutput.client> [AnyExport.cpp]	Green bar (Success)
19:16:50.406	REBUILD PROJECT: metaoutput.media	2.010 seconds Debug Any CPU	Green bar (Success)

The bottom of the window has a toolbar with various icons.



BUILDING: COMPIRATION PROCESS



Detailed information about build process is available for each project:

The screenshot shows the 'MetaOutput' window with a list of build logs. A red dashed box highlights the log for the 'metaoutput.client' project, which includes a warning about an unreferenced formal parameter and a build time of 4.381 seconds.

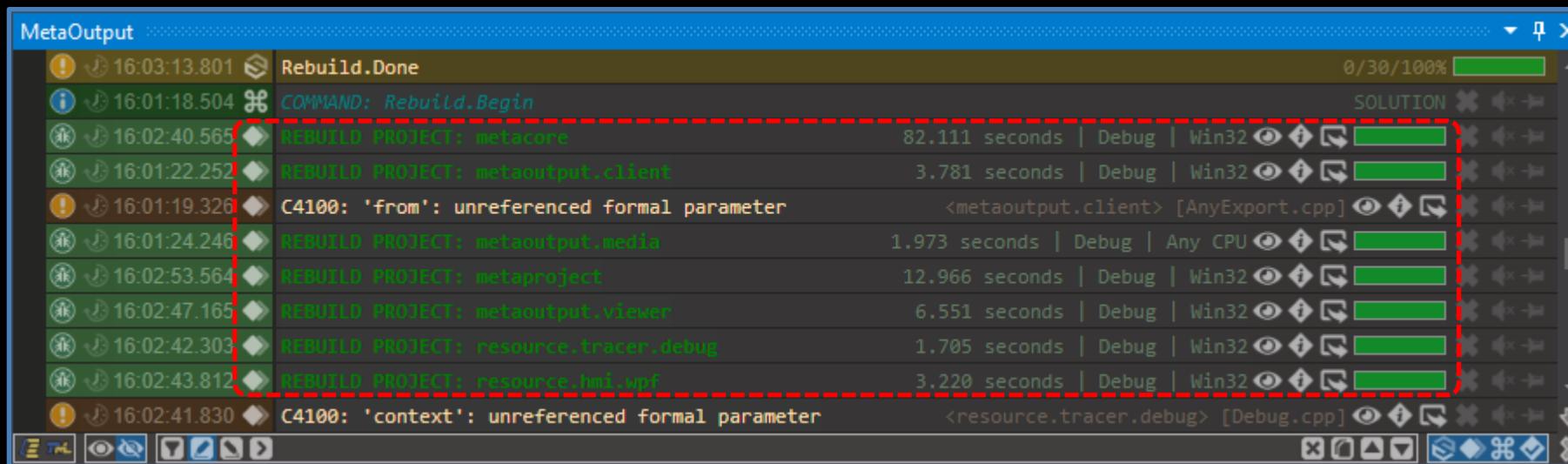
Time	Message	Project	Configuration	Time
19:16:50.407	Rebuild.Begin			
19:16:43.473	COMMAND: Build.RebuildSolution			<Global::Ctrl+Alt+F7>
19:16:44.036	COMMAND: Rebuild.Begin			SOLUTION
19:16:44.036	REBUILD PROJECT: metacore		Debug Win32	
19:16:48.402	REBUILD PROJECT: metaoutput.client		4.381 seconds Debug Win32	
19:16:45.986	C4100: 'from': unreferenced formal parameter	<metaoutput.client> [AnyExport.cpp]		
19:16:50.406	REBUILD PROJECT: metaoutput.media		2.010 seconds Debug Any CPU	



BUILDING: COMPILED RESULTS



Detailed information about compilation results is available for each project:





WHAT IS METAOUTPUT DEBUGGING?



MetaOutput provides completely new user experience in software debugging.

It give possibility not only to see current state of application debugging, but to do it in the past.

It's convenient mechanism, but also, it's new vision of **Time Travel Debugging**.



DEBUGGING: BREAKPOINTS



Detailed information is visualized for each application stops on breakpoints:

The screenshot shows the MetaOutput debugger window with the title "MetaOutput". The main pane displays a list of breakpoints and their details. A red dashed box highlights the first five entries, which are all identical: "BREAKPOINT: handler::metaoutput::PreviewSizeCalculate::_Execute <metaoutput.viewer.dll> [MetaOutput.cpp]". Below this, another entry is shown: "BREAKPOINT: handler::metaoutput::PreviewSizeCalculate::_Execute <metaoutput.viewer.dll> [MetaOutput.cpp]". The bottom section of the window shows a call stack with several frames, each with a small icon and a tooltip-like description. The call stack starts with "handler::metaoutput::PreviewSizeCalculate::_Execute(handler::metaoutput::PreviewSizeCalculate^ this)" and continues through "atom::Descriptor::AnyHandler::Execute(atom::Descriptor::AnyHandler^ {handler::metaoutput::PreviewSizeCalculate^} this)", "atom::Descriptor::__Execute(atom::Descriptor^ this)", "atom::Descriptor::__Start(atom::Descriptor^ this)", and "atom::Descriptor::Start(atom::Descriptor^ this)". The window has standard Windows-style buttons at the bottom.

The latest breakpoint shows call stack automatically.



DEBUGGING: EXCEPTIONS



Detailed information is visualized for each thrown exceptions:

The screenshot shows the 'MetaOutput' window from a debugger. A red dashed box highlights the stack trace and local variable information for a thrown exception. The stack trace shows frames from 'test_namespace.Program.Error2()' down to 'test_namespace.Program.Main()'. Local variables for the current frame ('Error2()') are listed, including 'args' (string[0]), 'ex' (System.Exception), 'i' (int), and 'ii' (int). The right side of the window displays the assembly code for the frames.

Stack trace with local variables is also available.



DEBUGGING: CALL STACKS



Call stack will be visualized for each breakpoint or exception:

The screenshot shows a debugger's call stack window titled "MetaOutput". It displays a stack trace starting from a breakpoint at `handler::metaoutput::PreviewSizeCalculate::_Execute` in `[MetaOutput.cpp]`. The stack trace is highlighted with a red dashed rectangle. The code in the stack trace is color-coded: green for standard text, blue for variable names, and red for function names. Below the stack trace, there is a list of local variables with their types and values. At the bottom of the window, there are several toolbar icons.

```
09:09:01.248 Debug.Breakpoint
09:09:01.248 BREAKPOINT: handler::metaoutput::PreviewSizeCalculate::_Execute <metaoutput.viewer.dll> [MetaOutput.cpp]
handler::metaoutput::PreviewSizeCalculate::_Execute(handler::metaoutput::PreviewSizeCalculate^ this) [MetaOutput.cpp]
atom::Descriptor::AnyHandler::Execute(atom::Descriptor::AnyHandler^ {handler::metaoutput::PreviewSizeCalculate^} this)
this = {handler::metaoutput::PreviewSizeCalculate^} :Descriptor::AnyHandler^ {handler::metaoutput::PreviewSizeCalculate^}
m_Context = "[state: CHANGED | CHANGING | CUSTOM26 | REFERENCES:2 | PROPERTIES:3]"
m_IndexCurrent = 0
m_IndexEnd = 4
m_IndexStart = 0
m_IsFreezed = false
context = Implicit function evaluation is turned off by the user
```

Number of function calls can be restricted by user preferences.



DEBUGGING: VARIABLES



Local variables can be visualized for each function call:

The screenshot shows the 'MetaOutput' debugger window with the title bar 'MetaOutput'. The window displays a stack trace with two entries:

- 09:09:01.248 Debug.Breakpoint
- 09:09:01.248 BREAKPOINT: handler::metaoutput::PreviewSizeCalculate::_Execute <metaoutput.viewer.dll> [MetaOutput.cpp]

The second entry is expanded, showing the local variable 'this' of type 'handler::metaoutput::PreviewSizeCalculate^'. A red dashed box highlights this variable and its members:

- m_Context = "[state: CHANGED | CHANGING | CUSTOM26 | REFERENCES:2 | PROPERTIES:3]" (atom::Descriptor^)
- m_IndexCurrent = 0 (int)
- m_IndexEnd = 4 (int)
- m_IndexStart = 0 (int)
- m_IsFreezed = false (bool)

At the bottom of the window, a note says: "context = Implicit function evaluation is turned off by the user". The window has standard Windows-style scroll bars and a toolbar at the bottom.

Amount of data can be restricted by timeout and deep of extracted data.



DEBUGGING: NESTINGS



Collecting of data for classes and structures can have different deep.

It can be restricted by user preferences and timeouts.



DEBUGGING: TIMEOUTS



Some function calls can have too many variables.

Their extraction can take a lot of time.

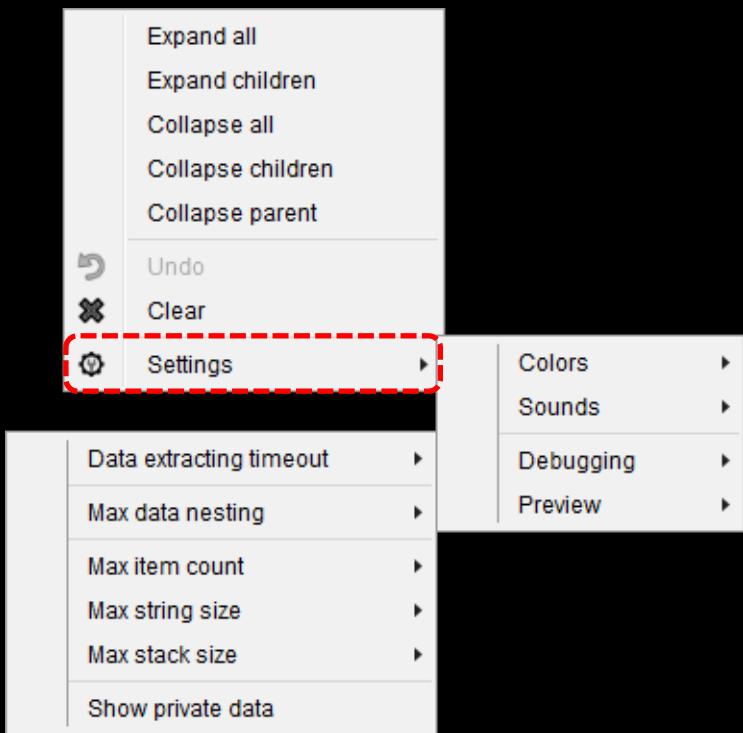
If to do it without any restrictions, this operation will make huge penalties for debugged process.

Therefore, data extracting will be stopped by ending of this operation or by exceeding of some interval of time.

DEBUGGING: SETTINGS



User have possibility to change any preferences by popup menu:





WHAT IS TRACE MESSAGE LANGUAGE (TML)?



TML is new data definition language integrated into **MetaOutput**.

- ❖ It can be used as substitution of **XML**, **JSON**, **YAML**, **INI** and other such languages;
- ❖ It can be used as new standard for logging;
- ❖ It can be used as new data container;
- ❖ It can be easily extended for many other goals...



IS TML ALREADY DEFINED AS STANDARD?



TML will be defined as **ISO** standard and specification will be available for all for free.

Any limitations with using, integrating to own products, commercial and noncommercial using will be absent.

However further development of this language **MUST BE COORDINATED** with author of this standard.



WHERE TO GET INFORMATION ABOUT TML?



Will be prepared additional presentation about **TML**.



HOW TO USE TML?



MetaOutput can visualize trace messages received from:

- ❖ From source code:
 - ❖ **C#** - call function `System.Diagnostics.Debug.WriteLine(tml_text);`
 - ❖ **C++ CLI** - call function `System::Diagnostics::Debug::WriteLine(tml_text);`
 - ❖ **C++** - call function `OutputDebugString(tml_text);`
- ❖ From **MetaOutput.Client** library;
- ❖ From <CONSOLE MODE> in **MetaOutput**.



USING TML: FROM SOURCE



This is example how to send **TML** message directly from source code:

```
System.Diagnostics.Debug.WriteLine(  
    "[[Some message]] " +  
    "@@@SOURCE COMMAND " +  
    "@@@TYPE INFO " +  
    "@@@COMMENT [[Some comment]] " +  
    "@@@FONT.STATE BLINK ITALIC " +  
    "@@@FOREGROUND TEAL");
```



USING TML: FROM API



This is example how to send message using **MetaOutput.Client** library:

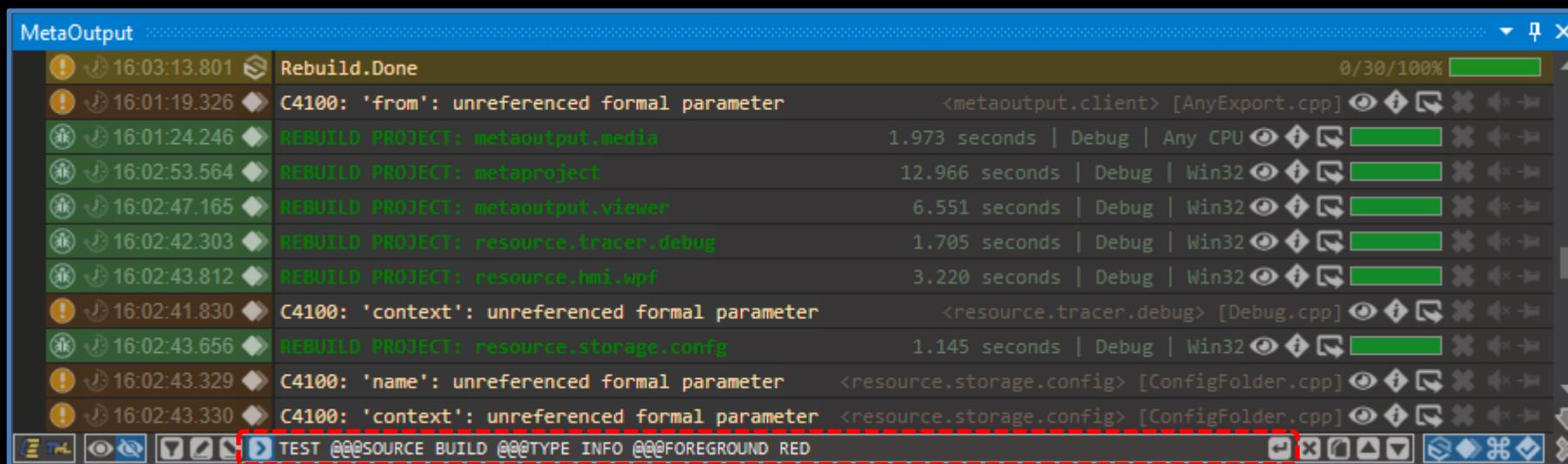
```
atom.Trace.GetInstance().  
    SetFontState(atom.Trace.NAME.FONT_STATE.BLINK).  
    SetFontState(atom.Trace.NAME.FONT_STATE.ITALIC).  
    SetForeground(atom.Trace.NAME.COLOR.TEAL).  
    SetComment("[[[Some comment]]]").  
    Send(atom.Trace.NAME.SOURCE.COMMAND, atom.Trace.NAME.TYPE.INFO, 0, "[[Some message]]");
```



USING TML: FROM METAOUTPUT



New message is possible to send directly from **MetaOutput** using **TML**:





WHAT IS TML PATTERNS?



TML pattern is official extension of **TML**.

Each such pattern add to **TML** new attributes which are focused on using in some application area.

Some patterns, which can be commonly used will be accepted as standard.



TML PATTERN: TML.CORE



Pattern **TML.CORE** provides such functionality to **TML**:

- ❖ Comments
- ❖ Hierarchy
- ❖ Links
- ❖ Metadata
- ❖ Sources
- ❖ Timestamps
- ❖ Types
- ❖ Values



TML PATTERN: TML.ACTION



Pattern **TML.ACTION** provides such functionality to **TML**:

- ❖ Commands
- ❖ Conditions
- ❖ Transformations
- ❖ Translations
- ❖ Variables



TML PATTERN: TML.VIEWER



Pattern **TML.VIEWER** add next functionality to **TML**:

- ❖ Alignments
- ❖ Colors
- ❖ Controls
- ❖ Fonts



HOW TO WRITE NEW TML PATTERNS?



This library is in development.



COULD METAOUTPUT BE TRANSLATED?



MetaOutput uses **English** localization by default.

However, any string in user interface or any string in output can be translated to any other language using **TML**.

It can do any user which need it.

This is example demonstrates how to make it:

```
[[[TEST STRING]]] @@@TRANSLATION.APPEND <<<UA>>> [[TESTОВИЙ РЯДОК]]
[[[TEST STRING]]] @@@TRANSLATION.APPEND <<<DE>>> [[TESTSTRING]]
[[[TEST STRING]]] @@@TRANSLATION.APPEND <<<IT>>> [[STRINGA DI PROVA]]
```



WHAT IS METAOUTPUT EXTENSIONS?



MetaOutput provides basic functionality, and mechanism how to expend it.
This mechanism is small and simple and it available using **MetaOutput.Client** library.

This library is implemented as **NuGet** package and available here:
<https://www.nuget.org/packages/MetaOutput.Client>

This library is open-source and source files are available here:
<https://github.com/viacheslav-lozinskyi/MetaOutput>



WHICH PLATFORMS ARE SUPPORTED?



Now implemented support only for **.NET Framework 4.5+**.

Support of the most popular platforms is planned.



WHICH LANGUAGES ARE SUPPORTED?



Now implemented support only for **C#** and **C++ CLI**.

Support of the most popular languages is planned.



METAOUTPUT EXTENSION: PREVIEW



This extension type is responsible for visualization of unknown for **MetaOutput** file formats.

For implementation is necessary to make inherited class:

```
class MyPreviewClass : extension.AnyPreview { ... }
```

After that is necessary to make registration of this class:

```
extension.AnyPreview.Connect();  
extension.AnyPreview.Register(".PNG", new MyPreviewClass());
```



METAOUTPUT EXTENSION: SOURCE



This extension type is responsible for sending to **MetaOutput** data from new sources.

For implementation is necessary to make inherited class:

```
class MySourceClass : extension.AnySource { ... }
```

After that is necessary to make registration of this class:

```
extension.AnySource.Connect();
extension.AnySource.Register(new MySourceClass());
```



METAOUTPUT EXTENSION: EXPORT



This extension type is responsible for sending data from **MetaOutput** to some specific file format (for example log file).

For implementation is necessary to make inherited class:

```
class MyExportClass : extension.AnyExport { ... }
```

After that is necessary to make registration of this class:

```
extension.AnyExport.Connect();
extension.AnyExport.Register(new MyExportClass());
```



METAOUTPUT EXTENSION: IMPORT



This extension type is responsible for sending to **MetaOutput** imported data in some specific file format (*for example log file*).

For implementation is necessary to make inherited class:

```
class MyImportClass : extension.AnyImport { ... }
```

After that is necessary to make registration of this class:

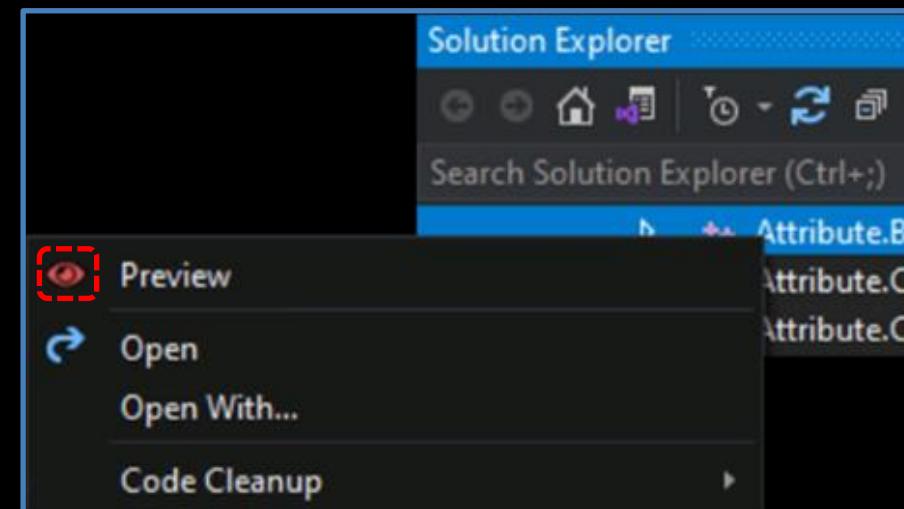
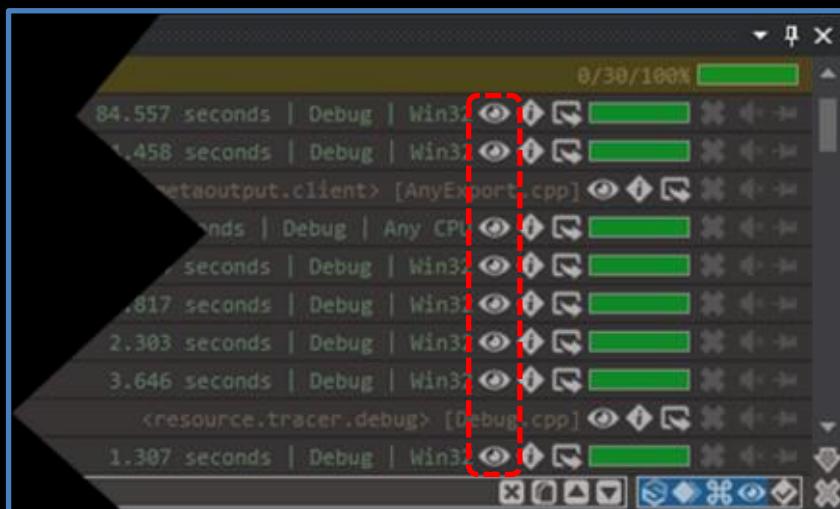
```
extension.AnyImport.Connect();  
extension.AnyImport.Register(new MyImportClass());
```



HOW TO USE EXTENSIONS?



Each file which have some **URL** can be previewed by installed extension.
If specialized extension is found, it will be responsible for visualization.
Otherwise, will be used generic mechanism.





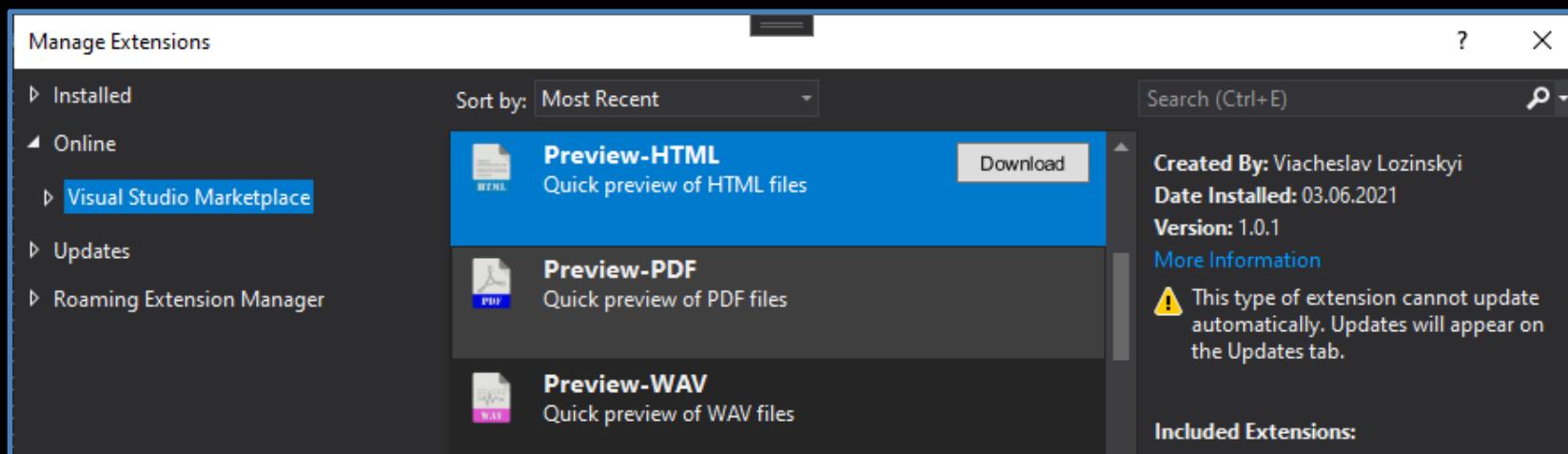
HOW TO INSTALL EXTENSIONS?



Installing of new extensions is possible from **Visual Studio Marketplace**:

<https://marketplace.visualstudio.com/search?term=MetaOutput&target=VS&category=Tools>

Also, it is possible to make directly from **IDE**:





HOW TO WRITE NEW EXTENSIONS?



The simplest way to write **MetaOutput** extensions is to use **MetaOutput.Client API**.

It provide enough mechanisms to write next types of extensions:

- ❖ **PREVIEW** (*visualization of required file formats*);
- ❖ **SOURCE** (*sending to **MetaOutput** data from some asynchronous source*);
- ❖ **IMPORT** (*import data from file in required format to **TML***);
- ❖ **EXPORT** (*export data from **TML** to file in required format*).



WHAT IS METAOUTPUT API?



MetaOutput provides several **APIs** for next goals:

- ❖ Improvement of **MetaOutput**;
- ❖ Using of **MetaOutput** control in own applications;
- ❖ Using of **Trace Message Language (TML)** in own applications.



METAOUTPUT API: CLIENT



This **API** provides possibility to write **MetaOutput** extensions.

MetaOutput.Client library is available here:

<https://github.com/viacheslav-lozinskyi/MetaOutput>

Samples with using of this **API** are here:

<https://github.com/viacheslav-lozinskyi?tab=repositories>



METAOUTPUT API: SERVER



This **API** provides possibility to integrate **TML** language to own application.

It will support all available **TML** patterns and provide possibility to include all available extensions.

Implementation is planned.



METAOUTPUT API: VIEWER



This **API** provides possibility to integrate **MetaOutput** control to own application.

Implementation is planned.



INTEGRATION TO IDE



MetaOutput can be integrated into any **IDE** or editor using official plugin mechanism
*(only for that products, who provide such **API**).*

It doesn't provide any influence on existing functionality, and it is working in parallel with standard tools and installed extensions from other vendors.



INTEGRATION TO IDE: VISUAL STUDIO



Plugin for **Visual Studio** is already implemented.

Supported versions are: **2015, 2017, 2019, 2022.**

Implementation is here:

<https://marketplace.visualstudio.com/items?itemName=ViacheslavLozinskyi.MetaOutput-2019>

<https://marketplace.visualstudio.com/items?itemName=ViacheslavLozinskyi.MetaOutput-2022>



INTEGRATION TO IDE: VISUAL STUDIO CODE



Plugin for **Visual Studio Code** is not implemented yet.

Implementation is planned.



INTEGRATION TO IDE: ECLIPSE



Plugin for **Eclipse** is not implemented yet.

Implementation is planned.



INTEGRATION TO IDE: XCODE



Plugin for **XCode** is not implemented yet.

Implementation is planned.



INTEGRATION TO IDE: OTHER IDE



Support for all popular **IDEs** will be implemented in any case.

Integration with other **IDEs** or editors is optional.

This is possible if owner of such product will finance this implementation and further support.

As alternative, development can be for free in case of significant promotion of **MetaOutput**.

If you are user of such **IDE** and want to use **MetaOutput** there, please send them this document. It will give possibility at least to start thinking about such project.



METAOUTPUT LICENSE



MetaOutput has proprietary license which provide next rights:



Permissions

- ❖ Commercial use
- ❖ Display
- ❖ Distribution
- ❖ Private use

Limitations

- ❖ Disclosure
- ❖ Liability
- ❖ Modification
- ❖ Warranty

METAOUTPUT PRICE



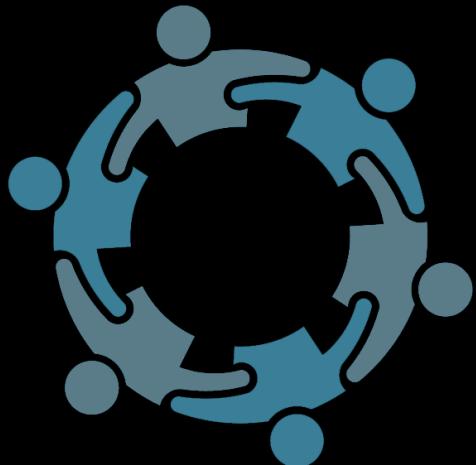
MetaOutput is freeware software.



In future it will have additional services which will be available by subscription.



ABOUT COMMUNITY



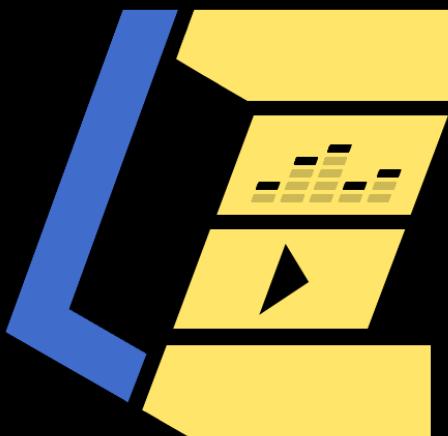
This community, it is about effectiveness.
Do more by less efforts!

- ❖ Any ideas is here...
- ❖ Any news is here...
- ❖ Any questions is here too...

Join us!



COMMUNITY: METAOUTPUT



Official community of **MetaOutput** is here:

Reddit: <https://bit.ly/metaoutput-community-reddit>



Official community of **TML** is here:

Reddit: <https://bit.ly/tml-community-reddit>



ABOUT FEEDBACKS



Improvement of **MetaOutput** is impossible without feedbacks from real users.

It is very important part of development, and if you have some concerns or see any bug
– **don't hesitate and report it!**

All found bugs will be fixed (*often in the nearest release*).

All new feature requests will be performed (*the most useful of them will be implemented*).



FEEDBACKS: GIT



Primary place for reporting about any bugs and new features is here:

<https://bit.ly/metaoutput-git-issues>

Thanks in advance for any reported bug or feature request!



FEEDBACKS: VISUAL STUDIO MARKETPLACE



Visual Studio Marketplace supports review mechanism.

It is placed here:

<https://bit.ly/metaoutput-rating>

Will be great to see your rating there.

It will help to promote **MetaOutput** and save time for development.

IT IS VERY IMPORTANT, and thanks in advance for any comment there!



ABOUT REPOSTS



MetaOutput is new product.

By functionality it hasn't competitors but has one drawback - IT IS UNKNOWN.

Any repost is your contribution into this product.

IT IS VERY IMPORTANT, and thanks in advance for reposts!



ABOUT THIS DOCUMENT



This presentation was created by **Viacheslav Lozinskyi**.

Design of this document was made by **Maria Lozinskaya**.

The latest version of this document is available here:

<https://bit.ly/metaoutput-presentation-pdf>

The latest version of video presentation is available here:

<https://bit.ly/metaoutput-presentation-youtube>



CONTACTS



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THANKS FOR WATCHING