ARC® Video Subsystem H.264 Decoder
H.264 Baseline Decoder

Getting Started

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Chapter 1 — Overview

The ARC Video Subsystem H.264 Decoder for the ARC 700 processor core with the ARC Media Extensions, provides the following codec:

- H.264 Baseline Decoder

The following sections provide further details on using the codec:

- The Documentation section contains an outline of the online documentation provided with the codec.

- The ARChitect Support section describes how to build the codec from the IP library.

- The MetaWare Toolset Support section describes how to compile and run the codec after it has been built from the ARChitect tool.

Chapter 2 — Documentation

The *ARC Video Subsystem H.264 Decoder Bookshelf* is the starting point for all the documentation, and provides links to specific reference material and additionally provides links to:

ARC Video Subsystem H.264 Decoder Release Notes: Containing a summary of the release, and changes since the last release.

ARC Video Subsystem H.264 Decoder Getting Started: Containing a summary on using the product.

ARC Video Sub-System Codecs Application Programming Interface Reference: Describing the C Application Program Interface (API) and resource requirements and the basic integration and usage of the codec library.

The following online information is available:

- [Online Documentation](#)

Online Documentation

The ARC Video Subsystem H.264 Decoder is supplied with built-in on-line documentation that is visible once the IP Library is enabled in the ARChitect list of libraries.

To view the on-line documentation, select **Help > Contents** from the ARChitect menu then select the **IP Library** tab in the help viewer.

For more information on using the help viewer, topic layout and printing topics, select **Help > Help on Help** from the help viewer menu.

Chapter 3 — ARChitect Support

This section describes ARChitect support for the ARC Video Subsystem H.264 Decoder.

The ARC Video Subsystem H.264 Decoder component is built from the IP library file using one of the following ARChitect modes:

- ARChitect Graphical User Interface
- ARChitect Command Line Option

Once the ARChitect tool has built the ARC Video Subsystem H.264 Decoder, the next step is to compile the code using the MetaWare toolset.

ARChitect Graphical User Interface

The ARC Video Subsystem H.264 Decoder component is supplied as an ARChitect IP library. To enable the IP library select **Project > Default Properties > Paths** dialog and add the library file (`.iplib`) to the list of IP Libraries.

Once the library is installed the **H264 Decoder** component will be shown in the **Video Codecs** tab in the **Components** view of the **Explorer** pane.

To generate the ARC Video Subsystem H.264 Decoder software library:

- Add the **H264 Decoder** component to a project that has used the **ARCvideo** template.
- Ensure that the **Build Software** and **Build Test Code** options are enabled in the **Build Sequence** viewer in the **Explorer** pane.
- Perform a project build using the menu option **Project > Build** or click the **Build** button.

The ARC Video Subsystem H.264 Decoder software library will be built in the following folder:

target_build/`software/video_codecs/H264Decoder`

When the **VlcHardware** component is selected in the **Topology** view, the following option is available in the **Options** pane:

Exp-Golomb and CAVLC support	To build the codec to make use of the VLC acceleration hardware for H.264.

Once the ARChitect tool has built the ARC Video Subsystem H.264 Decoder, the next step is to compile the code using the MetaWare toolset.

ARChitect Command Line Option

To enable the ARC Video Subsystem H.264 Decoder use the ARChitect command line option:

 -h264_decoder

Ensure the **-build_software** and **-build_test_code** command line options are used to correctly generate the codec and associated test code.

The following command line options are also available:

-vlc_has_ucavlc   To build the codec to make use of the VLC acceleration hardware for H.264.

-libraries   If the ARChitect has not enabled the ARC Video Subsystem H.264 Decoder IP Library, it can be specified at the command line with the **-libraries** command line option.

-template   The **-template** command line option can be used to specify the **ARCvideo** template.

Once the ARChitect tool has built the ARC Video Subsystem H.264 Decoder, the next step is to compile the code using the MetaWare toolset.

Chapter 4 — MetaWare Toolset Support

This section contains the steps to be performed in order to compile and run a project using the MetaWare toolset.

The MetaWare toolset can compile and run the ARC Video Subsystem H.264 Decoder component using the following modes:

- MetaWare Toolset Command Line

The following sections contain further information on configuring and using the codec:

- Compilation Environment
- Configuring the Compilation
- Target Application Command line

Compilation Environment

The ARC Video Codec uses a make file to compile the project. The user should ensure that a suitable make utility is installed and in the path. The MetaWare Development Toolkit uses GNU make (**gmake**), which is included with the MetaWare toolset and selected by default in the MetaWare IDE.

On Windows, ensure that a *remove* command (**rm**) is in the path, to allow **make clean** type commands to run correctly. A remove command, **rm**, is provided in the mktools/mkbin folder of the MetaWare Development Toolkit installation folder. Add the *metaware_installation*/mktools/mkbin folder to the path if no other *remove* command is available.

Windows users should also ensure that a Perl interpreter is available and installed with files of extension .pl associated with it. Particular Perl scripts are run when dependency files get regenerated, for example after source files have been edited, or after a *make* that removes and regenerates dependency files.

The make system uses relative paths from the base installation directory, and so should only be run from the base installation directory.

The make system assumes that the MetaWare C/C++ compiler tool chain has been installed and is in the path.

Configuring the Compilation

The ARC Video Subsystem H.264 Decoder can be compiled to take advantage of VLC hardware acceleration for Exp-Golomb and CAVLC operations. The ARChitect tool can be used to rebuild the software library with the support for hardware VLC operations.

The make file can also be edited directly to add or remove support for VLC acceleration.

For example to disable support, open the file Makefile with a suitable text editor and change the following line from:

```
export ENABLE_VLC=true
```

To
```
export ENABLE_VLC=false
```

Target Application Command line

The supplied example target application is able to open a H.264 elementary data stream, pass its contents in NAL units to the codec and save the returned decoded YUV frames to a file. The command line interface of the compiled application is as follows:

h264dec *inputfile***.h264** *outputfile***.yuv**

Where *inputfile***.h264** is a valid, fully qualified path to a H.264 elementary file and *outputfile***.yuv** is a valid fully qualified path to the file to be created during decode.

These options should be provided to the MetaWare debugger regardless of the target environment (simulator or ARCangel 4 development system).

MetaWare Toolset Command Line

The following section describe how to compile projects for the ARC Video Subsystem H.264 Decoder using the MetaWare Toolset command line:

- Compiling the Codec at the Command Prompt
- Running the Codec at the Command Prompt
- Using the ARCangel 4 Development System at the Command Prompt

Compiling the Codec at the Command Prompt

Ensure the compilation environment is correctly set up before compiling the codec.

To compile the ARC Video Subsystem H.264 Decoder open a command window, go to the folder that contains the make file and type the relevant make command to invoke your make utility, for example:

make

If the local make system does not automatically detect the `Makefile` file in the directory, then use the appropriate command line to define the make file to use, for example:

make –f Makefile

The following make commands can be used to re-compile the library if it has been re-built by the ARChitect tool:

make libclean clean	To clean (i.e. remove object files, executables and libraries).
make libdepclean depclean	To remove dependencies and objects, libraries and executables
make lib	To make just the library.
make all	To make everything.
make libclean clean all	To do a full clean compile (not regenerating dependencies).

make libdepclean depclean all   To do a full clean compile (regenerating dependencies).

The MetaWare toolset instruction set simulator supports the ARC Media Extensions and can be used to run and debug the example codec application. Alternatively the software can be run on the ARCangel 4 development system using a suitable FPGA XBF image file.

Once the code is compiled the following steps can be carried out:

- Running the Codec at the Command Prompt

- Using the ARCangel 4 Development System at the Command Prompt

Running the Codec at the Command Prompt

In order to run the simulator successfully the user must ensure that the ARC Media Extensions are available. The SIMD extensions are delivered as an optional plug-in into the base MetaWare toolset, and are delivered in the form of a single file simd.*OS_specific_file_extension.*

The SIMD extensions file is not included as part of the standard MetaWare installation process. The SIMD extensions file is delivered with the ARC Media Extensions IP library, therefore it is necessary to install the ARC Media Extensions IP library and generate a build using the ARChitect configuration tool.

- If the ARChitect GUI is used, ensure that the **Build Software** and **Build Test Code** options are enabled in the **Build Sequence** viewer in the ARChitect **Explorer** pane to correctly generate the codec and associated test code.

- If the ARChitect command line is used, ensure the **-build_software** and **-build_test_code** command line options are used to correctly generate the codec and associated test code.

The SIMD extensions file is located in the *build_directory*/iss folder. For convenience, you can copy the SIMD extension file to the MetaWare/arc/bin installation directory.

The following steps outline the process required to execute the codec by using the instruction set simulator.

Run the MetaWare debugger using the following command line options, to execute the target file to completion.

mdb -simextp=*build_directory***/iss/simd,scm_size=5120 -arc700 -Xlib -Xmpy –nooptions** *path-to-executable***/h264dec** *inputfile***.h264** *outputfile***.yuv**

Where, according to the application command line, *inputfile***.h264** is a valid, fully qualified path to a H.264 elementary file and *outputfile***.yuv** is a valid fully qualified path to the file to be created during decode. The codec will output the specified sequence as YUV 4:2:0.

The following section shows how to use the ARCangel 4 Development System at the command prompt.

Using the ARCangel 4 Development System at the Command Prompt

To run the software on an ARCangel 4 development system:

- Ensure that an ARCangel 4 is connected to the host PC using a parallel cable and that the unit is powered.

- Download ('blast') the FPGA image file containing the ARC700 with Media Extensions to the ARCangel 4.

- Run the MetaWare debugger using the following command line options, for an example 70MHz build, to execute the target file to completion:

  1 **mdb -DLLprop=gclk=70 -hard –jtag –nooptions** *path-to-executable/***h264dec** *inputfile***.h264** *outputfile***.yuv**

- Where, according to the <u>application command line</u>, *inputfile***.h264** is a valid, fully qualified path to a H.264 elementary file and *outputfile***.yuv** is a valid fully qualified path to the file to be created during decode. The codec will output the specified sequence as YUV 4:2:0.