

Summary - FIFO

Name	fifo
Worker Type	Application
Version	1.4
Release Date	October 2018
Component Library	ocpi.assets.util_comps
Workers	fifo.hdl
Tested Platforms	isim

Functionality

The FIFO component passes complex signed samples (Q0.15 I, Q0.15 Q) from the input port through a First-In-First-Out (FIFO) buffer and onward to the output port. The depth, in number of complex samples, of the FIFO buffer is parameterized. This component includes a property-driven oneshot mode which, when enabled, allows the first FIFO depth number of samples to be sent to the output port and then discontinues data flow to the output port. After data flow is discontinued, the input port still ingests available samples, effectively operating as a data sink. This worker can also be parameterized to send a Zero-Length Message (ZLM) once data flow is discontinued.

Worker Implementation Details

fifo.hdl

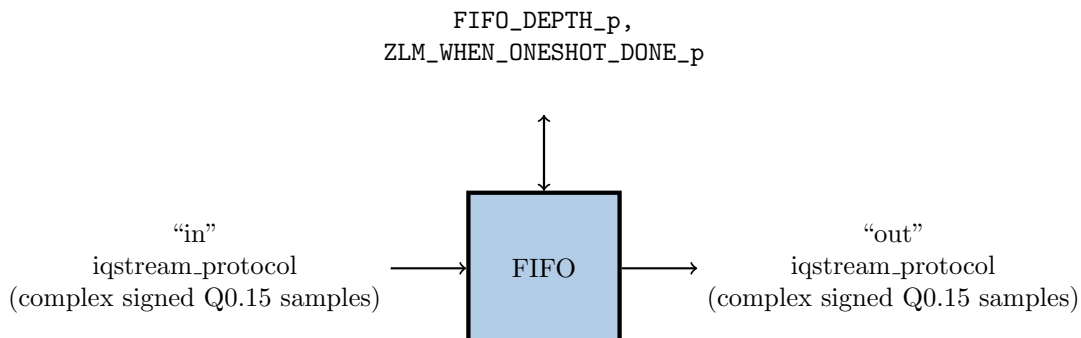
In keeping with good data flow control practices, backpressure is transferred, when necessary, from the output port to the input port. Backpressure is never transferred when in oneshot mode and after the data flow is discontinued. Backpressure from the output port and forwardpressure from the input port are both alleviated by the FIFO buffer, with the degree of alleviation being directly proportional to the parameterized depth of the FIFO buffer (FIFO_DEPTH_p).

The input port's SOM, EOM, byte_enable, and valid indicators are passed through the FIFO to the output port when data flow is allowed. Consequently, ZLMs will be passed through this worker. If operating in oneshot mode and data flow has been discontinued, the EOM will be set (i.e. logic value of 1 applied) on the same clock pulse as the last output sample.

The ZLM_WHEN_ONESHOT_DONE_p parameter property, when having a value of true, forces the worker to send a single ZLM when in oneshot mode and data flow has been discontinued (i.e. when oneshot is 'done'). This is useful for allowing applications which use this worker to terminate once data flow is discontinued.

Block Diagrams

Top level



Source Dependencies

fifo.hdl

- assets/components/util_comps/fifo.hdl/fifo.vhd
- core/hdl/primitives/bsv/bsv_pkg.vhd
- core/hdl/primitives/bsv/imports/SizedFIFO.v

Component Spec Properties

Name	Type	SequenceLength	ArrayDimensions	Accessibility	Valid Range	Default	Usage
FIFO_DEPTH_p	ULong	-	-	Parameter	Standard	1024	Maximum number of complex samples which the FIFO can hold at any given time.
ZLM_WHEN_ONESHOT_DONE_p	Bool	-	-	Readable, Initial	Standard	False	When true, worker will generate Zero-Length-Message after oneshot was enabled and completed.

Worker Properties

fifo.hdl

Type	Name	Type	SequenceLength	ArrayDimensions	Accessibility	Valid Range	Default	Usage
-	-	-	-	-	-	-	-	-

Component Ports

Name	Producer	Protocol	Optional	Advanced	Usage
in	false	iqstream_protocol	false	ZeroLengthMessages=true	Complex signed samples (Q0.15 I, Q0.15 Q). This port effectively becomes a data sink when oneshot is true and FIFO_DEPTH_p samples have been passed through this port. Note that input Zero-Length Messages will not be counted when using oneshot mode.
out	true	iqstream_protocol	false	ZeroLengthMessages=true	Complex signed samples (Q0.15 I, Q0.15 Q). This port will pass through all samples from the input port, while obeying and transferring backpressure. If oneshot is true and FIFO_DEPTH_p samples have been passed through this port, no more data will be passed through this port until a reset occurs. Note that Zero-Length Messages will not be counted when using oneshot mode.

Worker Interfaces

fifo.hdl

Type	Name	DataWidth	Advanced	Usage
StreamInterface	in	32	-	-
StreamInterface	out	32	-	-

Control Timing and Signals

The FIFO worker uses the clock from the Control Plane and standard Control Plane signals.

Worker Configuration Parameters

fifo.hdl

Table 1: Table of Worker Configurations for worker: fifo

Configuration	FIFO_DEPTH_p	ZLM_WHEN_ONESHOT_DONE_p	ocpi_endian	ocpi_debug
0	8192	false	little	false
1	8192	true	little	false

Performance and Resource Utilization

fifo.hdl

Table 2: Resource Utilization Table for worker: fifo

Configuration	OCPI Target	Tool	Version	Device	Registers (Typ)	LUTs (Typ)	Fmax (MHz) (Typ)	Memory/Special Functions
0	zynq	Vivado	2017.1	xc7z020clg400-3	370	7913	N/A	N/A
0	virtex6	ISE	14.7	6vcx75tff484-2	191	8032	267.551	RAM64M: 1536
0	stratix4	Quartus	17.1.0	N/A	286	344	N/A	Block Memory Bits: 278494
1	zynq	Vivado	2017.1	xc7z020clg400-3	409	7989	N/A	N/A
1	virtex6	ISE	14.7	6vcx75tff484-2	191	8035	253.615	RAM64M: 1536
1	stratix4	Quartus	17.1.0	N/A	286	348	N/A	Block Memory Bits: 278494

Test and Verification

For verification, multiple test files are generated of varying lengths. Each test file is passed into the input port, and the output of the output port is saved to a file. The output file is compared against the input file to make sure they have the same binary contents and length. For the tests that use oneshot mode, the output file is only compared to the first $\min(\text{input file size}, 8192)$ samples, with 8192 hardcoded to correspond to `FIFO_DEPTH_p`.