DCFG

Generated by Doxygen 1.8.2

Tue Jun 2 2015 16:28:25

Contents

Chapter 1

Main Page

1.1 Introduction

A control-flow graph (CFG) is a fundamental structure used in computer science and engineering for describing and analyzing the structure of an algorithm or program. A dynamic control-flow graph (DCFG) is a specialized CFG that adds data from a specific execution of a program. This application-programmer interface (API) provides access to the DCFG data from within a Pin tool or a standalone program.

Chapter 2

Hierarchical Index

2.1 Class Hierarchy

This inheritance list is sorted roughly, but not completely, alphabetically:

Chapter 3

Class Index

3.1 Class List

Here are the classes, structs, unions and interfaces with brief descriptions:

Chapter 4

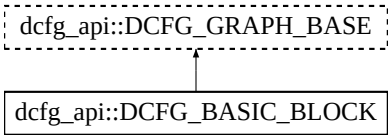
Class Documentation

4.1 dcfg_api::DCFG_BASIC_BLOCK Class Reference

Interface to information about a basic block.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_BASIC_BLOCK:



Public Member Functions

- virtual DCFG_ID get_basic_block_id () const =0

  Get basic-block ID number.
- virtual DCFG_ID get_process_id () const =0

  Get the process ID.
- virtual DCFG_ID get_image_id () const =0

  Get the image ID.
- virtual DCFG_ID get_routine_id () const =0

  Get routine ID.
- virtual DCFG_ID get_inner_loop_id () const =0

  Get innermost loop ID.
- virtual UINT64 get_first_instr_addr () const =0

  Get starting or base address.
- virtual UINT64 get_last_instr_addr () const =0

  Get the address of the last instruction.
- virtual UINT32 get_size () const =0

  Get size.
- virtual UINT32 get_num_instrs () const =0

  Get static number of instructions in the block.

- virtual const std::string * get_symbol_name () const =0

  Get symbol name of this block.
- virtual UINT32 get_symbol_offset () const =0

  Get symbol offset of this block.
- virtual const std::string * get_source_filename () const =0

  Get name of source file for this block.
- virtual UINT32 get_source_line_number () const =0

  Get line number in source file this block.
- virtual UINT64 get_exec_count () const =0

  Get dynamic execution count.
- virtual UINT64 get_exec_count_for_thread (UINT32 thread_id) const =0

  Get dynamic execution count.

4.1.1 Detailed Description

Interface to information about a basic block.

4.1.2 Member Function Documentation

4.1.2.1 virtual DCFG_ID dcfg_api::DCFG_BASIC_BLOCK::get_basic_block_id ( ) const [pure virtual]

Get basic-block ID number.

Basic-block ID numbers are unique within a process.

Returns

ID number of this basic block.

4.1.2.2 virtual UINT64 dcfg_api::DCFG_BASIC_BLOCK::get_exec_count ( ) const [pure virtual]

Get dynamic execution count.

Returns

Number of times the block was executed, summed across all threads.

4.1.2.3 virtual UINT64 dcfg_api::DCFG_BASIC_BLOCK::get_exec_count_for_thread (UINT32 *thread_id*) const [pure virtual]

Get dynamic execution count.

Returns

Number of times the block was executed in given thread.

Parameters

in	*thread_id*	Thread number. Typically, threads are consecutively numbered from zero to DCFG_PROCESS::get_highest_thread_id().

4.1.2.4 virtual UINT64 dcfg_api::DCFG_BASIC_BLOCK::get_first_instr_addr ( ) const [pure virtual]

Get starting or base address.

Returns

Address of first instruction in this block.

4.1.2.5 virtual DCFG_ID dcfg_api::DCFG_BASIC_BLOCK::get_image_id ( ) const [pure virtual]

Get the image ID.

Returns

Image ID of this block.

4.1.2.6 virtual DCFG_ID dcfg_api::DCFG_BASIC_BLOCK::get_inner_loop_id ( ) const [pure virtual]

Get innermost loop ID.

To find all loops containing this block, get the innermost loop and then follow the parent loop IDs until there are no parents.

Returns

ID number of innermost loop containing this block or zero (0) if none.

4.1.2.7 virtual UINT64 dcfg_api::DCFG_BASIC_BLOCK::get_last_instr_addr ( ) const [pure virtual]

Get the address of the last instruction.

This is *not* the address of the last byte in the block unless the last instruction is exactly one byte long. The address of the last byte is DCFG_BASIC_BLOCK::get_first_instr_addr() + DCFG_BASIC_BLOCK::get_size() - 1.

Returns

Address of last instruction in this block.

4.1.2.8 virtual UINT32 dcfg_api::DCFG_BASIC_BLOCK::get_num_instrs ( ) const [pure virtual]

Get *static* number of instructions in the block.

To get the dynamic count of instructions executed, use DCFG_GRAPH_BASE::get_instr_count() or DCFG_GRAPH_BASE::get_instr_count_for_thread().

Returns

Static number of instructions in this block.

4.1.2.9 virtual DCFG_ID dcfg_api::DCFG_BASIC_BLOCK::get_process_id ( ) const [pure virtual]

Get the process ID.

Returns

Process ID of this block.

4.1.2.10 virtual DCFG_ID dcfg_api::DCFG_BASIC_BLOCK::get_routine_id ( ) const [pure virtual]

Get routine ID.

Returns

routine ID number of this block or zero (0) if none.

4.1.2.11 virtual UINT32 dcfg_api::DCFG_BASIC_BLOCK::get_size ( ) const [pure virtual]

Get size.

Returns

Size of this block in bytes.

4.1.2.12 virtual const std::string* dcfg_api::DCFG_BASIC_BLOCK::get_source_filename ( ) const [pure virtual]

Get name of source file for this block.

Returns

Pointer to name of the source filename at the base address of this block if it exists, NULL otherwise.

4.1.2.13 virtual UINT32 dcfg_api::DCFG_BASIC_BLOCK::get_source_line_number ( ) const [pure virtual]

Get line number in source file this block.

Returns

Line number at the base address of this block if it exists, zero (0) otherwise.

4.1.2.14 virtual const std::string* dcfg_api::DCFG_BASIC_BLOCK::get_symbol_name ( ) const [pure virtual]

Get symbol name of this block.

Returns

Pointer to name of the symbol at the base address of this block if one exists, NULL otherwise.

4.1.2.15 virtual UINT32 dcfg_api::DCFG_BASIC_BLOCK::get_symbol_offset ( ) const [pure virtual]

Get symbol offset of this block.

Returns

Difference between base address of the symbol returned in DCFG_BASIC_BLOCK::get_symbol_name() and the base address of this block or zero (0) if no symbol exits.

The documentation for this class was generated from the following file:

- dcfg_api.H

4.2 dcfg_api::DCFG_DATA Class Reference

Interface to all data in a DCFG.

`#include <dcfg_api.H>`

Public Member Functions

- virtual bool read (std::istream &strm, std::string &errMsg, bool readToEof=true)=0

  Set internal DCFG data from a C++ `istream`.
- virtual bool read (const std::string filename, std::string &errMsg)=0

  Open a file for reading and set internal DCFG data from its contents.
- virtual void write (std::ostream &strm) const =0

  Write internal DCFG data to a C++ `ostream`.
- virtual bool write (const std::string &filename, std::string &errMsg) const =0

  Write internal DCFG data to a file.
- virtual void clearCounts ()=0

  Set all dynamic counts to zero.
- virtual UINT32 get_process_ids (DCFG_ID_CONTAINER &process_ids) const =0

  Get list of process IDs.
- virtual DCFG_PROCESS_CPTR get_process_info (DCFG_ID process_id) const =0

  Get access to data for a process.

Static Public Member Functions

- static DCFG_DATA * new_dcfg ()

  Create a new DCFG.

4.2.1 Detailed Description

Interface to all data in a DCFG.

This is an interface; use DCFG_DATA::new_dcfg() to create an object that implements the interface.

4.2.2 Member Function Documentation

4.2.2.1 virtual UINT32 dcfg_api::DCFG_DATA::get_process_ids (DCFG_ID_CONTAINER & *process_ids*) const [pure virtual]

Get list of process IDs.

Returns

Number of IDs that were added to `process_ids`.

Parameters

`out`	*process_ids*	Container to which process IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.2.2.2 virtual DCFG_PROCESS_CPTR dcfg_api::DCFG_DATA::get_process_info (DCFG_ID *process_id*) const [pure virtual]

Get access to data for a process.

Returns

Pointer to interface object for specified process or `NULL` if `process_id` is invalid.

Parameters

`in`	*process_id*	ID of desired process.

4.2.2.3 static DCFG_DATA* dcfg_api::DCFG_DATA::new_dcfg ( ) [static]

Create a new DCFG.

This is a factory method to create a new object that implements the DCFG_DATA interface.

Returns

Pointer to new object. It can be freed with `delete`.

4.2.2.4 virtual bool dcfg_api::DCFG_DATA::read (std::istream & *strm*, std::string & *errMsg*, bool *readToEof* = `true`) [pure virtual]

Set internal DCFG data from a C++ `istream`.

Returns

`true` on success, `false` otherwise (and sets `errMsg`).

Parameters

in	*strm*	Stream to read from. Reads one JSON value, which must follow the DCFG JSON format.
out	*errMsg*	Contains error message upon failure.
in	*readToEof*	Defines what to do after the JSON value is read. If `true`, continue reading to end of input stream and fail if any non-whitespace characters are found. If `false`, stop reading after the the JSON value.

4.2.2.5 virtual bool dcfg_api::DCFG_DATA::read (const std::string *filename,* std::string & *errMsg*) [pure virtual]

Open a file for reading and set internal DCFG data from its contents.

Returns

`true` on success, `false` otherwise (and sets `errMsg`).

Parameters

in	*filename*	Name of file to open. Reads one JSON value, which must follow the DCFG JSON format.
out	*errMsg*	Contains error message upon failure.

4.2.2.6 virtual void dcfg_api::DCFG_DATA::write (std::ostream & *strm*) const [pure virtual]

Write internal DCFG data to a C++ `ostream`.

Parameters

out	*strm*	Stream to write to. Output will conform to the DCFG JSON format.

4.2.2.7 virtual bool dcfg_api::DCFG_DATA::write (const std::string & *filename,* std::string & *errMsg*) const [pure virtual]

Write internal DCFG data to a file.

Returns

`true` on success, `false` otherwise (and sets `errMsg`).

Parameters

in	*filename*	Name of file to open. Output will conform to the DCFG JSON format.
out	*errMsg*	Contains error message upon failure.

The documentation for this class was generated from the following file:

- dcfg_api.H

4.3 dcfg_api::DCFG_EDGE Class Reference

Interface to information about an edge between basic blocks and/or special nodes.

`#include <dcfg_api.H>`

Public Member Functions

- virtual DCFG_ID get_edge_id () const =0

  Get ID number of edge.
- virtual DCFG_ID get_source_node_id () const =0

  Get node ID of edge source.
- virtual DCFG_ID get_target_node_id () const =0

  Get node ID of edge target.
- virtual UINT64 get_exec_count () const =0

  Get edge count.
- virtual UINT64 get_exec_count_for_thread (UINT32 thread_id) const =0

  Get edge count per thread.
- virtual const std::string * get_edge_type () const =0

  Get edge type.
- virtual bool is_any_branch_type () const =0

  Determine whether this edge is any type of branch.
- virtual bool is_any_call_type () const =0

  Determine whether this edge is any type of call.
- virtual bool is_any_return_type () const =0

  Determine whether this edge is any type of return.
- virtual bool is_any_inter_routine_type () const =0

  Determine whether this edge is any type of call or return or an edge from the start node or to the exit node.
- virtual bool is_any_bypass_type () const =0

  Determine whether this edge is any type of bypass, which is a "fabricated" edge across call/return pairs, etc.
- virtual bool is_branch_edge_type () const =0

  Determine whether this edge is a branch edge type.
- virtual bool is_call_edge_type () const =0

  Determine whether this edge is a call edge type.
- virtual bool is_return_edge_type () const =0

  Determine whether this edge is a return edge type.
- virtual bool is_call_bypass_edge_type () const =0

  Determine whether this edge is a call bypass edge type.
- virtual bool is_conditional_branch_edge_type () const =0

  Determine whether this edge is a conditional branch edge type.
- virtual bool is_context_bypass_edge_type () const =0

  Determine whether this edge is a context bypass edge type.
- virtual bool is_context_edge_type () const =0

  Determine whether this edge is a context edge type.
- virtual bool is_context_return_edge_type () const =0

  Determine whether this edge is a context return edge type.
- virtual bool is_direct_branch_edge_type () const =0

Determine whether this edge is a direct branch edge type.

- virtual bool is_direct_call_edge_type () const =0

  Determine whether this edge is a direct call edge type.
- virtual bool is_direct_conditional_branch_edge_type () const =0

  Determine whether this edge is a direct conditional branch edge type.
- virtual bool is_direct_unconditional_branch_edge_type () const =0

  Determine whether this edge is a direct unconditional branch edge type.
- virtual bool is_entry_edge_type () const =0

  Determine whether this edge is an entry edge type.
- virtual bool is_excluded_bypass_edge_type () const =0

  Determine whether this edge is an excluded bypass edge type.
- virtual bool is_exit_edge_type () const =0

  Determine whether this edge is an exit edge type.
- virtual bool is_fall_thru_edge_type () const =0

  Determine whether this edge is a fall thru edge type.
- virtual bool is_indirect_branch_edge_type () const =0

  Determine whether this edge is an indirect branch edge type.
- virtual bool is_indirect_call_edge_type () const =0

  Determine whether this edge is an indirect call edge type.
- virtual bool is_indirect_conditional_branch_edge_type () const =0

  Determine whether this edge is an indirect conditional branch edge type.
- virtual bool is_indirect_unconditional_branch_edge_type () const =0

  Determine whether this edge is an indirect unconditional branch edge type.
- virtual bool is_rep_edge_type () const =0

  Determine whether this edge is a rep-prefix edge type.
- virtual bool is_sys_call_bypass_edge_type () const =0

  Determine whether this edge is a system call bypass edge type.
- virtual bool is_sys_call_edge_type () const =0

  Determine whether this edge is a system call edge type.
- virtual bool is_sys_return_edge_type () const =0

  Determine whether this edge is a system return edge type.
- virtual bool is_unconditional_branch_edge_type () const =0

  Determine whether this edge is an unconditional branch edge type.
- virtual bool is_unknown_edge_type () const =0

  Determine whether this edge is an unknown edge type.

4.3.1 Detailed Description

Interface to information about an edge between basic blocks and/or special nodes.

4.3.2 Member Function Documentation

4.3.2.1 virtual DCFG_ID dcfg_api::DCFG_EDGE::get_edge_id ( ) const [pure virtual]

Get ID number of edge.

Returns

ID number for this edge, unique within a process.

4.3.2.2 virtual const std::string* dcfg_api::DCFG_EDGE::get_edge_type ( ) const [pure virtual]

Get edge type.

Returns

Pointer to string describing edge type per DCFG format documentation or NULL if type data is internally inconsistent (should not happen).

4.3.2.3 virtual UINT64 dcfg_api::DCFG_EDGE::get_exec_count ( ) const [pure virtual]

Get edge count.

Returns

Number of times edge was taken, summed across all threads.

4.3.2.4 virtual UINT64 dcfg_api::DCFG_EDGE::get_exec_count_for_thread (UINT32 *thread_id*) const [pure virtual]

Get edge count per thread.

Returns

Number of times edge was taken on given thread.

Parameters

in	*thread_id*	Thread number. Typically, threads are consecutively numbered from zero to DCFG_PROCESS::get_highest_thread_id().

4.3.2.5 virtual DCFG_ID dcfg_api::DCFG_EDGE::get_source_node_id ( ) const [pure virtual]

Get node ID of edge source.

This is the node node the edge is "coming from". Most node IDs correspond to basic-blocks, but they could also be for special nodes. In particular, a source node ID could be the "START" node.

Returns

ID of source node.

4.3.2.6 virtual DCFG_ID dcfg_api::DCFG_EDGE::get_target_node_id ( ) const [pure virtual]

Get node ID of edge target.

This is the node node the edge is "going to". Most node IDs correspond to basic-blocks, but they could also be for special nodes. In particular, a source node ID could be the "START" node.

Returns

ID of target node.

4.3.2.7 virtual bool dcfg_api::DCFG_EDGE::is_any_branch_type ( ) const [pure virtual]

Determine whether this edge is *any* type of branch.

Returns

`true` if branch, `false` otherwise.

4.3.2.8 virtual bool dcfg_api::DCFG_EDGE::is_any_bypass_type ( ) const [pure virtual]

Determine whether this edge is *any* type of bypass, which is a "fabricated" edge across call/return pairs, etc.

See the DCFG documentation for more information on bypasses.

Returns

`true` if bypass, `false` otherwise.

4.3.2.9 virtual bool dcfg_api::DCFG_EDGE::is_any_call_type ( ) const [pure virtual]

Determine whether this edge is *any* type of call.

This includes routine calls, system calls, etc.

Returns

`true` if call, `false` otherwise.

4.3.2.10 virtual bool dcfg_api::DCFG_EDGE::is_any_inter_routine_type ( ) const [pure virtual]

Determine whether this edge is *any* type of call or return *or* an edge from the start node or to the exit node.

Returns

`true` if inter-routine, `false` otherwise.

4.3.2.11 virtual bool dcfg_api::DCFG_EDGE::is_any_return_type ( ) const [pure virtual]

Determine whether this edge is *any* type of return.

This includes routine returns, system returns, etc.

Returns

`true` if return, `false` otherwise.

4.3.2.12 virtual bool dcfg_api::DCFG_EDGE::is_branch_edge_type ( ) const [pure virtual]

Determine whether this edge is a branch edge type.

Returns

`true` if branch edge, `false` otherwise.

4.3.2.13 virtual bool dcfg_api::DCFG_EDGE::is_call_bypass_edge_type ( ) const [pure virtual]

Determine whether this edge is a call bypass edge type.

Returns

`true` if call bypass edge, `false` otherwise.

4.3.2.14 virtual bool dcfg_api::DCFG_EDGE::is_call_edge_type ( ) const [pure virtual]

Determine whether this edge is a call edge type.

Returns

`true` if call edge, `false` otherwise.

4.3.2.15 virtual bool dcfg_api::DCFG_EDGE::is_conditional_branch_edge_type ( ) const [pure virtual]

Determine whether this edge is a conditional branch edge type.

Returns

`true` if conditional branch edge, `false` otherwise.

4.3.2.16 virtual bool dcfg_api::DCFG_EDGE::is_context_bypass_edge_type ( ) const [pure virtual]

Determine whether this edge is a context bypass edge type.

Returns

`true` if context bypass edge, `false` otherwise.

4.3.2.17 virtual bool dcfg_api::DCFG_EDGE::is_context_edge_type ( ) const [pure virtual]

Determine whether this edge is a context edge type.

Returns

`true` if context edge, `false` otherwise.

4.3.2.18 virtual bool dcfg_api::DCFG_EDGE::is_context_return_edge_type ( ) const [pure virtual]

Determine whether this edge is a context return edge type.

Returns

`true` if context return edge, `false` otherwise.

4.3.2.19 virtual bool dcfg_api::DCFG_EDGE::is_direct_branch_edge_type ( ) const [pure virtual]

Determine whether this edge is a direct branch edge type.

Returns

`true` if direct branch edge, `false` otherwise.

4.3.2.20 virtual bool dcfg_api::DCFG_EDGE::is_direct_call_edge_type ( ) const [pure virtual]

Determine whether this edge is a direct call edge type.

Returns

`true` if direct call edge, `false` otherwise.

4.3.2.21 virtual bool dcfg_api::DCFG_EDGE::is_direct_conditional_branch_edge_type ( ) const [pure virtual]

Determine whether this edge is a direct conditional branch edge type.

Returns

`true` if direct conditional branch edge, `false` otherwise.

4.3.2.22 virtual bool dcfg_api::DCFG_EDGE::is_direct_unconditional_branch_edge_type ( ) const [pure virtual]

Determine whether this edge is a direct unconditional branch edge type.

Returns

`true` if direct unconditional branch edge, `false` otherwise.

4.3.2.23 virtual bool dcfg_api::DCFG_EDGE::is_entry_edge_type ( ) const [pure virtual]

Determine whether this edge is an entry edge type.

Returns

`true` if entry edge, `false` otherwise.

4.3.2.24 virtual bool dcfg_api::DCFG_EDGE::is_excluded_bypass_edge_type ( ) const [pure virtual]

Determine whether this edge is an excluded bypass edge type.

Returns

`true` if excluded bypass edge, `false` otherwise.

4.3.2.25 virtual bool dcfg_api::DCFG_EDGE::is_exit_edge_type ( ) const [pure virtual]

Determine whether this edge is an exit edge type.

Returns

`true` if exit edge, `false` otherwise.

4.3.2.26 virtual bool dcfg_api::DCFG_EDGE::is_fall_thru_edge_type ( ) const [pure virtual]

Determine whether this edge is a fall thru edge type.

Returns

`true` if fall thru edge, `false` otherwise.

4.3.2.27 virtual bool dcfg_api::DCFG_EDGE::is_indirect_branch_edge_type ( ) const [pure virtual]

Determine whether this edge is an indirect branch edge type.

Returns

`true` if indirect branch edge, `false` otherwise.

4.3.2.28 virtual bool dcfg_api::DCFG_EDGE::is_indirect_call_edge_type ( ) const [pure virtual]

Determine whether this edge is an indirect call edge type.

Returns

`true` if indirect call edge, `false` otherwise.

4.3.2.29 virtual bool dcfg_api::DCFG_EDGE::is_indirect_conditional_branch_edge_type ( ) const [pure virtual]

Determine whether this edge is an indirect conditional branch edge type.

Returns

`true` if indirect conditional branch edge, `false` otherwise.

4.3.2.30 virtual bool dcfg_api::DCFG_EDGE::is_indirect_unconditional_branch_edge_type ( ) const [pure virtual]

Determine whether this edge is an indirect unconditional branch edge type.

Returns

`true` if indirect unconditional branch edge, `false` otherwise.

4.3.2.31 virtual bool dcfg_api::DCFG_EDGE::is_rep_edge_type ( ) const [pure virtual]

Determine whether this edge is a rep-prefix edge type.

Returns

`true` if rep edge, `false` otherwise.

4.3.2.32 virtual bool dcfg_api::DCFG_EDGE::is_return_edge_type ( ) const [pure virtual]

Determine whether this edge is a return edge type.

Returns

`true` if return edge, `false` otherwise.

4.3.2.33 virtual bool dcfg_api::DCFG_EDGE::is_sys_call_bypass_edge_type ( ) const [pure virtual]

Determine whether this edge is a system call bypass edge type.

Returns

`true` if sys call bypass edge, `false` otherwise.

4.3.2.34 virtual bool dcfg_api::DCFG_EDGE::is_sys_call_edge_type ( ) const [pure virtual]

Determine whether this edge is a system call edge type.

Returns

`true` if sys call edge, `false` otherwise.

4.3.2.35 virtual bool dcfg_api::DCFG_EDGE::is_sys_return_edge_type ( ) const [pure virtual]

Determine whether this edge is a system return edge type.

Returns

`true` if sys return edge, `false` otherwise.

4.3.2.36 virtual bool dcfg_api::DCFG_EDGE::is_unconditional_branch_edge_type ( ) const [pure virtual]

Determine whether this edge is an unconditional branch edge type.

Returns

`true` if unconditional branch edge, `false` otherwise.

4.3.2.37 virtual bool dcfg_api::DCFG_EDGE::is_unknown_edge_type ( ) const [pure virtual]

Determine whether this edge is an unknown edge type.

Returns

`true` if unknown edge, `false` otherwise.

The documentation for this class was generated from the following file:

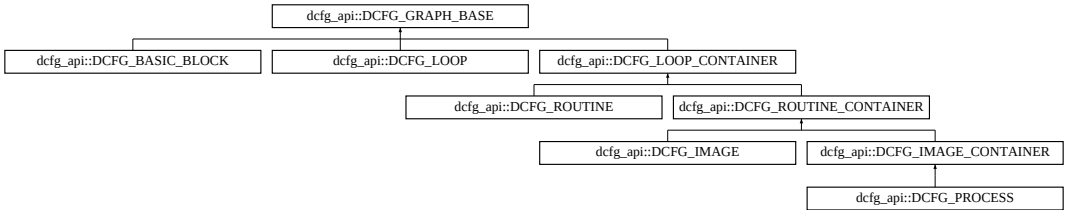
- dcfg_api.H

4.4 dcfg_api::DCFG_GRAPH_BASE Class Reference

Common interface to any structure containing nodes and edges between them, i.e., processes, images, routines, loops and basic blocks.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_GRAPH_BASE:



Public Member Functions

- virtual UINT32 get_basic_block_ids (DCFG_ID_CONTAINER &node_ids) const =0

  Get IDs of all basic blocks in the structure.
- virtual UINT32 get_internal_edge_ids (DCFG_ID_CONTAINER &edge_ids) const =0

  Get list of internal edge IDs.
- virtual UINT32 get_inbound_edge_ids (DCFG_ID_CONTAINER &edge_ids) const =0

  Get list of in-bound edge IDs.
- virtual UINT32 get_outbound_edge_ids (DCFG_ID_CONTAINER &edge_ids) const =0

  Get list of out-bound edge IDs.
- virtual UINT64 get_instr_count () const =0

  Get the total dynamic instruction count.
- virtual UINT64 get_instr_count_for_thread (UINT32 thread_id) const =0

  Get per-thread dynamic instruction count.

4.4.1 Detailed Description

Common interface to any structure containing nodes and edges between them, i.e., processes, images, routines, loops and basic blocks.

A single basic block is a special case consisting of one block and no internal edges. Most nodes correspond to basic blocks of the executed binary, but some nodes are "special". See the DCFG documentation for more information.

4.4.2 Member Function Documentation

4.4.2.1 virtual UINT32 dcfg_api::DCFG_GRAPH_BASE::get_basic_block_ids (DCFG_ID_CONTAINER & *node_ids*) const [pure virtual]

Get IDs of all basic blocks in the structure.

Returns

Number of IDs that were added to `node_ids`.

Parameters

`out`	*node_ids*	Container to which IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.4.2.2 virtual UINT32 dcfg_api::DCFG_GRAPH_BASE::get_inbound_edge_ids (DCFG_ID_CONTAINER & *edge_ids*) const [pure virtual]

Get list of in-bound edge IDs.

These are all edges such that the source node *is not* within the structure and the target node *is* within the structure. Note that this set contains *all* the edges that terminate within the structure, including returns from calls, interrupts, etc., not only those that are considered to "enter" the structure.

Returns

Number of IDs that were added to `edge_ids`.

Parameters

`out`	*edge_ids*	Container to which IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.4.2.3 virtual UINT64 dcfg_api::DCFG_GRAPH_BASE::get_instr_count ( ) const [pure virtual]

Get the total dynamic instruction count.

Returns

Count of instructions executed in this structure across all threads.

4.4.2.4 virtual UINT64 dcfg_api::DCFG_GRAPH_BASE::get_instr_count_for_thread (UINT32 *thread_id*) const [pure virtual]

Get per-thread dynamic instruction count.

Returns

Count of instructions executed in this structure on specified thread or zero (0) if thread is invalid.

Parameters

in	*thread_id*	Thread number. Typically, threads are consecutively numbered from zero to DCFG_PROCESS::get_highest_thread_id().

4.4.2.5 virtual UINT32 dcfg_api::DCFG_GRAPH_BASE::get_internal_edge_ids (DCFG_ID_CONTAINER & *edge_ids*) const [pure virtual]

Get list of internal edge IDs.

These are all edges such that both the source and target nodes are within the structure.

Returns

Number of IDs that were added to `edge_ids`.

Parameters

out	*edge_ids*	Container to which IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.4.2.6 virtual UINT32 dcfg_api::DCFG_GRAPH_BASE::get_outbound_edge_ids (DCFG_ID_CONTAINER & *edge_ids*) const [pure virtual]

Get list of out-bound edge IDs.

These are all edges such that the source node *is* within the structure and the target node *is not* within the structure. Note that this set contains *all* the edges that originate within the structure, including calls, interrupts, etc., not only those that are considered to "exit" the structure.

Returns

Number of IDs that were added to `edge_ids`.

Parameters

out	*edge_ids*	Container to which edge IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

The documentation for this class was generated from the following file:

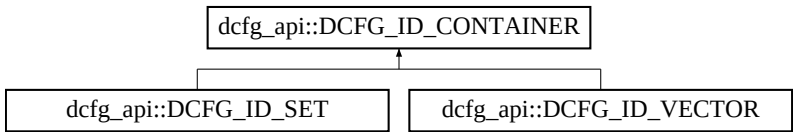
- dcfg_api.H

4.5 dcfg_api::DCFG_ID_CONTAINER Class Reference

Interface for any container of ID numbers.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_ID_CONTAINER:



Public Member Functions

- virtual void add_id (DCFG_ID id)=0

  Add one ID to the container.

4.5.1 Detailed Description

Interface for any container of ID numbers.

The API programmer is free to define and use any class that implements this interface to collect ID numbers (process IDs, basic blocks, etc.) from the relevant DCFG APIs.

4.5.2 Member Function Documentation

4.5.2.1 virtual void dcfg_api::DCFG_ID_CONTAINER::add_id (DCFG_ID *id*) [pure virtual]

Add one ID to the container.

All concrete implementations must define this method.

Parameters

in	*id*	ID to add.

Implemented in dcfg_api::DCFG_ID_SET, and dcfg_api::DCFG_ID_VECTOR.

The documentation for this class was generated from the following file:

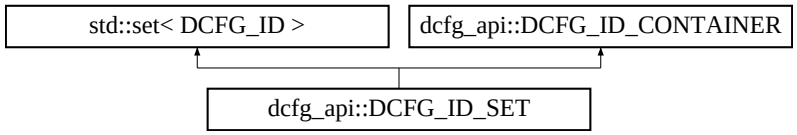
- dcfg_api.H

4.6 dcfg_api::DCFG_ID_SET Class Reference

Set of ID numbers.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_ID_SET:



Public Member Functions

- virtual void add_id (DCFG_ID id)
  Add one ID to the container.

Additional Inherited Members

4.6.1 Detailed Description

Set of ID numbers.

This is an example of a DCFG_ID_CONTAINER implementation based on an STL `set`. This is useful for iterating through the added IDs in numerical order and checking whether a certain ID exists.

4.6.2 Member Function Documentation

4.6.2.1 virtual void dcfg_api::DCFG_ID_SET::add_id (DCFG_ID *id*) [inline], [virtual]

Add one ID to the container.

All concrete implementations must define this method.

Implements dcfg_api::DCFG_ID_CONTAINER.

The documentation for this class was generated from the following file:

- dcfg_api.H

4.7 dcfg_api::DCFG_ID_VECTOR Class Reference

Vector of ID numbers.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_ID_VECTOR:

Public Member Functions

- virtual void add_id (DCFG_ID id)

Add one ID to the container.

Additional Inherited Members

4.7.1 Detailed Description

Vector of ID numbers.

This is an example of a DCFG_ID_CONTAINER implementation based on an STL `vector`. This is useful when it is important to maintain the order in which elements are added.

4.7.2 Member Function Documentation

4.7.2.1 virtual void dcfg_api::DCFG_ID_VECTOR::add_id (DCFG_ID *id*) [inline], [virtual]

Add one ID to the container.

All concrete implementations must define this method.

Implements dcfg_api::DCFG_ID_CONTAINER.

The documentation for this class was generated from the following file:

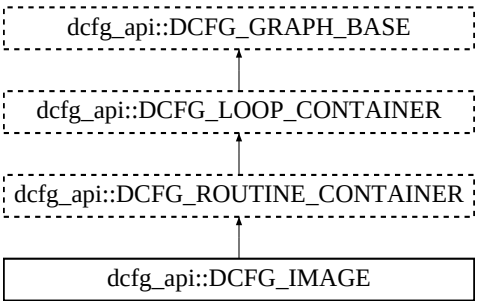
- dcfg_api.H

4.8 dcfg_api::DCFG_IMAGE Class Reference

Interface to information about a binary image within a process.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_IMAGE:



Public Member Functions

- virtual DCFG_ID get_process_id () const =0

  Get the process ID.
- virtual DCFG_ID get_image_id () const =0

  Get the image ID.
- virtual const std::string * get_filename () const =0

Get the filename of the image.

- virtual UINT64 get_base_address () const =0

  Get base address of image.

- virtual UINT64 get_size () const =0

  Get size of image.

- virtual UINT32 get_basic_block_ids_by_addr (UINT64 addr, DCFG_ID_CONTAINER &node_ids) const =0

  Get basic block ID(s) containing given address in this image.

4.8.1 Detailed Description

Interface to information about a binary image within a process.

4.8.2 Member Function Documentation

4.8.2.1 virtual UINT64 dcfg_api::DCFG_IMAGE::get_base_address ( ) const [pure virtual]

Get base address of image.

Returns

Address where image was loaded into memory by O/S.

4.8.2.2 virtual UINT32 dcfg_api::DCFG_IMAGE::get_basic_block_ids_by_addr (UINT64 *addr,* DCFG_ID_CONTAINER & *node_ids*) const [pure virtual]

Get basic block ID(s) containing given address in this image.

It is possible to get zero or more IDs returned: zero if the address appears in no basic blocks, one if it appears in exactly one block in one image, and more than one if it is not unique. Basic blocks may not be unique if an image uses self-modifying code (SMC) or other mechanisms that replace code regions. For most images, this will not be the case, and addresses will be unique for a given image.

Returns

Number of IDs that were added to `node_ids`.

Parameters

in	*addr*	Virtual address that can appear anywhere within a basic block.
out	*node_ids*	Container to which basic-block IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.8.2.3 virtual const std::string* dcfg_api::DCFG_IMAGE::get_filename ( ) const [pure virtual]

Get the filename of the image.

Returns

Pointer to string containing full pathname of image or base name if pathname not available or NULL if no name is available.

4.8.2.4 virtual DCFG_ID dcfg_api::DCFG_IMAGE::get_image_id ( ) const [pure virtual]

Get the image ID.

Returns

ID of this image.

4.8.2.5 virtual DCFG_ID dcfg_api::DCFG_IMAGE::get_process_id ( ) const [pure virtual]

Get the process ID.

Returns

Process ID of this image.

4.8.2.6 virtual UINT64 dcfg_api::DCFG_IMAGE::get_size ( ) const [pure virtual]

Get size of image.

Returns

Size of image as loaded into memory by O/S, in bytes.

The documentation for this class was generated from the following file:

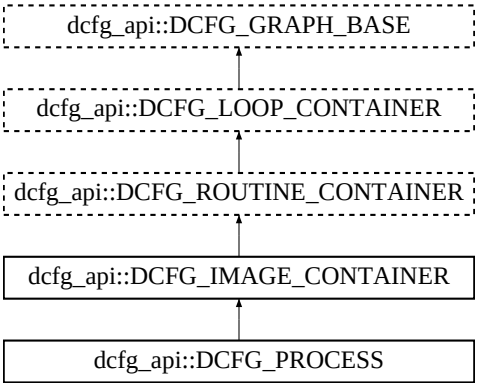
- dcfg_api.H

4.9 dcfg_api::DCFG_IMAGE_CONTAINER Class Reference

Common interface to any structure containing images, i.e., processes.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_IMAGE_CONTAINER:



Public Member Functions

- virtual UINT32 get_image_ids (DCFG_ID_CONTAINER &image_ids) const =0

  Get the set of image IDs.
- virtual DCFG_IMAGE_CPTR get_image_info (DCFG_ID image_id) const =0

  Get access to data for an image.

4.9.1 Detailed Description

Common interface to any structure containing images, i.e., processes.

4.9.2 Member Function Documentation

4.9.2.1 virtual UINT32 dcfg_api::DCFG_IMAGE_CONTAINER::get_image_ids (DCFG_ID_CONTAINER & *image_ids*) const [pure virtual]

Get the set of image IDs.

Get IDs of all images seen, not just the ones that are active at any given time. The address ranges of two or more of the the images may overlap if an image was loaded after another was unloaded.

Returns

Number of IDs that were added to `image_ids`.

Parameters

`out`	*image_ids*	Container to which image IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.9.2.2 virtual DCFG_IMAGE_CPTR dcfg_api::DCFG_IMAGE_CONTAINER::get_image_info (DCFG_ID *image_id*) const [pure virtual]

Get access to data for an image.

Returns

Pointer to interface object for specified image or `NULL` if `image_id` is invalid.

Parameters

`in`	*image_id*	ID of desired image.

The documentation for this class was generated from the following file:

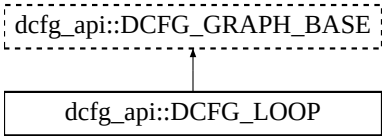
- dcfg_api.H

4.10 dcfg_api::DCFG_LOOP Class Reference

Interface to information about a loop.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_LOOP:



Public Member Functions

- virtual DCFG_ID get_process_id () const =0

  Get the process ID.
- virtual DCFG_ID get_image_id () const =0

  Get the image ID.
- virtual DCFG_ID get_routine_id () const =0

  Get routine ID.
- virtual DCFG_ID get_loop_id () const =0

  Get loop ID, which equals the basic-block ID of the head node.
- virtual UINT32 get_entry_edge_ids (DCFG_ID_CONTAINER &edge_ids) const =0

  Get set of IDs of the entry edges.
- virtual UINT32 get_exit_edge_ids (DCFG_ID_CONTAINER &edge_ids) const =0

  Get set of IDs of the exit edges.
- virtual UINT32 get_back_edge_ids (DCFG_ID_CONTAINER &edge_ids) const =0

  Get set of IDs of the back-edges.
- virtual DCFG_ID get_parent_loop_id () const =0

  Get head node ID of most immediate containing loop, if any.
- virtual UINT64 get_iteration_count () const =0

  Get dynamic iteration count.
- virtual UINT64 get_iteration_count_for_thread (UINT32 thread_id) const =0

  Get dynamic execution count per thread.

4.10.1 Detailed Description

Interface to information about a loop.

4.10.2 Member Function Documentation

4.10.2.1 virtual UINT32 dcfg_api::DCFG_LOOP::get_back_edge_ids (DCFG_ID_CONTAINER & *edge_ids*) const [pure virtual]

Get set of IDs of the back-edges.

These are the edges that are traversed when a loop is repeated following an entry. The target node of each back edge will be the head node of the loop by definition. By definition, an edge n->h is a back edge if h dominates n, where h is the head node.

Returns

Number of IDs that were added to `edge_ids`.

Parameters

`out`	*edge_ids*	Container to which edge IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.10.2.2 virtual UINT32 dcfg_api::DCFG_LOOP::get_entry_edge_ids (DCFG_ID_CONTAINER & *edge_ids*) const [pure virtual]

Get set of IDs of the entry edges.

These are the edges that are traversed when a loop is entered from somewhere outside the loop. This set does *not* include back edges.

Returns

Number of IDs that were added to `edge_ids`.

Parameters

`out`	*edge_ids*	Container to which edge IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.10.2.3 virtual UINT32 dcfg_api::DCFG_LOOP::get_exit_edge_ids (DCFG_ID_CONTAINER & *edge_ids*) const [pure virtual]

Get set of IDs of the exit edges.

These are the edges that are traversed when a loop is exited. This set does *not* include call edges from the loop. If you also want call edges, use DCFG_GRAPH_BASE::get_outbound_edge_ids(). Note that any given edge may exit more than one loop when loops are nested.

Returns

Number of IDs that were added to `edge_ids`.

Parameters

`out`	*edge_ids*	Container to which edge IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.10.2.4 virtual DCFG_ID dcfg_api::DCFG_LOOP::get_image_id ( ) const [pure virtual]

Get the image ID.

Returns

Image ID of this loop.

4.10.2.5 virtual UINT64 dcfg_api::DCFG_LOOP::get_iteration_count ( ) const [pure virtual]

Get dynamic iteration count.

This is the number of times the loop was executed, including entry from outside the loop and via its back edges. By definition, a loop can only be entered at its head node.

Returns

Number of times loop was execcuted, summed across all threads.

4.10.2.6 virtual UINT64 dcfg_api::DCFG_LOOP::get_iteration_count_for_thread (UINT32 *thread_id*) const [pure virtual]

Get dynamic execution count per thread.

See DCFG_LOOP::get_iteration_count() for iteration-count definition.

Returns

Number of times loop was executed in given thread.

Parameters

in	*thread_id*	Thread number. Typically, threads are consecutively numbered from zero to DCFG_PROCESS::get_highest_thread_id().

4.10.2.7 virtual DCFG_ID dcfg_api::DCFG_LOOP::get_loop_id ( ) const [pure virtual]

Get loop ID, which equals the basic-block ID of the head node.

The head node is the common target of all the back edges in the loop.

Returns

ID number of head node.

4.10.2.8 virtual DCFG_ID dcfg_api::DCFG_LOOP::get_parent_loop_id ( ) const [pure virtual]

Get head node ID of most immediate containing loop, if any.

This indicates loop nesting.

Returns

ID number of head node of parent loop or zero (0) if there is no parent loop.

4.10.2.9 virtual DCFG_ID dcfg_api::DCFG_LOOP::get_process_id ( ) const [pure virtual]

Get the process ID.

Returns

Process ID of this loop.

4.10.2.10 virtual DCFG_ID dcfg_api::DCFG_LOOP::get_routine_id ( ) const [pure virtual]

Get routine ID.

Returns

routine ID number of this loop.

The documentation for this class was generated from the following file:

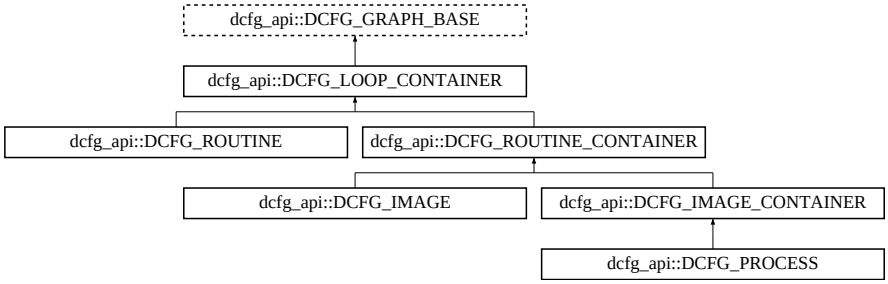
- dcfg_api.H

4.11 dcfg_api::DCFG_LOOP_CONTAINER Class Reference

Common interface to any structure containing loops, i.e., routines, images, and processes.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_LOOP_CONTAINER:



Public Member Functions

- virtual UINT32 get_loop_ids (DCFG_ID_CONTAINER &node_ids) const =0

  Get the set of loop IDs.
- virtual DCFG_LOOP_CPTR get_loop_info (DCFG_ID loop_id) const =0

  Get access to data for a loop.

4.11.1 Detailed Description

Common interface to any structure containing loops, i.e., routines, images, and processes.

Note: even though loops can be nested, a loop is not considered a DCFG_LOOP_CONTAINER. Loop nesting structure can be determined by querying the parent loop id from a DCFG_LOOP object.

4.11.2 Member Function Documentation

4.11.2.1 virtual UINT32 dcfg_api::DCFG_LOOP_CONTAINER::get_loop_ids (DCFG_ID_CONTAINER & *node_ids*) const [pure virtual]

Get the set of loop IDs.

Get IDs of all loops in the structure. A loop ID is the same as the ID of the basic block at its head node.

Returns

Number of IDs that were added to `node_ids`.

Parameters

`out`	*node_ids*	Container to which IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.11.2.2 virtual DCFG_LOOP_CPTR dcfg_api::DCFG_LOOP_CONTAINER::get_loop_info (DCFG_ID *loop_id*) const [pure virtual]

Get access to data for a loop.

Returns

Pointer to interface object for specified loop or `NULL` if `loop_id` is invalid.

Parameters

`in`	*loop_id*	ID of desired loop.

The documentation for this class was generated from the following file:

- dcfg_api.H

4.12 dcfg_pin_api::DCFG_PIN_MANAGER Class Reference

Connection between a Pin tool and a DCFG_DATA object.

`#include <dcfg_pin_api.H>`

Public Member Functions

- virtual bool dcfg_enable_knob () const

  Whether the '-dcfg' knob was used on the command-line.
- virtual void activate ()=0

  Initialize and add Pin instrumentation.
- virtual void activate (void *pinplay_engine)=0

  Initialize and add PinPlay instrumentation.
- virtual dcfg_api::DCFG_DATA_CPTR get_dcfg_data () const =0

  Get access to DCFG data being constructed by the Pin tool.
- virtual void set_cfg_collection (bool enable)=0

  Explicitly set CFG-data collection.

Static Public Member Functions

- static DCFG_PIN_MANAGER * new_manager ()

  Create a new DCFG_PIN_MANAGER.

4.12.1 Detailed Description

Connection between a Pin tool and a DCFG_DATA object.

This is an interface; use DCFG_PIN_MANAGER::new_manager() to create an object that implements the interface.

4.12.2 Member Function Documentation

4.12.2.1 virtual void dcfg_pin_api::DCFG_PIN_MANAGER::activate ( ) [pure virtual]

Initialize and add Pin instrumentation.

Default behavior depends on settings of dcfg knobs.

4.12.2.2 virtual void dcfg_pin_api::DCFG_PIN_MANAGER::activate (void * *pinplay_engine*) [pure virtual]

Initialize and add PinPlay instrumentation.

Default behavior depends on settings of dcfg knobs and whether logger, replayer or both are activated.

Parameters

in	*pinplay_engine*	pointer to existing pinplay engine or `NULL` if none.

4.12.2.3 virtual bool dcfg_pin_api::DCFG_PIN_MANAGER::dcfg_enable_knob ( ) const [virtual]

Whether the '-dcfg' knob was used on the command-line.

Returns

`true` if '-dcfg' knob was used, `false` otherwise.

4.12.2.4 virtual dcfg_api::DCFG_DATA_CPTR dcfg_pin_api::DCFG_PIN_MANAGER::get_dcfg_data ( ) const [pure virtual]

Get access to DCFG data being constructed by the Pin tool.

The returned DCFG will only be valid at the end of a region or program. There will not be a DCFG if an activate() method has not been called.

Returns

Pointer to associated DCFG data or `NULL` if none.

4.12.2.5 static DCFG_PIN_MANAGER* dcfg_pin_api::DCFG_PIN_MANAGER::new_manager ( ) [static]

Create a new DCFG_PIN_MANAGER.

This is a factory method to create a new object that implements the DCFG_PIN_MANAGER interface.

Returns

Pointer to new object. It can be freed with `delete`.

4.12.2.6 virtual void dcfg_pin_api::DCFG_PIN_MANAGER::set_cfg_collection (bool *enable*) [pure virtual]

Explicitly set CFG-data collection.

This controls whether control-flow instructions are instrumented to build a CFG. This is independent of whether a DCFG file is written. If a DCFG file is written with CFG collection disabled, it will have no CFG data in it.

Parameters

in	*enable*	turn CFG collection on or off.

The documentation for this class was generated from the following file:

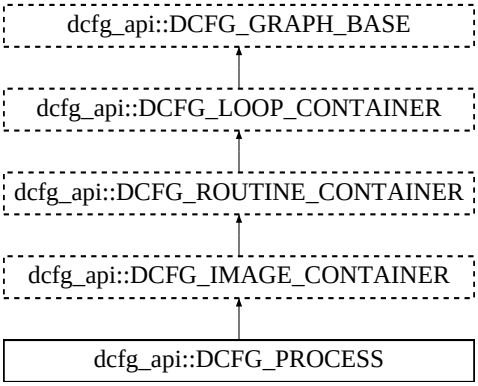
- dcfg_pin_api.H

4.13 dcfg_api::DCFG_PROCESS Class Reference

Interface to information about an O/S process.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_PROCESS:



Public Member Functions

- virtual DCFG_ID get_process_id () const =0

  Get the process ID.
- virtual UINT32 get_highest_thread_id () const =0

  Get the highest thread ID.
- virtual UINT32 get_basic_block_ids_by_addr (UINT64 addr, DCFG_ID_CONTAINER &node_ids) const =0

  Get basic block ID(s) containing given address in this process.
- virtual UINT32 get_start_node_id () const =0

  Get ID of start node.
- virtual UINT32 get_end_node_id () const =0

  Get ID of end node.
- virtual UINT32 get_unknown_node_id () const =0

  Get ID of unknown node.
- virtual DCFG_ID get_edge_id (DCFG_ID source_node_id, DCFG_ID target_node_id) const =0

  Get the ID of an edge given its source and target nodes.
- virtual UINT32 get_successor_node_ids (DCFG_ID source_node_id, DCFG_ID_CONTAINER &node_ids) const =0

  Get the set of target nodes that have an edge from the given source.
- virtual UINT32 get_predecessor_node_ids (DCFG_ID target_node_id, DCFG_ID_CONTAINER &node_ids) const =0

  Get the set of source nodes that have an edge to the given target.
- virtual DCFG_EDGE_CPTR get_edge_info (DCFG_ID edge_id) const =0

  Get access to data for an edge.
- virtual DCFG_BASIC_BLOCK_CPTR get_basic_block_info (DCFG_ID node_id) const =0

  Get access to data for a basic block.
- virtual bool is_special_node (DCFG_ID node_id) const =0

  Determine whether a node ID refers to any "special" (non-basic-block) node.
- virtual bool is_start_node (DCFG_ID node_id) const =0

  Determine whether a node ID refers to the special non-basic-block start node.
- virtual bool is_end_node (DCFG_ID node_id) const =0

  Determine whether a node ID refers to the special non-basic-block end node.
- virtual bool is_unknown_node (DCFG_ID node_id) const =0

  Determine whether a node ID refers to the special non-basic-block "unknown" node.

4.13.1 Detailed Description

Interface to information about an O/S process.

4.13.2 Member Function Documentation

4.13.2.1 virtual UINT32 dcfg_api::DCFG_PROCESS::get_basic_block_ids_by_addr (UINT64 *addr,* DCFG_ID_CONTAINER & *node_ids*) const [pure virtual]

Get basic block ID(s) containing given address in this process.

It is possible to get zero or more IDs returned: zero if the address appears in no basic blocks, one if it appears in exactly one block in one image, and more than one if it is not unique. Basic blocks may not be unique if a dynamically-linked process unloads one image and loads another image in an overlapping address region.

Returns

Number of IDs that were added to `node_ids`.

Parameters

`in`	*addr*	Virtual address that can appear anywhere within a basic block.
`out`	*node_ids*	Container to which basic-block IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.13.2.2 virtual DCFG_BASIC_BLOCK_CPTR dcfg_api::DCFG_PROCESS::get_basic_block_info (DCFG_ID *node_id*) const [pure virtual]

Get access to data for a basic block.

Returns

Pointer to interface object for specified basic block or `NULL` if `node_id` refers to a "special" node or is invalid.

Parameters

`in`	*node_id*	ID of desired basic block.

4.13.2.3 virtual DCFG_ID dcfg_api::DCFG_PROCESS::get_edge_id (DCFG_ID *source_node_id,* DCFG_ID *target_node_id*) const [pure virtual]

Get the ID of an edge given its source and target nodes.

Returns

ID number of edge or zero (0) if there is no edge between the two nodes.

Parameters

in	*source_node_id*	ID number of node the edge is coming from.
in	*target_node_id*	ID number of node the edge is going to.

4.13.2.4 virtual DCFG_EDGE_CPTR dcfg_api::DCFG_PROCESS::get_edge_info (DCFG_ID *edge_id*) const [pure virtual]

Get access to data for an edge.

Returns

Pointer to interface object for specified edge or `NULL` if `edge_id` is invalid.

Parameters

in	*edge_id*	ID of desired edge.

4.13.2.5 virtual UINT32 dcfg_api::DCFG_PROCESS::get_end_node_id ( ) const [pure virtual]

Get ID of end node.

This is a "special" node that is not a basic block. It is the target node of the edge from the last basic block executed in each thread.

Returns

ID number of end node.

4.13.2.6 virtual UINT32 dcfg_api::DCFG_PROCESS::get_highest_thread_id ( ) const [pure virtual]

Get the highest thread ID.

The lowest thread ID is zero (0). Typically, threads are consecutively numbered from zero to DCFG_PROCESS::get_highest_thread_id().

Returns

Highest thread ID recorded when the DCFG was created.

4.13.2.7 virtual UINT32 dcfg_api::DCFG_PROCESS::get_predecessor_node_ids (DCFG_ID *target_node_id*, DCFG_ID_CONTAINER & *node_ids*) const [pure virtual]

Get the set of source nodes that have an edge to the given target.

Predecessor node sets are used in various graph algorithms.

Returns

Number of IDs that were added to `node_ids`.

Parameters

in	*target_node_id*	ID number of target node.
out	*node_ids*	Container to which source node IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.13.2.8 virtual DCFG_ID dcfg_api::DCFG_PROCESS::get_process_id ( ) const [pure virtual]

Get the process ID.

Returns

Process ID captured when the DCFG was created.

4.13.2.9 virtual UINT32 dcfg_api::DCFG_PROCESS::get_start_node_id ( ) const [pure virtual]

Get ID of start node.

This is a "special" node that is not a basic block. It is the source node of the edge to the first basic block executed in each thread.

Returns

ID number of start node.

4.13.2.10 virtual UINT32 dcfg_api::DCFG_PROCESS::get_successor_node_ids (DCFG_ID *source_node_id*, DCFG_ID_CONTAINER & *node_ids*) const [pure virtual]

Get the set of target nodes that have an edge from the given source.

Successor node sets are used in various graph algorithms.

Returns

Number of IDs that were added to `node_ids`.

Parameters

in	*source_node_id*	ID number of source node.
out	*node_ids*	Container to which target node IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.13.2.11 virtual UINT32 dcfg_api::DCFG_PROCESS::get_unknown_node_id ( ) const [pure virtual]

Get ID of unknown node.

This is a "special" node that is not a basic block. It is a placeholder for any section of executable code for which

basic-block data cannot be obtained. An unknown node should not appear in a well-formed graph.

Returns

ID number of the unknown node.

4.13.2.12 virtual bool dcfg_api::DCFG_PROCESS::is_end_node (DCFG_ID *node_id*) const [pure virtual]

Determine whether a node ID refers to the special non-basic-block end node.

Returns

`true` if end node, `false` otherwise.

Parameters

in	*node_id*	ID of node in question.

4.13.2.13 virtual bool dcfg_api::DCFG_PROCESS::is_special_node (DCFG_ID *node_id*) const [pure virtual]

Determine whether a node ID refers to any "special" (non-basic-block) node.

This could be a start, end, or unknown node. If this returns `false` it does not necessarily mean that the node is a basic-block; it could be that the ID is invalid.

Returns

`true` if node is special, `false` otherwise.

Parameters

in	*node_id*	ID of node in question.

4.13.2.14 virtual bool dcfg_api::DCFG_PROCESS::is_start_node (DCFG_ID *node_id*) const [pure virtual]

Determine whether a node ID refers to the special non-basic-block start node.

Returns

`true` if start node, `false` otherwise.

Parameters

in	*node_id*	ID of node in question.

4.13.2.15 virtual bool dcfg_api::DCFG_PROCESS::is_unknown_node (DCFG_ID *node_id*) const [pure virtual]

Determine whether a node ID refers to the special non-basic-block "unknown" node.

A well-formed DCFG should not have any unknown nodes.

Returns

`true` if unknown node, `false` otherwise.

Parameters

`in`	*node_id*	ID of node in question.

The documentation for this class was generated from the following file:

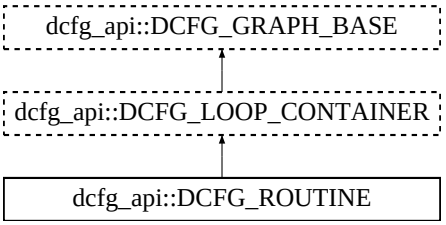
- dcfg_api.H

4.14 dcfg_api::DCFG_ROUTINE Class Reference

Interface to information about a routine in an image.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_ROUTINE:



Public Member Functions

- virtual DCFG_ID get_process_id () const =0

  Get the process ID.
- virtual DCFG_ID get_image_id () const =0

  Get the image ID.
- virtual DCFG_ID get_routine_id () const =0

  Get routine ID, which equals the basic-block ID of the entry node.
- virtual const std::string * get_symbol_name () const =0

  Get symbol name of this routine.
- virtual UINT32 get_entry_edge_ids (DCFG_ID_CONTAINER &edge_ids) const =0

  Get set of entry edge IDs.
- virtual UINT32 get_exit_edge_ids (DCFG_ID_CONTAINER &edge_ids) const =0

  Get set of exit edge IDs.
- virtual DCFG_ID get_idom_node_id (DCFG_ID node_id) const =0

  Get immediate dominator.
- virtual UINT64 get_entry_count () const =0

  Get dynamic entry count.
- virtual UINT64 get_entry_count_for_thread (UINT32 thread_id) const =0

  Get dynamic entry count per thread.

4.14.1 Detailed Description

Interface to information about a routine in an image.

A routine is also known as a subroutine, function, or procedure.

4.14.2 Member Function Documentation

4.14.2.1 virtual UINT64 dcfg_api::DCFG_ROUTINE::get_entry_count ( ) const [pure virtual]

Get dynamic entry count.

This is the number of times the routine was called or otherwise entered. By the DCFG definition, a routine can only be entered at its entry node. A call within a routine to its entry node is considered an entry (via recursion). If there is a branch within a routine to its entry node, it will also be considered an entry (this is unusual).

Returns

Number of times routine was entered, summed across all threads.

4.14.2.2 virtual UINT64 dcfg_api::DCFG_ROUTINE::get_entry_count_for_thread (UINT32 *thread_id*) const [pure virtual]

Get dynamic entry count per thread.

See DCFG_ROUTINE::get_entry_count() for entry-count definition.

Returns

Number of times routine was entered in given thread.

Parameters

in	*thread_id*	Thread number. Typically, threads are consecutively numbered from zero to DCFG_PROCESS::get_highest_thread_id().

4.14.2.3 virtual UINT32 dcfg_api::DCFG_ROUTINE::get_entry_edge_ids (DCFG_ID_CONTAINER & *edge_ids*) const [pure virtual]

Get set of entry edge IDs.

For routines, these are typically from "call" statements, but they can also include branches to routines for unstructured code. The source of an entry edge will be from another routine except in the case of direct recursion (call from routine to itself). The target of an entry edge will always be the entry node. This set does *not* include incoming return edges. If you also want return edges, use DCFG_GRAPH_BASE::get_inbound_edge_ids().

Returns

Number of IDs that were added to `edge_ids`.

Parameters

out	*edge_ids*	Container to which exit edge IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.14.2.4 virtual UINT32 dcfg_api::DCFG_ROUTINE::get_exit_edge_ids (DCFG_ID_CONTAINER & *edge_ids*) const [pure virtual]

Get set of exit edge IDs.

For routines, these are typically from "return" statements, but they can also include branches out of routines for unstructured code. The target of an exit edge will be to another routine except for direct recursion. This set does *not* include outgoing call edges. If you also want call edges, use DCFG_GRAPH_BASE::get_outbound_edge_ids().

Returns

Number of IDs that were added to edge_ids.

Parameters

out	*edge_ids*	Container to which exit edge IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.14.2.5 virtual DCFG_ID dcfg_api::DCFG_ROUTINE::get_idom_node_id (DCFG_ID *node_id*) const [pure virtual]

Get immediate dominator.

The immediate dominator (idom) is the last node before the given node that must be executed before the given node is executed. The idom of the entry node is itself. The idom must be within the routine, i.e., it does not consider edges between routines. Idoms relationships are used in many graph algorithms.

Returns

ID number of idom of node_id or zero (0) if node_id is not in this routine.

Parameters

in	*node_id*	ID number of *dominated* node.

4.14.2.6 virtual DCFG_ID dcfg_api::DCFG_ROUTINE::get_image_id ( ) const [pure virtual]

Get the image ID.

Returns

Image ID of this routine.

4.14.2.7 virtual DCFG_ID dcfg_api::DCFG_ROUTINE::get_process_id ( ) const [pure virtual]

Get the process ID.

Returns

Process ID of this routine.

4.14.2.8 virtual DCFG_ID dcfg_api::DCFG_ROUTINE::get_routine_id ( ) const [pure virtual]

Get routine ID, which equals the basic-block ID of the entry node.

By the DCFG definition, a routine can only have one entry node. If there is a call into the "middle" of a routine, that entry point defines a separate routine in a DCFG.

Returns

ID number of entry node.

4.14.2.9 virtual const std::string* dcfg_api::DCFG_ROUTINE::get_symbol_name ( ) const [pure virtual]

Get symbol name of this routine.

For more comprehensive symbol and source-code data, use DCFG_BASIC_BLOCK::get_symbol_name(), DCFG_BASIC_BLOCK::get_source_filename(), and DCFG_BASIC_BLOCK::get_source_line_number() for one or more basic blocks in this routine.

Returns

Pointer to name of the symbol at the entry node of the routine if it exists, `NULL` otherwise.

The documentation for this class was generated from the following file:

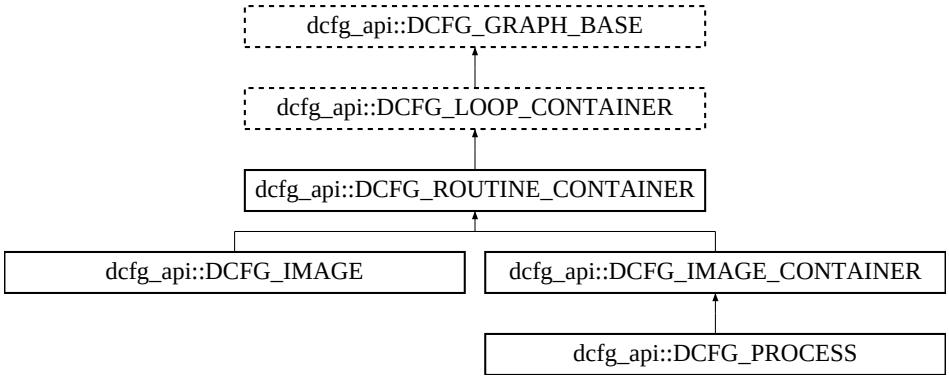
- dcfg_api.H

4.15 dcfg_api::DCFG_ROUTINE_CONTAINER Class Reference

Common interface to any structure containing routines, i.e., images and processes.

`#include <dcfg_api.H>`

Inheritance diagram for dcfg_api::DCFG_ROUTINE_CONTAINER:



Public Member Functions

- virtual UINT32 get_routine_ids (DCFG_ID_CONTAINER &node_ids) const =0

  Get the set of routine IDs.
- virtual DCFG_ROUTINE_CPTR get_routine_info (DCFG_ID routine_id) const =0

  Get access to data for a routine.

4.15.1 Detailed Description

Common interface to any structure containing routines, i.e., images and processes.

4.15.2 Member Function Documentation

4.15.2.1 virtual UINT32 dcfg_api::DCFG_ROUTINE_CONTAINER::get_routine_ids (DCFG_ID_CONTAINER & *node_ids*) const [pure virtual]

Get the set of routine IDs.

Get IDs of all routines in the structure. A routine ID is the same as the ID of the basic block at its entry node.

Returns

Number of IDs that were added to `node_ids`.

Parameters

`out`	*node_ids*	Container to which IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER: DCFG_ID_VECTOR, DCFG_ID_SET, etc.

4.15.2.2 virtual DCFG_ROUTINE_CPTR dcfg_api::DCFG_ROUTINE_CONTAINER::get_routine_info (DCFG_ID *routine_id*) const [pure virtual]

Get access to data for a routine.

Returns

Pointer to interface object for specified routine or `NULL` if `routine_id` is invalid.

Parameters

`in`	*routine_id*	ID of desired routine.

The documentation for this class was generated from the following file:

- dcfg_api.H

4.16 dcfg_trace_api::DCFG_TRACE_READER Class Reference

Interface to all data in a DCFG edge trace.

`#include <dcfg_trace_api.H>`

Public Member Functions

- virtual bool open (const std::string filename, UINT32 tid, std::string &errMsg)=0

  Open a file for reading from the given thread.
- virtual bool get_edge_ids (dcfg_api::DCFG_ID_CONTAINER &edge_ids, bool &done, std::string &errMsg)=0

  Read a chunk of edge IDs.

Static Public Member Functions

- static DCFG_TRACE_READER * new_reader (dcfg_api::DCFG_ID process_id)

  Create a new DCFG edge-trace reader.

4.16.1 Detailed Description

Interface to all data in a DCFG edge trace.

This is an interface; use DCFG_TRACE::new_trace() to create an object that implements the interface.

4.16.2 Member Function Documentation

4.16.2.1 virtual bool dcfg_trace_api::DCFG_TRACE_READER::get_edge_ids (dcfg_api::DCFG_ID_CONTAINER & *edge_ids,* bool & *done,* std::string & *errMsg*) [pure virtual]

Read a chunk of edge IDs.

They will be added to `edge_ids` in the order in which they were recorded. This method will not typically read all the values at once. Call it repeatedly until `done` is set to `true`.

Returns

`true` on success, `false` otherwise (and sets `errMsg`).

Parameters

out	*edge_ids*	Container to which edge IDs are added. Previous contents of the container are *not* emptied by this call, so it should be emptied by the programmer before the call if desired. The programmer can use any implementation of DCFG_ID_CONTAINER that maintains insertion order: DCFG_ID_VECTOR, etc.
out	*done*	Set to `true` when end of sequence has been reached, `false` if there are more to read.
out	*errMsg*	Contains error message upon failure.

4.16.2.2 static DCFG_TRACE_READER* dcfg_trace_api::DCFG_TRACE_READER::new_reader (dcfg_api::DCFG_ID *process_id*) [static]

Create a new DCFG edge-trace reader.

This is a factory method to create a new object that implements the DCFG_TRACE_READER interface. A reader can access only one process. Create multiple readers to read multiple processes.

Returns

Pointer to new object. It can be freed with `delete`.

Parameters

in	*process_id*	ID of process to read. This can be determined from the DCFG data object corresponding to the trace.

4.16.2.3 virtual bool dcfg_trace_api::DCFG_TRACE_READER::open (const std::string *filename,* UINT32 *tid,* std::string & *errMsg*) [pure virtual]

Open a file for reading from the given thread.

Returns

`true` on success, `false` otherwise (and sets `errMsg`).

Parameters

in	*filename*	Name of file to open, which must follow the DCFG-Trace JSON format.
in	*tid*	ID number of thread to read.
out	*errMsg*	Contains error message upon failure.

The documentation for this class was generated from the following file:

- dcfg_trace_api.H

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