

Collective Calling Requirements in Parallel HDF5 Applications

Introduction

This document addresses two topics of concern in a parallel computing environment:

- HDF5 functions that must be called collectively and when
- Properties that must be used in a coordinated manner

The term *Macro* in the “Additional notes” column indicates that the first item in the “Function” column of the same row is a macro that is selectively mapped to one of the two immediately-following functions. For example, `H5Acreate` is a macro that can be mapped to either `H5Acreate1` or `H5Acreate2`. This mapping is configurable and is explained in [API Compatibility Macros in HDF5](#). The macro structure was introduced at HDF5 Release 1.8.0.

Always collective

The following functions must always be called collectively.

API	Function	All processes: same datatype & dataspace	All processes: same access properties	All processes: same creation properties	Available in releases since	Additional notes
H5A	H5Acreate H5Acreate1 H5Acreate2				1.8.x	Macro The function <code>H5Acreate</code> was renamed to <code>H5Acreate1</code> at Release 1.8.0.
	H5Acreate_by_name				1.8.x	
	H5Adelete					
	H5Adelete_by_idx				1.8.x	
	H5Adelete_by_name				1.8.x	
	H5Arename				1.6.x	
	H5Arename_by_name				1.8.x	
	H5Awrite					Because raw data for an attribute is cached locally, all processes must participate in order to guarantee that future <code>H5Aread</code> calls return correct results on all processes.
H5D	H5Dcreate H5Dcreate1 H5Dcreate2				1.8.x	Macro The function <code>H5Dcreate</code> was renamed to <code>H5Dcreate1</code> at Release 1.8.0.
	H5Dcreate_anon				1.8.x	
	H5Dextend					All processes must participate only if the number of chunks in the dataset actually changes. All processes must use the same dataspace dimensions.
	H5Dset_extent				1.6.x	All processes must participate only if the number of chunks in the dataset actually changes. All processes must use the same dataspace dimensions.
H5F	H5Fclose					All processes must participate only if this is the last reference to the file identifier.
	H5Fcreate					

	H5Fflush					
	H5Fmount					
	H5Fopen					
	H5Freopen					
	H5Funmount					
H5G	H5Gcreate H5Gcreate1 H5Gcreate2				1.8.x	Macro The function H5Gcreate was renamed to H5Gcreate1 at Release 1.8.0.
	H5Gcreate_anon				1.8.x	
	H5Glink					
	H5Glink2				1.6.x	
	H5Gmove					
	H5Gmove2				1.6.x	
	H5Gset_comment					
	H5Gunlink					
H5I	H5Idec_ref				1.6.x	This function may be called independently if the object identifier does not refer to an object that was collectively opened.
	H5LIinc_ref				1.6.x	This function may be called independently if the object identifier does not refer to an object that was collectively opened.
H5L	H5Lcopy				1.8.x	
	H5Lcreate_external				1.8.x	
	H5Lcreate_hard				1.8.x	
	H5Lcreate_soft				1.8.x	
	H5Lcreate_ud				1.8.x	
	H5Ldelete				1.8.x	
	H5Ldelete_by_idx				1.8.x	
	H5Lmove				1.8.x	
H5O	H5Ocopy				1.8.x	
	H5Odecr_refcount				1.8.x	
	H5Oincr_refcount				1.8.x	
	H5Olink				1.8.x	
	H5Oset_comment				1.8.x	
	H5Oset_comment_by_name				1.8.x	
H5R	H5Rcreate					
H5T	H5Tcommit H5Tcommit1 H5Tcommit2				1.8.x	Macro The function H5Tcommit was renamed to H5Tcommit1 at Release 1.8.0.
	H5Tcommit_anon				1.8.x	

Collective, unless target object will not be modified

The following functions must normally be called collectively. If, however, the target object will not be modified, they may be called independently.

API	Function	All processes: same datatype & dataspace	All processes: same access properties	All processes: same creation properties	Available in releases since	Additional notes
H5A	H5Aclose					All processes must participate only if all file identifiers for a file have been closed and this is the last outstanding object identifier.
	H5Aopen				1.8.x	
	H5Aopen_by_idx				1.8.x	
	H5Aopen_by_name				1.8.x	
	H5Aopen_idx					
	H5Aopen_name					
H5D	H5Dclose					All processes must participate only if all file identifiers for a file have been closed and this is the last outstanding object identifier.
	H5Dopen H5Dopen1 H5Dopen2				1.8.x	Macro The function H5Dopen was renamed to H5Dopen1 at Release 1.8.0.
H5G	H5Gclose					All processes must participate only if all file identifiers for a file have been closed and this is the last outstanding object identifier.
	H5Gopen H5Gopen1 H5Gopen2				1.8.x	Macro The function H5Gopen was renamed to H5Gopen1 at Release 1.8.0.
H5I	H5Iget_file_id				1.8.x	
H5O	H5Oclose				1.8.x	All processes must participate only if all file identifiers for a file have been closed and this is the last outstanding object identifier.
	H5Oopen				1.8.x	
	H5Oopen_by_addr				1.8.x	
	H5Oopen_by_idx				1.8.x	
H5R	H5Rdereference					
H5T	H5Tclose					All processes must participate only if the datatype is for a committed datatype, all the file identifiers for the file have been closed, and this is the last outstanding object identifier.
	H5Topen H5Topen1 H5Topen2				1.8.x	Macro The function H5Topen was renamed to H5Topen1 at Release 1.8.0.

Properties

The following properties must be set to the same values for an object or link in all cases where the object or link is accessed in a parallel program.

Function	Available in releases since
<u>Dataset creation properties</u>	
H5Pmodify_filter	1.8.x
H5Premove_filter	1.8.x
H5Pset_alloc_time	
H5Pset_chunk	
H5Pset_external	
H5Pset_fill_time	
H5Pset_fill_value	
H5Pset_filter	
H5Pset_fletcher32	1.8.x
H5Pset_layout	
H5Pset_nbit	1.8.x
H5Pset_shuffle	
H5Pset_szip	
<u>Dataset transfer properties</u>	
H5Pset_btree_ratios	
H5Pset_buffer	
H5Pset_dxpl_mpio	
H5Pset_hyper_cache	
H5Pset_preserve	
<u>File access properties</u>	
H5Pset_alignment	
H5Pset_cache	
H5Pset_fapl_mpio	
H5Pset_fclose_degree	
H5Pset_gc_references	
H5Pset_latest_format	1.8.x
H5Pset_libver_bounds	1.8.x
H5Pset_mdc_config	
H5Pset_meta_block_size	
H5Pset_small_data_block_size	
H5Pset_sieve_buf_size	

Function	Available in releases since
<u>File creation properties</u>	
H5Pset_istore_k	
H5Pset_shared_mesg_index	1.8.x
H5Pset_shared_mesg_nindexes	1.8.x
H5Pset_shared_mesg_phase_change	1.8.x
H5Pset_sizes	
H5Pset_sym_k	
H5Pset_userblock	
<u>Group creation properties</u>	
H5Pset_ext_link_info	1.8.x
H5Pset_link_creation_order	1.8.x
H5Pset_link_phase_change	1.8.x
H5Pset_local_heap_size_hint	1.8.x
<u>Link creation properties</u>	
H5Pset_char_encoding	1.8.x
H5Pset_create_intermediate_group	1.8.x
<u>Object creation properties</u>	
H5Pset_attr_phase_change	1.8.x
H5Pset_attr_creation_order	1.8.x
H5Pset_obj_track_times	1.8.x
<u>Object copy properties</u>	
H5Pset_copy_object	1.8.x

