



▶ Multi Threading

▶ Introduction

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A *thread* is a strand of execution in the APL workspace. Prior to version 8.2, Dyalog supported only a single thread. Version 8.2 introduced multiple threads running in parallel.

A thread is created by calling a function *asynchronously*, using the new primitive operator 'spawn': `&`.

With a traditional APL *synchronous* function call, execution of the calling environment is paused, *pendent* on the return of the called function. With an *asynchronous* call, both calling environment and called function proceed to execute concurrently.

An asynchronous function call is said to start a new *thread* of execution. Each thread has a unique *thread number*, with which, for example, its presence can be monitored or its execution terminated.

Any thread can spawn any number of sub-threads, subject only to workspace availability. This implies a hierarchy in which a thread is said to be a *child thread* of its *parent thread*. The *base thread* at the root of this hierarchy has thread number 0.

With multi-threading, APL's stack or state indicator can be viewed as a branching tree in which the path from the base to each leaf is a thread.

When a parent thread terminates, any of its children which are still running, become the children of (are 'adopted' by) the parent's parent.

Thread numbers are allocated sequentially from 0 to 2147483647. At this point, the sequence 'wraps around' and numbers are allocated from 0 again avoiding any still in use. The sequence is reinitialised when the active workspace is cleared or a new workspace loaded. A workspace may not be saved with threads other than the base thread: 0, running.

Threads introduce new language elements:

- A primitive operator: *spawn*: `&`.
- System functions:
`⊠TID`, `⊠TNUMS`, `⊠TCNUMS`, `⊠TKILL`, `⊠TSYNC`.
- An extension to the GUI Event syntax to allow asynchronous call-backs.
- A control structure: `:Hold`.

System commands: `)HOLDS`, `)TID`.

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