

. Endava .Net Core Training

Processes, Threads and
Asynchronous Programming



Agenda

Processes, Threads and
Asynchronous Programming



- Processes, Threads and Asynchronous Programming
- Background Worker Class
- Multi-threading Considerations. Synchronization
- Concurrent collections.
- Parallel Loops
- Task library
- Async/Await
- Timer

Content

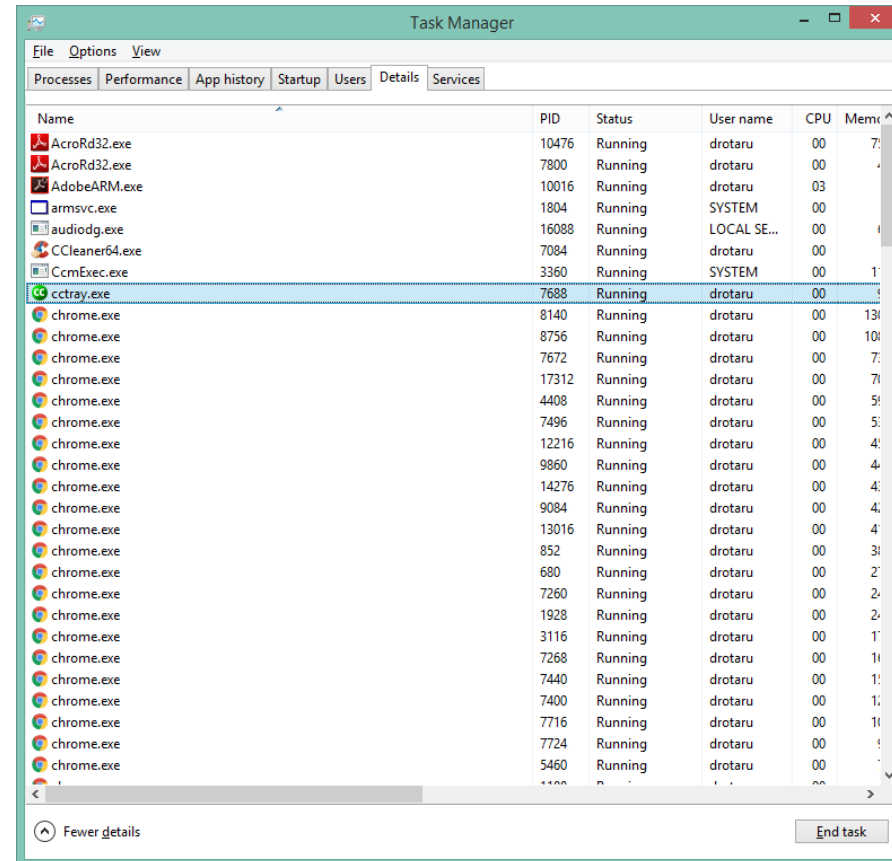
1. Processes, Threads and Asynchronous Programming

1. What are Processes ?
2. What is a thread?
3. Thread class. Creating and executing a thread.
4. BackgroundWorker Class
5. Multi-threading and synchronization
6. Locking. Thread safe.
7. Concurrent collections.

Processes

What is a process

- A process is the set of resources that comprise a running program
- A process contains only a single thread, which executes from the beginning of the program to the end



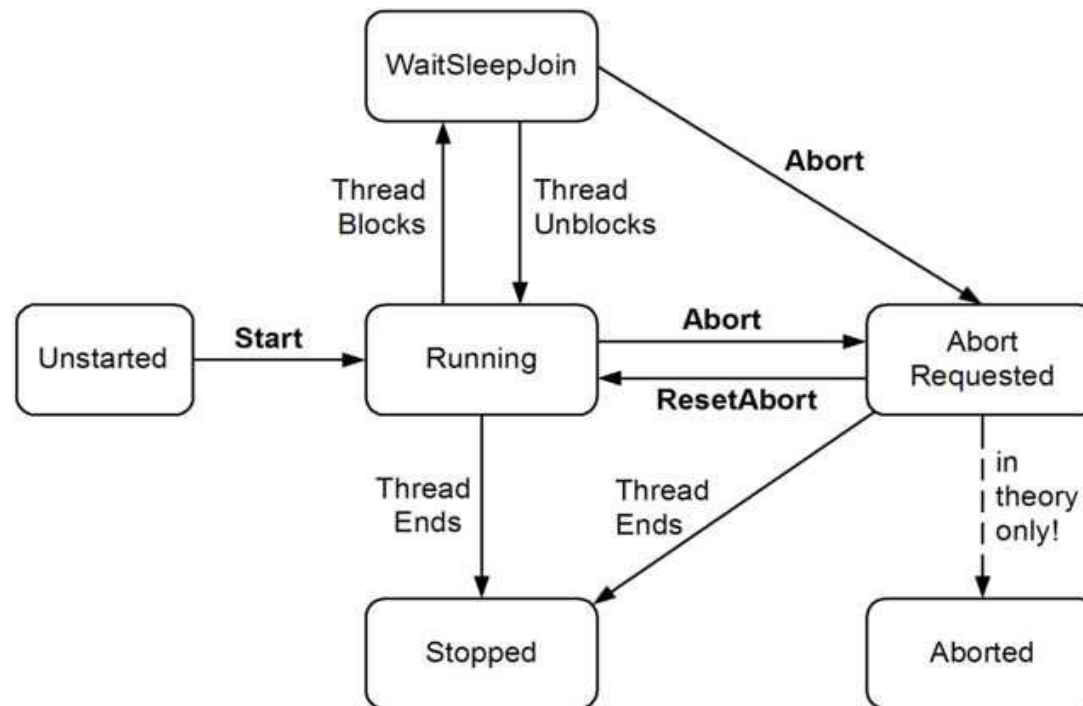
The screenshot shows the Windows Task Manager window with the 'Processes' tab selected. The table lists various running processes, including system services and user applications. The 'cctray.exe' process is highlighted.

Name	PID	Status	User name	CPU	Mem
AcroRd32.exe	10476	Running	drotaru	00	7%
AcroRd32.exe	7800	Running	drotaru	00	4%
AdobeARM.exe	10016	Running	drotaru	03	1%
armsvc.exe	1804	Running	SYSTEM	00	0%
audiodg.exe	16088	Running	LOCAL SE...	00	0%
CCleaner64.exe	7084	Running	drotaru	00	0%
CcmExec.exe	3360	Running	SYSTEM	00	1%
cctray.exe	7688	Running	drotaru	00	1%
chrome.exe	8140	Running	drotaru	00	13%
chrome.exe	8756	Running	drotaru	00	10%
chrome.exe	7672	Running	drotaru	00	7%
chrome.exe	17312	Running	drotaru	00	7%
chrome.exe	4408	Running	drotaru	00	5%
chrome.exe	7496	Running	drotaru	00	5%
chrome.exe	12216	Running	drotaru	00	4%
chrome.exe	9860	Running	drotaru	00	4%
chrome.exe	14276	Running	drotaru	00	4%
chrome.exe	9084	Running	drotaru	00	4%
chrome.exe	13016	Running	drotaru	00	4%
chrome.exe	852	Running	drotaru	00	3%
chrome.exe	680	Running	drotaru	00	2%
chrome.exe	7260	Running	drotaru	00	2%
chrome.exe	1928	Running	drotaru	00	2%
chrome.exe	3116	Running	drotaru	00	1%
chrome.exe	7268	Running	drotaru	00	1%
chrome.exe	7440	Running	drotaru	00	1%
chrome.exe	7400	Running	drotaru	00	1%
chrome.exe	7716	Running	drotaru	00	1%
chrome.exe	7724	Running	drotaru	00	1%
chrome.exe	5460	Running	drotaru	00	1%

Threads

What is a thread

- A thread is defined as the execution path of a program
- More than one thread can execute code inside the same process.
- More threads do not mean more performance (more resource consumed, context switching, complexity)



Threads

With threads you can:

- Maintain responsiveness
- Perform operations that consume a large amount of time without stopping the rest of the application
- Distinguish tasks of varying priority
- Parallel programming
- Allowing requests to be processed simultaneously (ASP.NET, WCF, Web Services)

Thread pool

Demo creating and starting threads.

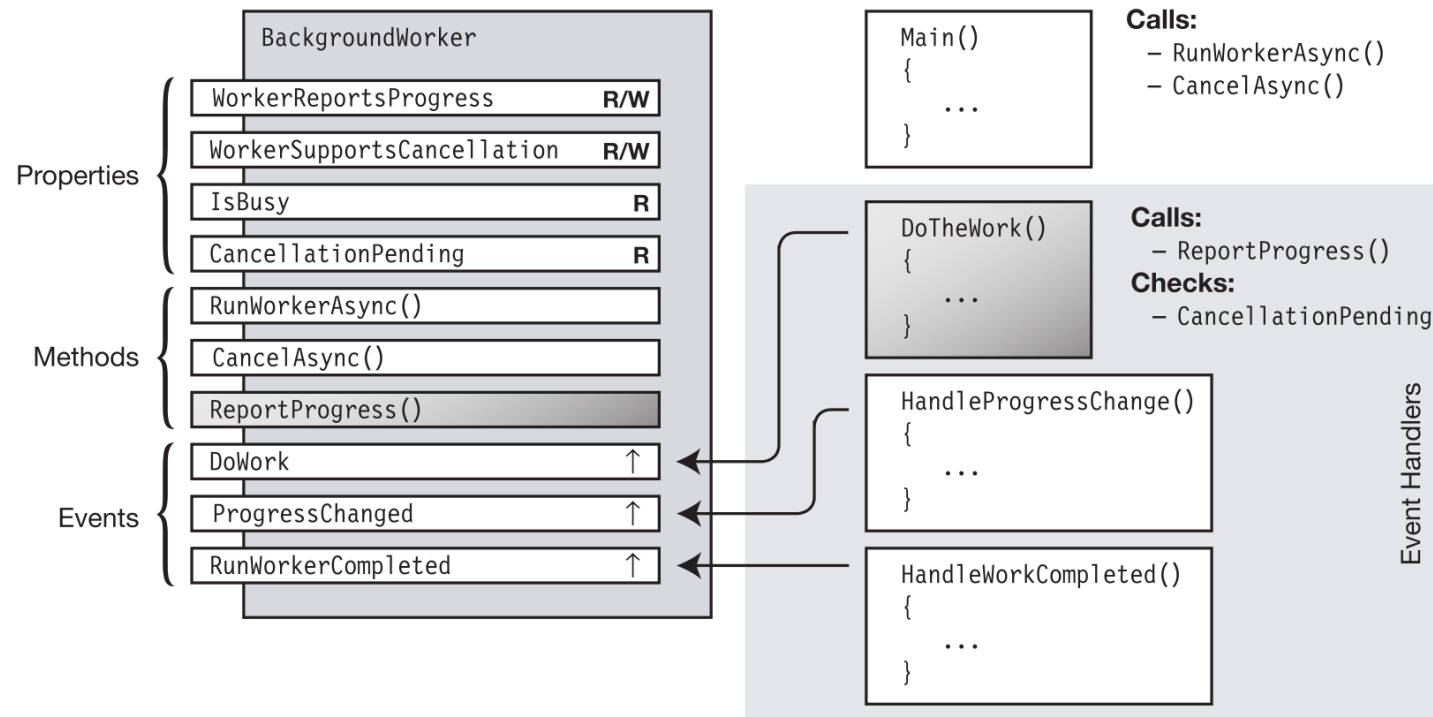
Threads

Thread class implements various methods & properties that allows to manipulate concurrently running threads

- **CurrentThread**
- **IsAlive**
- **IsBackground**
- **Name**
- **Priority**
- **ThreadState**
- **Suspend**
- **Resume**
- **Abort**

BackgroundWorker class

- **BackgroundWorker class makes it simple to perform a task in the background on a separate thread**
- **Designed primarily for GUI programming (Windows Forms and WPF)**



Multithreading. Synchronization.



Multithreading considerations

- Multithreading can increase complexity - interaction between threads
- Threading also incurs a resource and CPU cost in scheduling and switching threads
- It can even slow down performance if used excessively or inappropriately

Demo

Multithreading. Synchronization.



Synchronization

- Lock / Monitor
- `System.Threading.Interlocked`
- Mutex – cross process
- Semaphore

Demo

Concurrent collections



- `ConcurrentStack<T>`
- `ConcurrentQueue<T>`
- `ConcurrentBag<T>`
- `BlockingCollection<T>`
- `ConcurrentDictionary<TKey,TValue>`






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