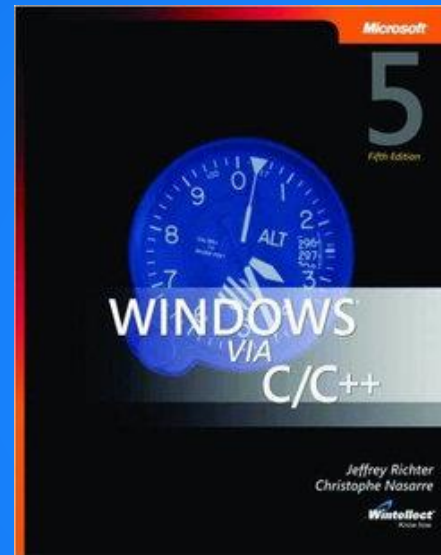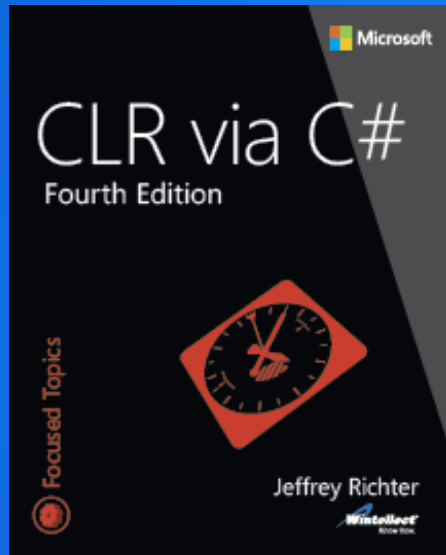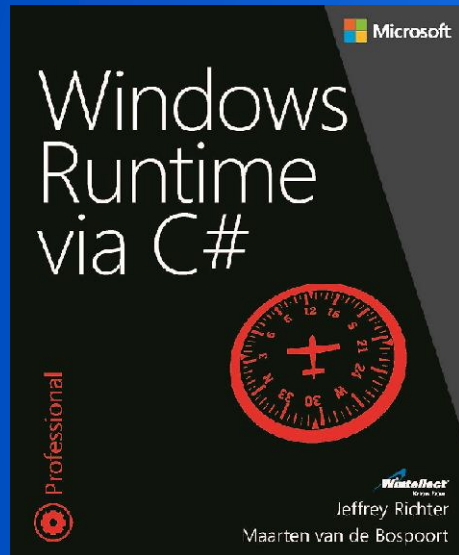# Efficient Buffer Manipulation using C# 7.2's Span<T>

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Windows Runtime via C#
Professional
Wintellect Know How
Jeffrey Richter
Maarten van de Bospoort
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Fifth Edition
WINDOWS VIA C/C++
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Christophe Nasarre
Wintellect Know How
Microsoft

5.1.b-Leader Election–Fundamentals–Leader election via a lease

Leader election via a lease

- All service instances execute:

```
while (!AskDB_IsProcessingDone()) {
    bool isLeader = RequestLease()
    if (isLeader) {
        ProcessAndRenewLease()  ← NOTE: may crash; Lease abandoned
        TellDB_ProcessingIsDone()
    } else { /* Continuously try to become the new leader */ }
    Delay()  // Avoid DB DDoS
}
```

Service #1
Service #2
Service #3

Database			
Work time	Done	Leasee	Lease expiration
2017-07-27	false	#1	(not expired)

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2:50 / 6:56

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YouTube: http://aka.ms/RichterCloudApps
EdX: https://aka.ms/edx-devops200_9x-about

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(ReadOnly)Span & (ReadOnly)Memory Value Types

Span<T>	ReadOnlySpan<T>	Memory<T>	ReadOnlyMemory<T>
Must live on stack (compiler-enforced)		***Can*** live on heap (as field)	
Has ***pointer*** & length fields Can refer to ***(un)managed memory***		Has ***object***, index, & length fields Must refer to ***managed memory***	
Construct from (T[], start, length)			
Construct from (void*, length)		Can refer to native memory via MemoryManager	
Implicit conversion from T[] and ArraySegment			
Implicit conversion from Memory<T>	Implicit conversion from Span<T>	No implicit conversions	Implicit conversion from Memory<T>
Cannot create Memory instances		Can create Span instances	
Members: Slice, Length, IsEmpty, ToArray, (Try)CopyTo, ==, !=			
Methods: Clear, Fill			
Indexer: get/set	Indexer: get	Indexer: none	
GetEnumerator		Enumeration isn't possible	
GetPinnableReference		Pin	

Helper Methods

- ## System.MemoryExtensions
  - ### Buffer processors
    - BinarySearch, CompareTo, Contains, EndsWith, Equals, (Last)IndexOf(Any), IsWhiteSpace, Overlaps, Reverse, SequenceCompareTo, SequenceEqual, StartsWith, ToLower(Invariant), ToUpper(Invariant), Trim(Start|End)
  - ### Converters
    - String | ArraySegment | T[] → Span | Memory
- ## System.Runtime.InteropServices.MemoryMarshal
  - Cast: (ReadOnly)Span<TFrom> → (ReadOnly)Span<TTo> where Ts are structs
    - AsBytes: (ReadOnly)Span<TFrom> → (ReadOnly)Span<byte>
  - Create(ReadOnly)Span from ref T & length
  - GetReference from (ReadOnly)Span<T>
  - (Try)[Read|Write] struct from/to (ReadOnly)Span<T>