Introduction to Windows C++ Synchronization Techniques

Topics

1. Purpose of Synchronization

Topics

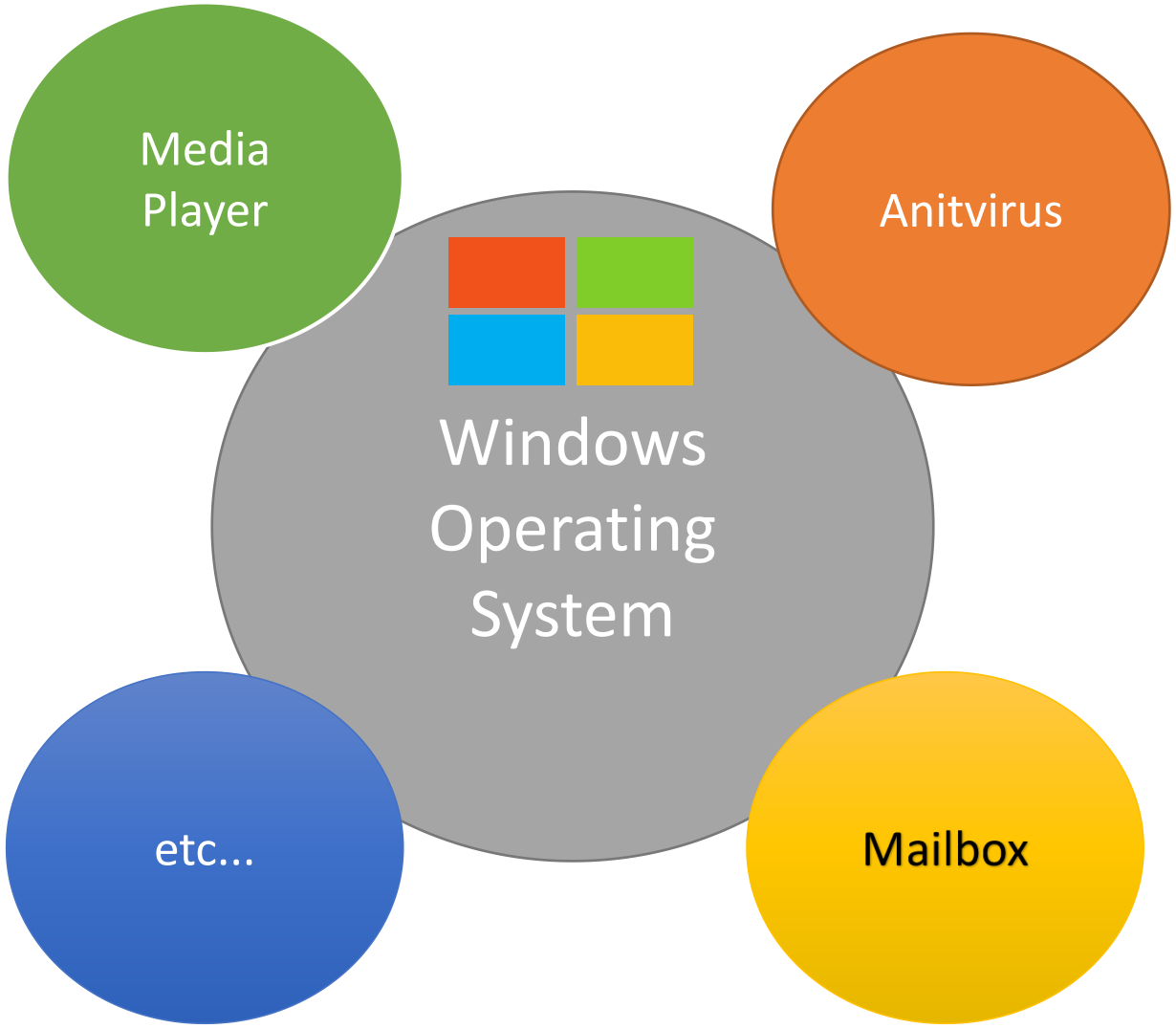
1. Purpose of Synchronization

2. **Synchronization Classification**

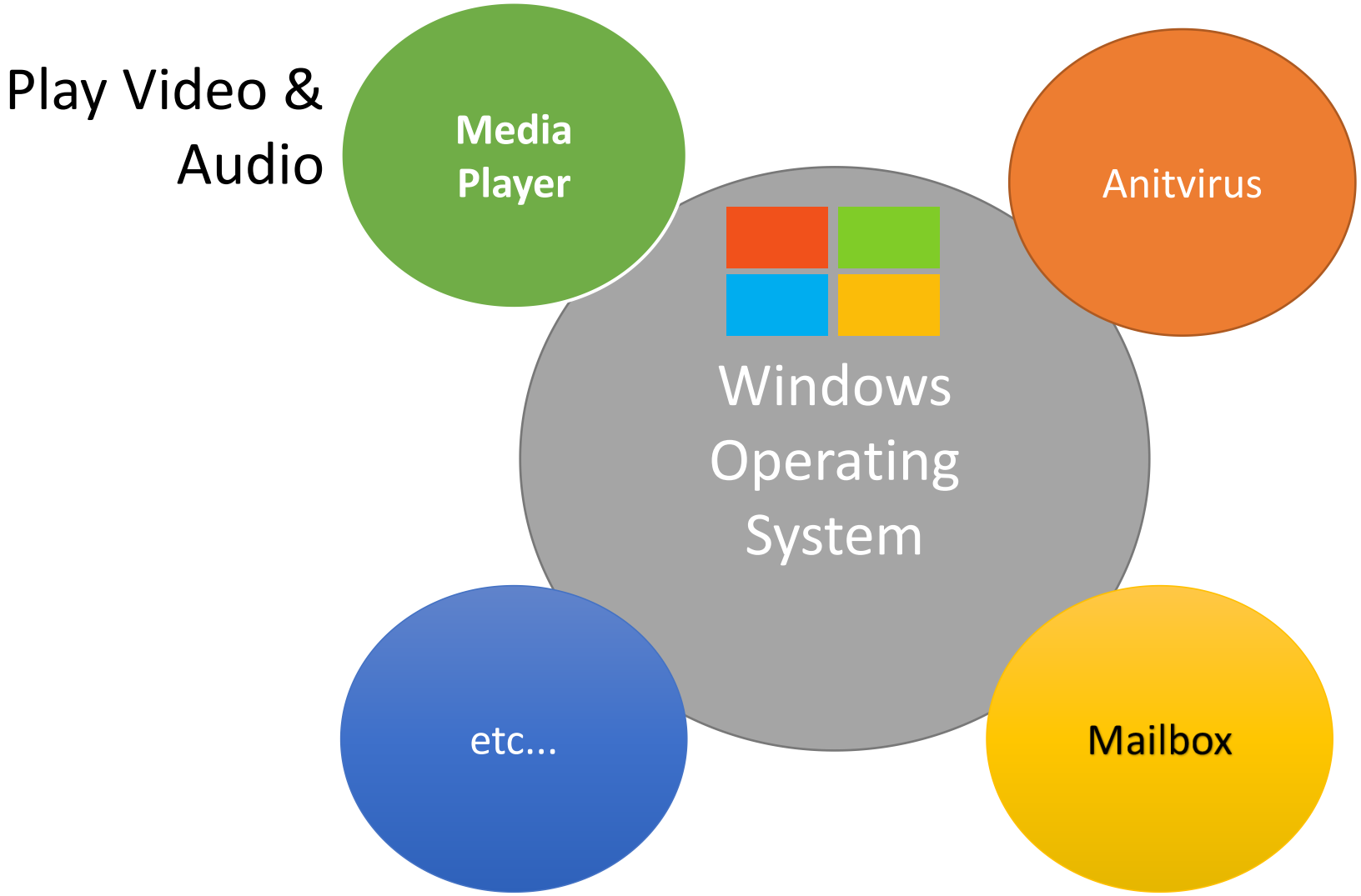
Topics

1. Purpose of Synchronization
2. Synchronization Classification
3. **Windows synchronization objects**

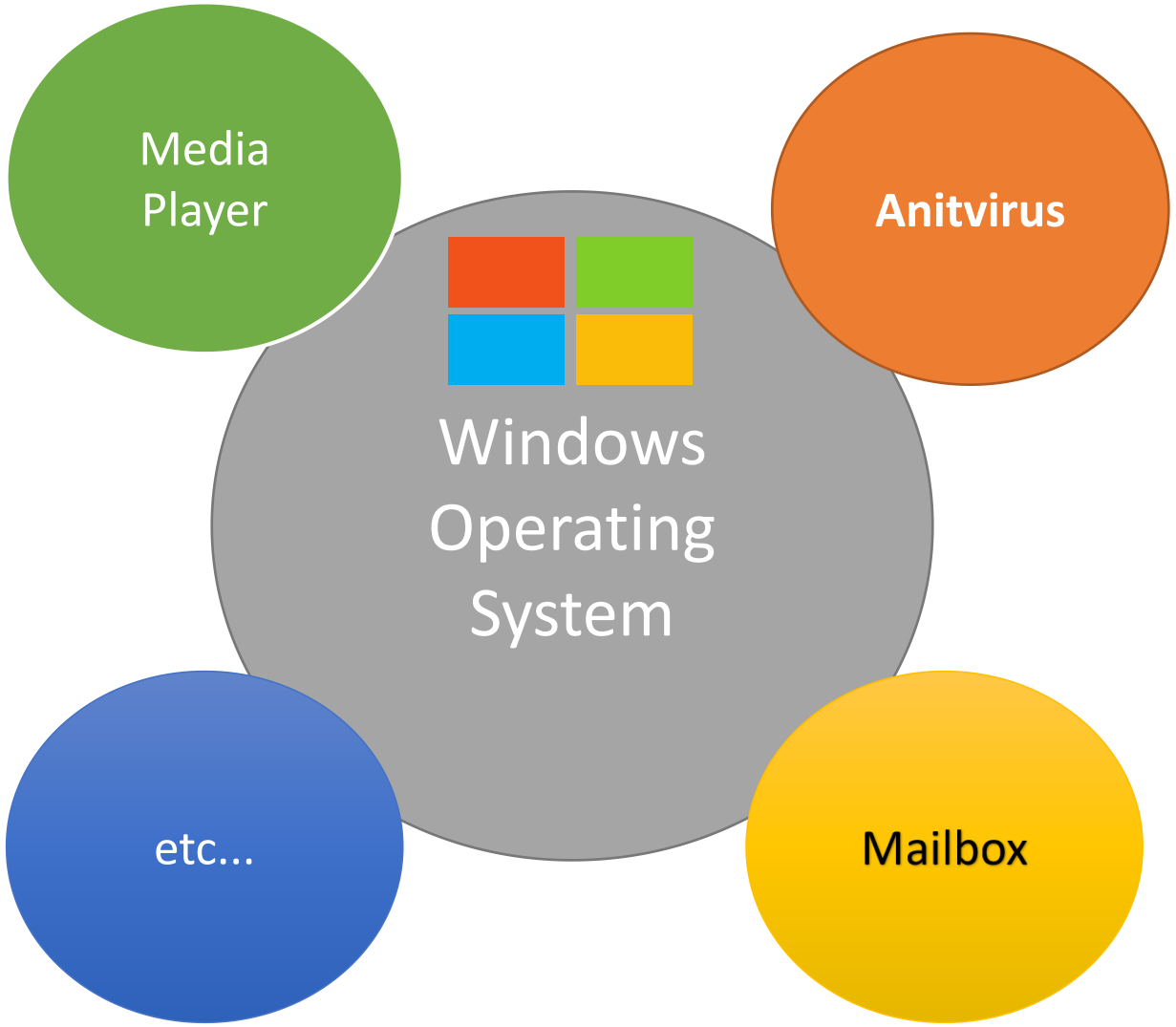
Purpose of Synchronization



Purpose of Synchronization

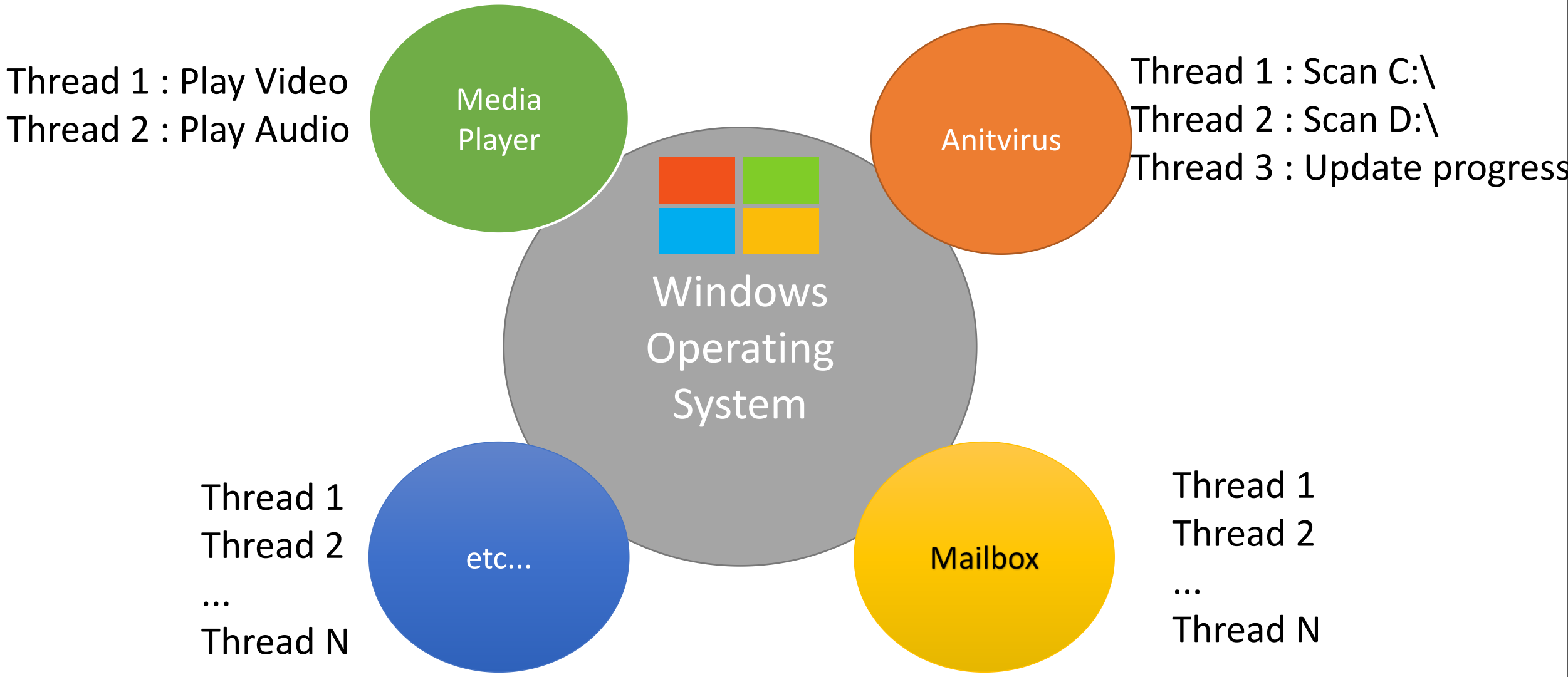


Purpose of Synchronization



Secures PC from malwares/virus

Purpose of Synchronization



Purpose of Synchronization

For synchronization of shared data/code block.

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For synchronization of shared data/code block.

- **Prevent data race**

Purpose of Synchronization

For synchronization of shared data/code block.

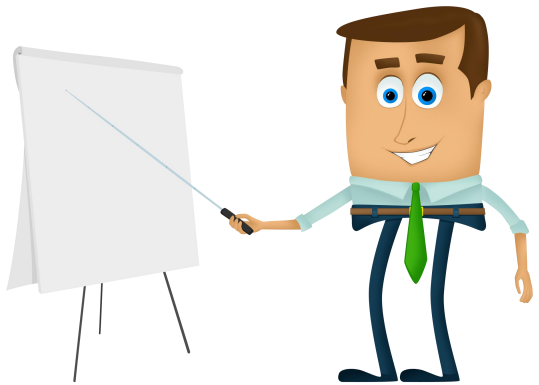
- Prevent data race
- **Prevent executing mutually incompatible code/functionality at at time .**

Purpose of Synchronization

For synchronization of shared data/code block.

Example:

- Writing to file and reading the file



Synchronization Classification

Synchronization can be broadly classified as

Synchronization Classification

Synchronization can be broadly classified as

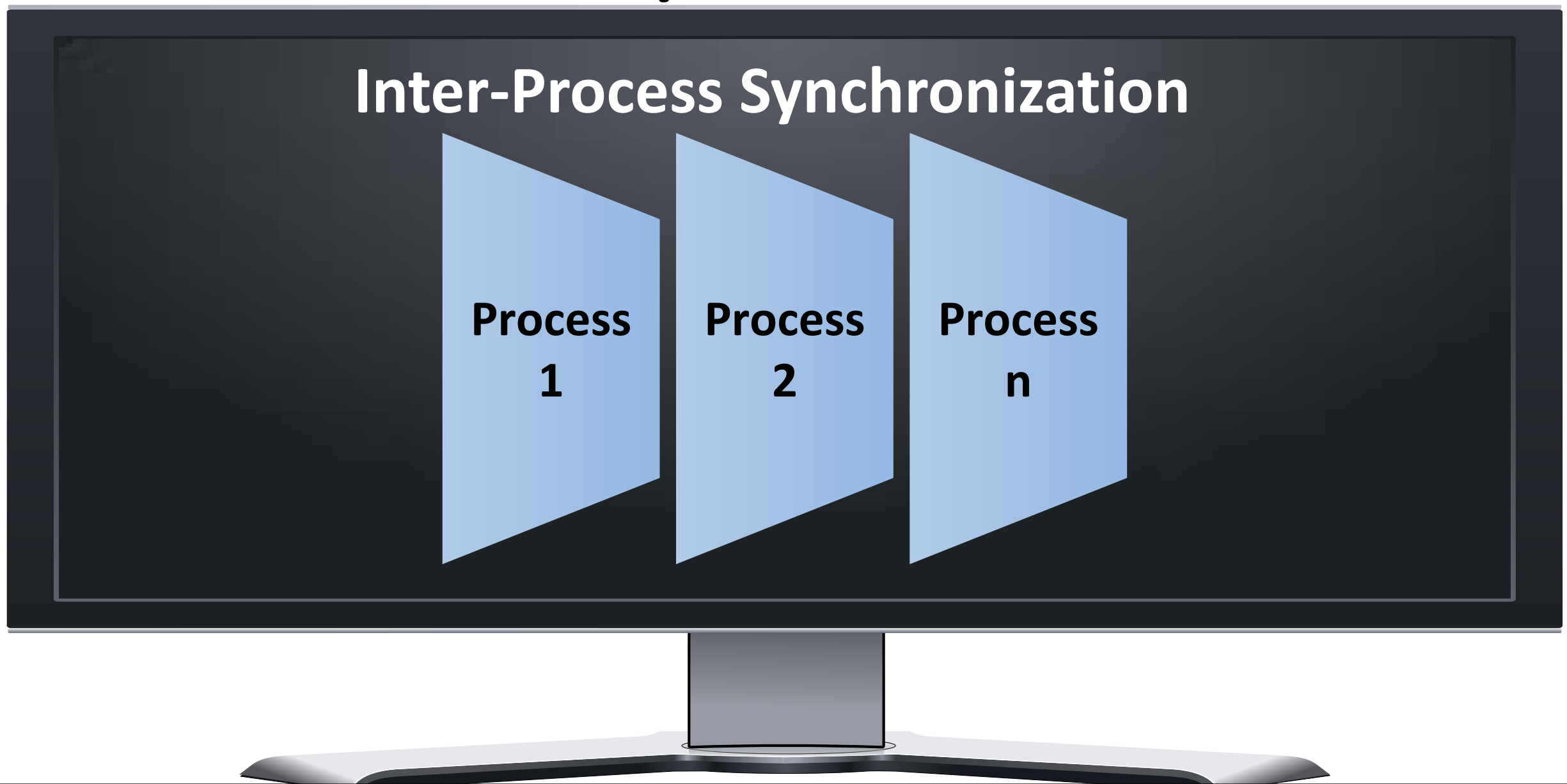
1. Inter-Process

Synchronization Classification

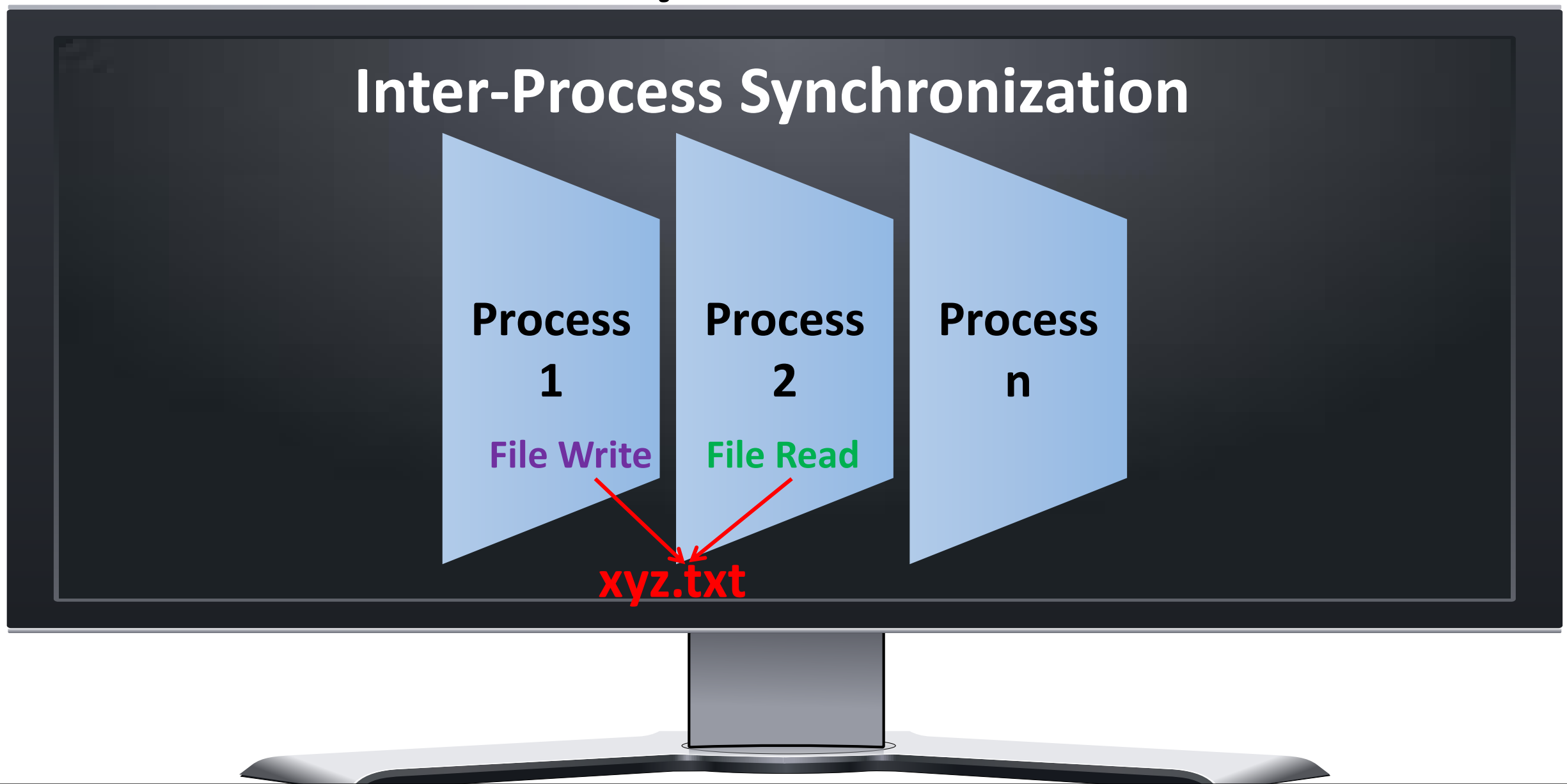
Synchronization can be broadly classified as

1. Inter-Process
2. Intra-Process(Inter-Thread)

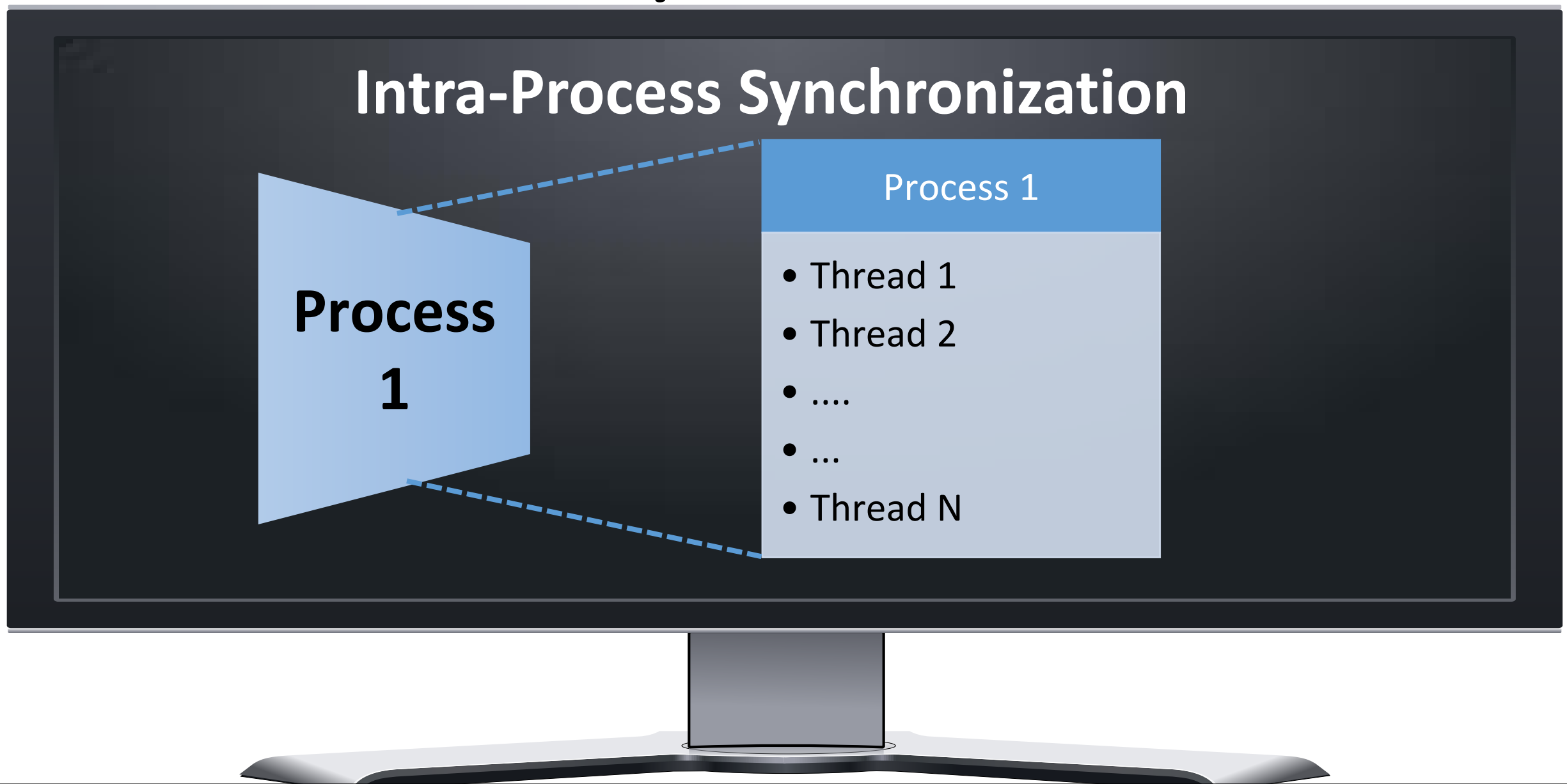
Inter-Process Synchronization



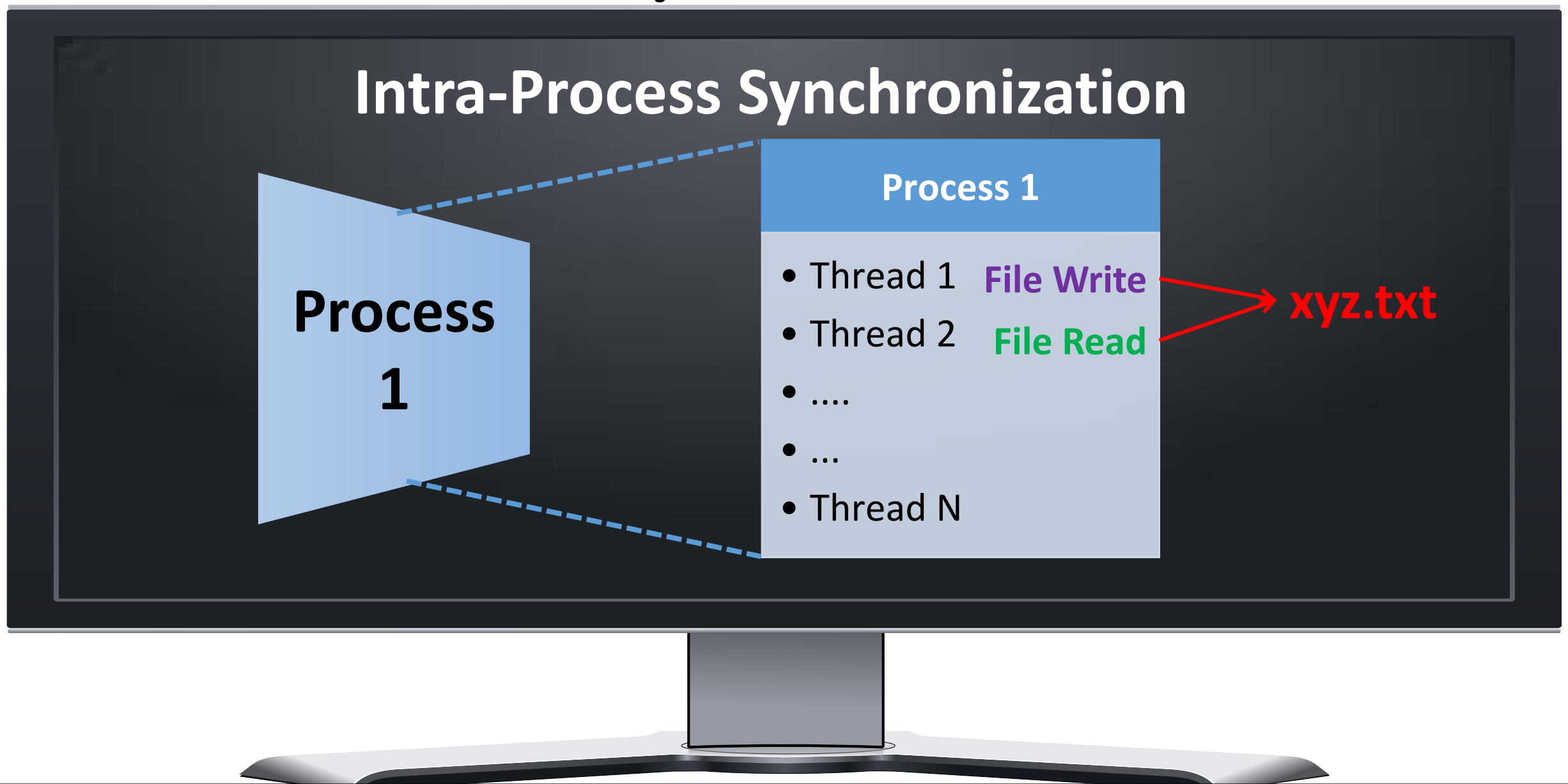
Inter-Process Synchronization



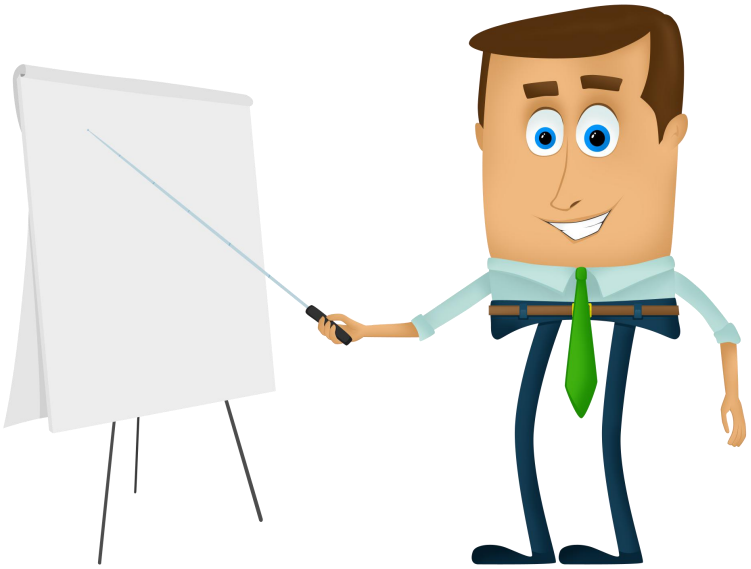
Intra-Process Synchronization



Intra-Process Synchronization

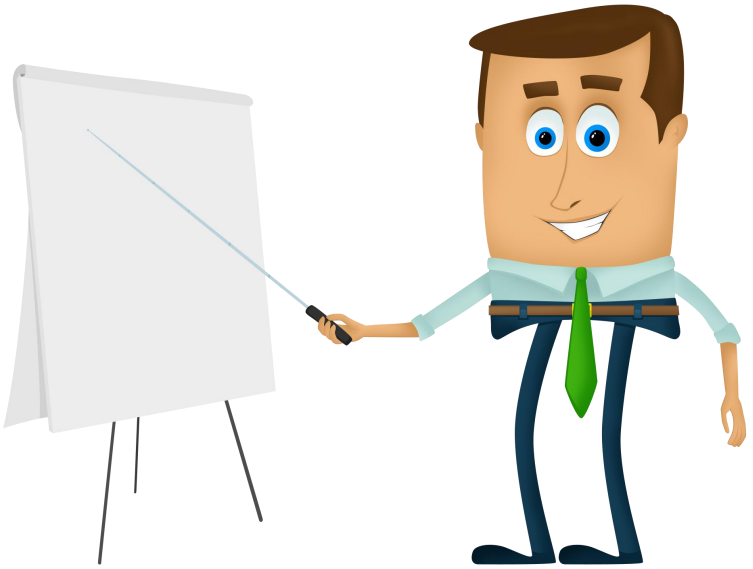


Windows synchronization objects



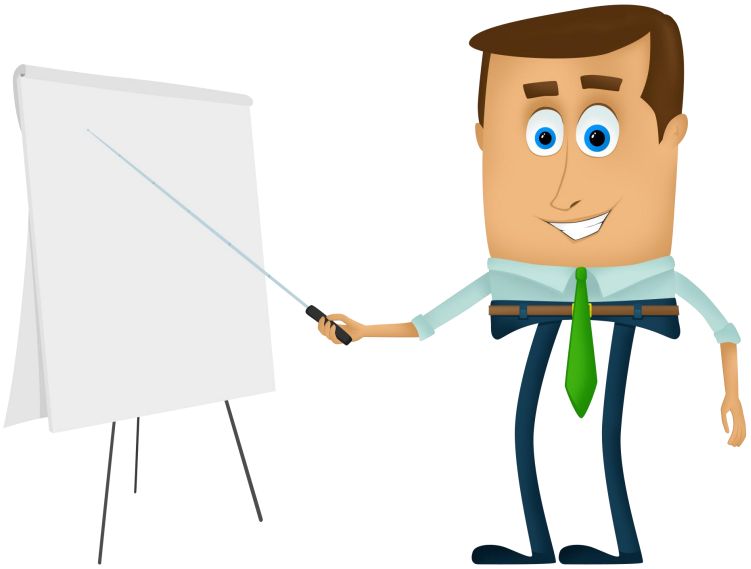
Windows synchronization objects

1. Critical Section
2. Mutex
3. Semaphore
4. Event



Windows synchronization objects

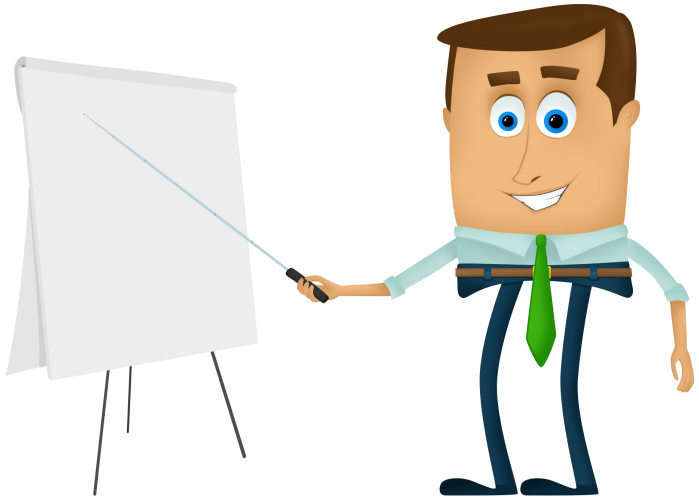
1. Critical Section



Windows synchronization objects

1. **Critical Section**
   - **Usage Scenario : read & write from different thread**

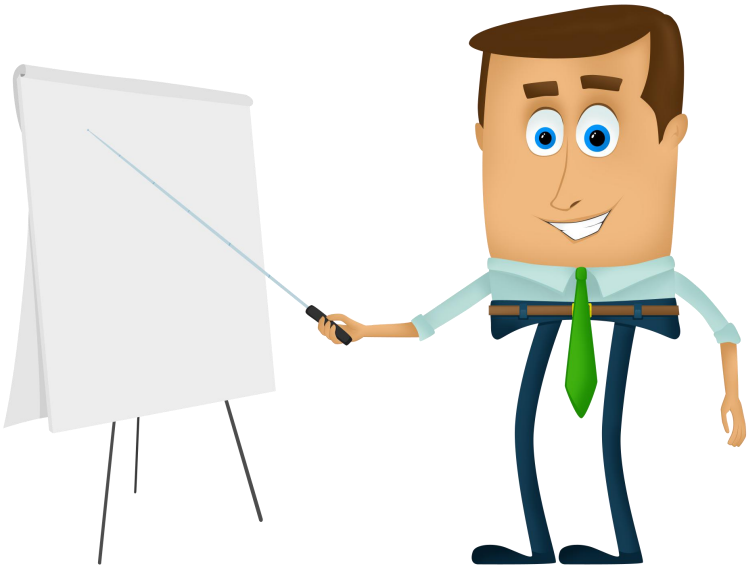
Writer Thread 1



Reader Thread 1

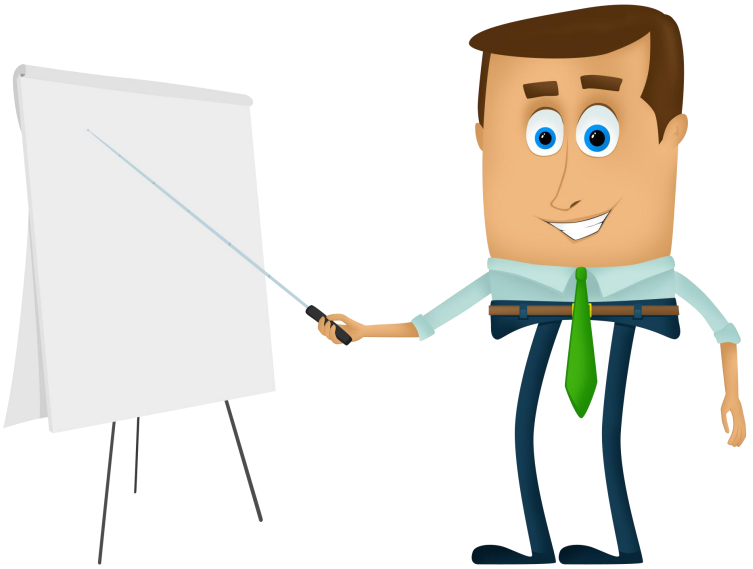
Windows synchronization objects

1. **Critical Section**
   - **Inter-thread synchronization**



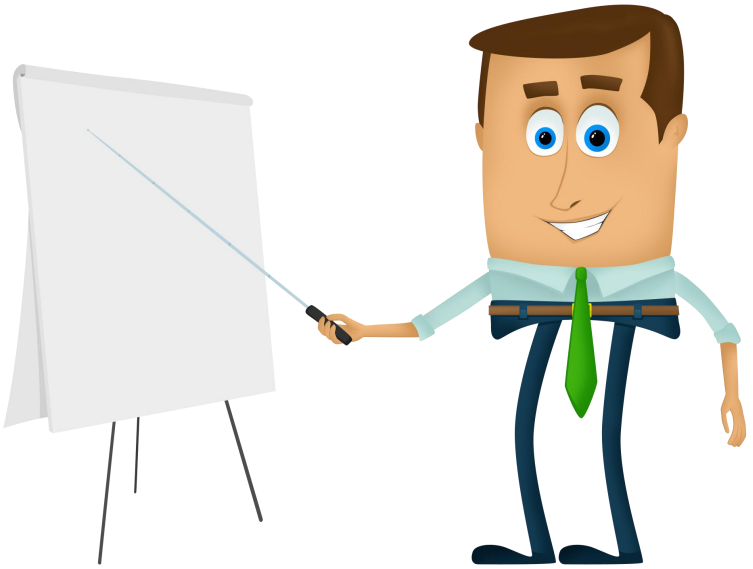
Windows synchronization objects

1. **Critical Section**
   - Inter-thread synchronization
   - **cannot be shared across processes.**



Windows synchronization objects

1. **Critical Section**
   - Inter-thread synchronization
   - cannot be shared across processes.
   - **Not Kernel Object**

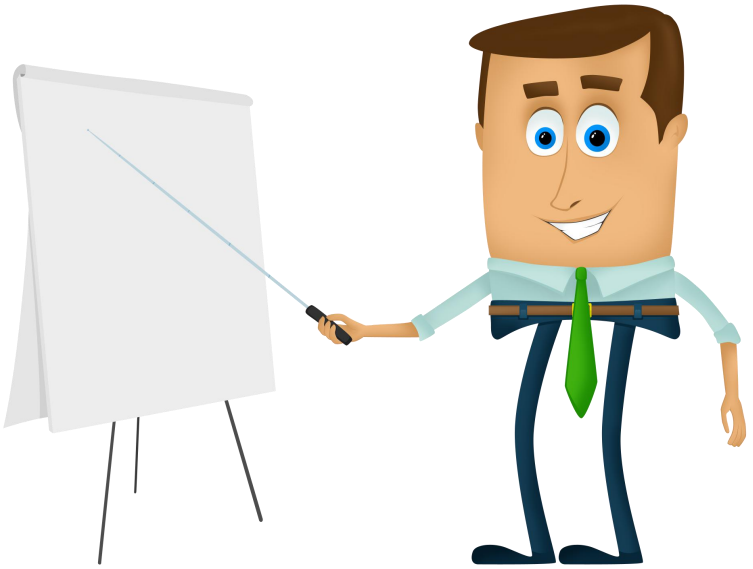


Windows synchronization objects

1. Critical Section

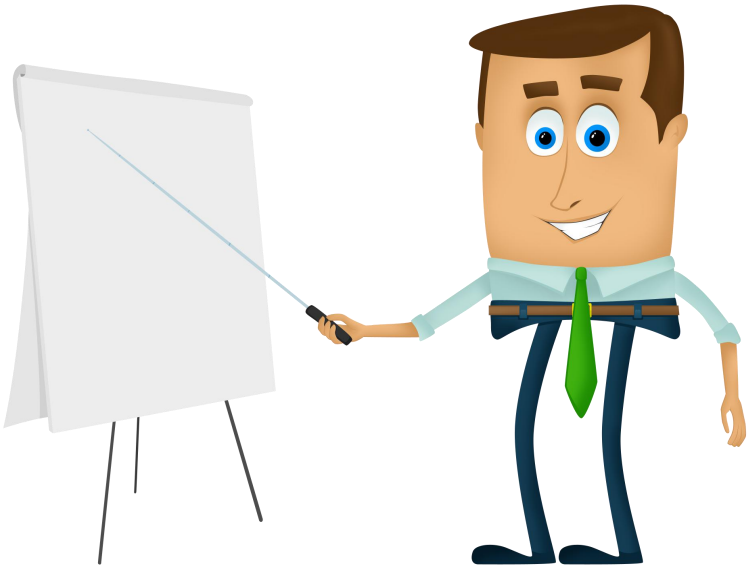
- Inter-thread synchronization
- cannot be shared across processes.
- Not Kernel Object

Win32 : CRITICAL_SECTION
MFC : CCriticalSection



Windows synchronization objects

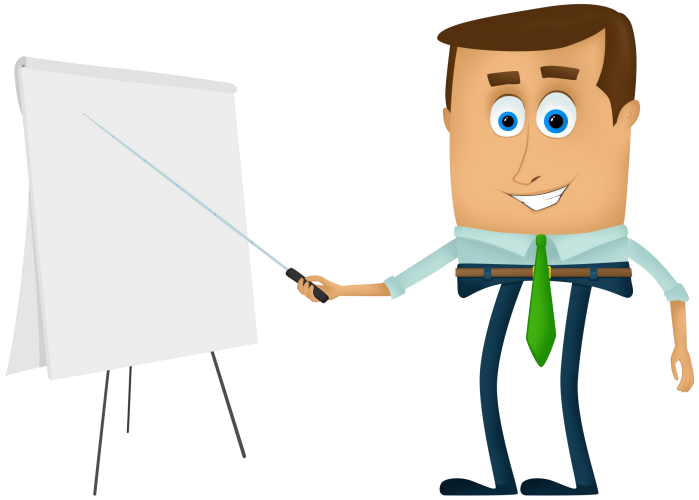
2. Mutex



Windows synchronization objects

1. **Mutex**
   - **Usage Scenario : read & write from different process**

Writer.exe

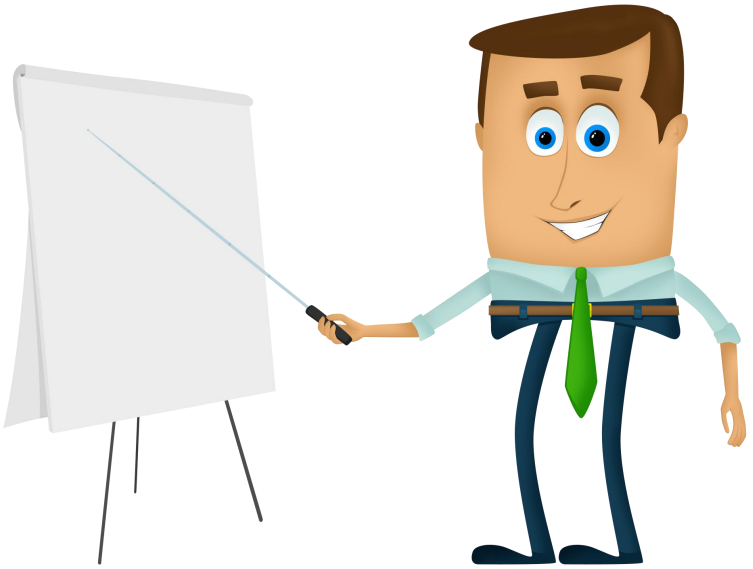


Reader.exe

Windows synchronization objects

2. Mutex

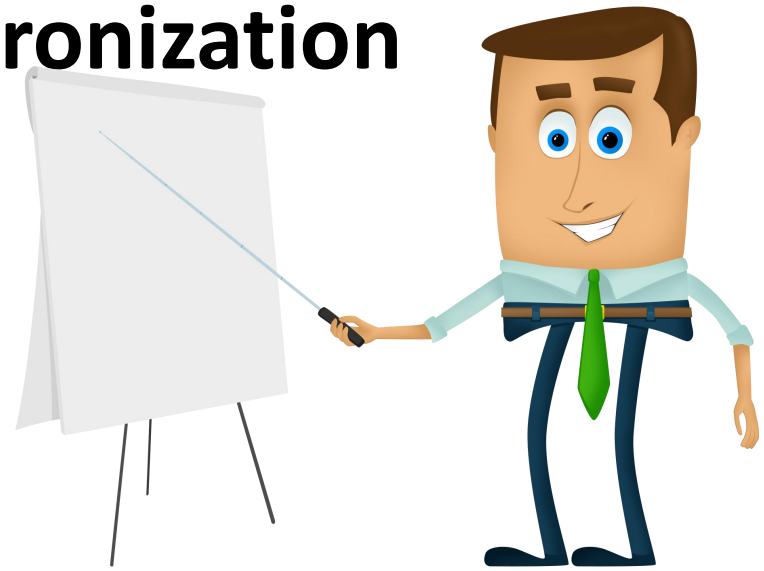
- **Inter-Process**
- **Intra-Process**



Windows synchronization objects

2. Mutex

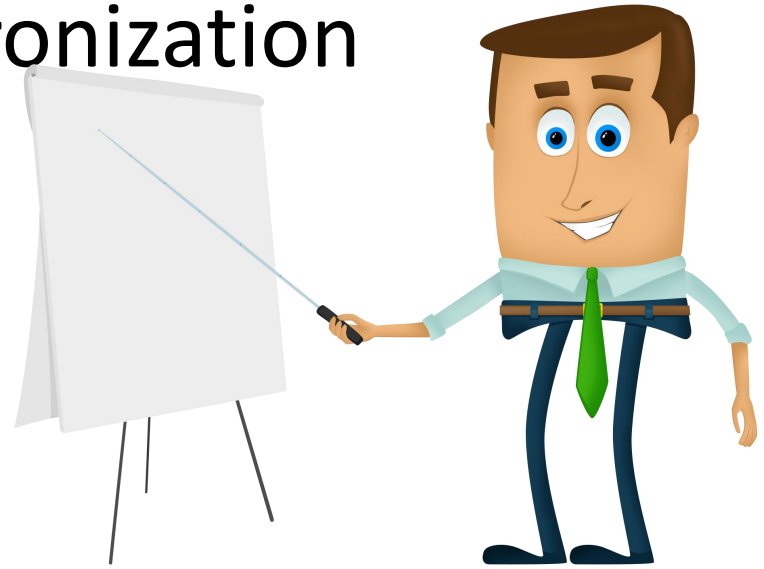
- Inter-Process
- Intra-Process
- **Primarly inter-process synchronization**



Windows synchronization objects

2. Mutex

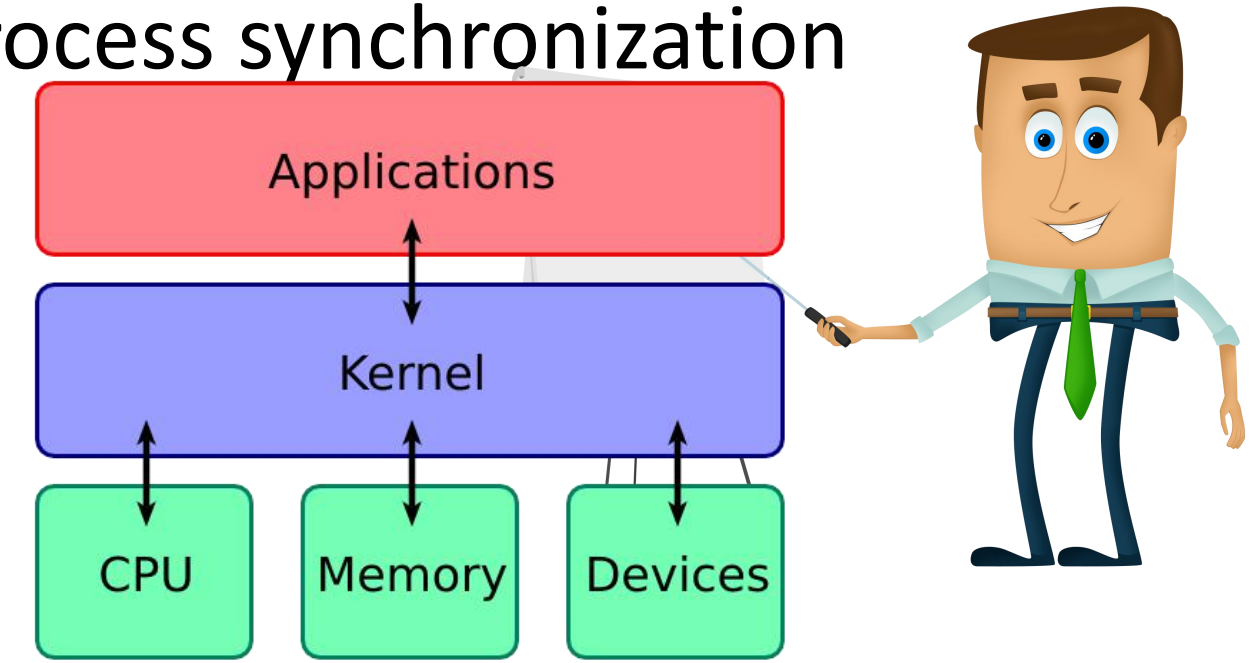
- Inter-Process
- Intra-Process
- Primarly inter-process synchronization
- **Kernel Object**



Windows synchronization objects

2. Mutex

- Inter-Process
- Intra-Process
- Primarly inter-process synchronization
- **Kernel Object**



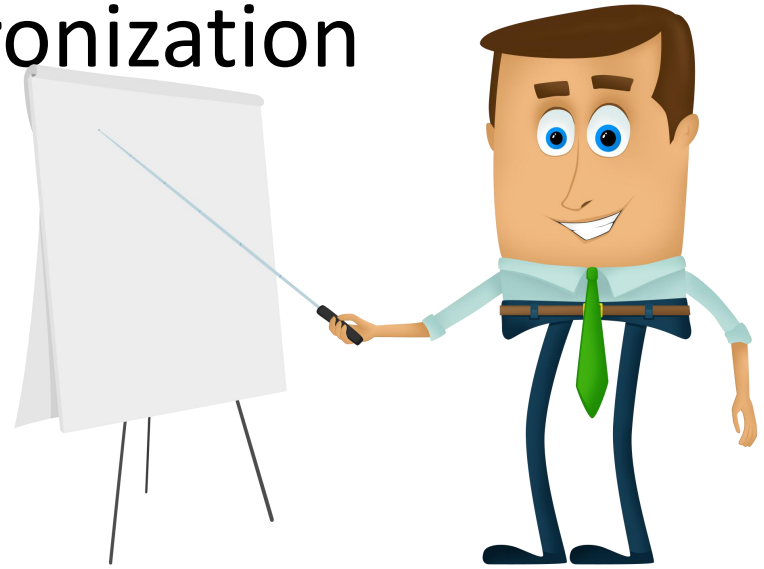
Windows synchronization objects

2. Mutex

- Inter-Process
- Intra-Process
- Primarly inter-process synchronization

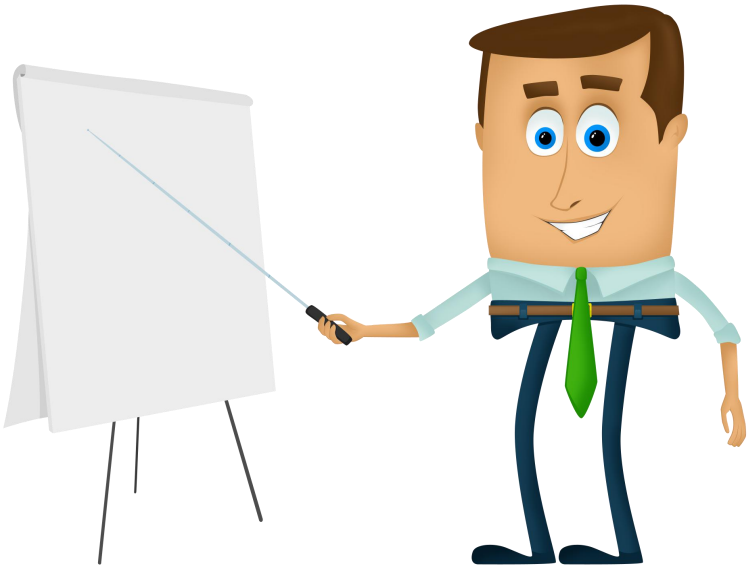
Win32 API : CreateMutex

MFC : CMutex



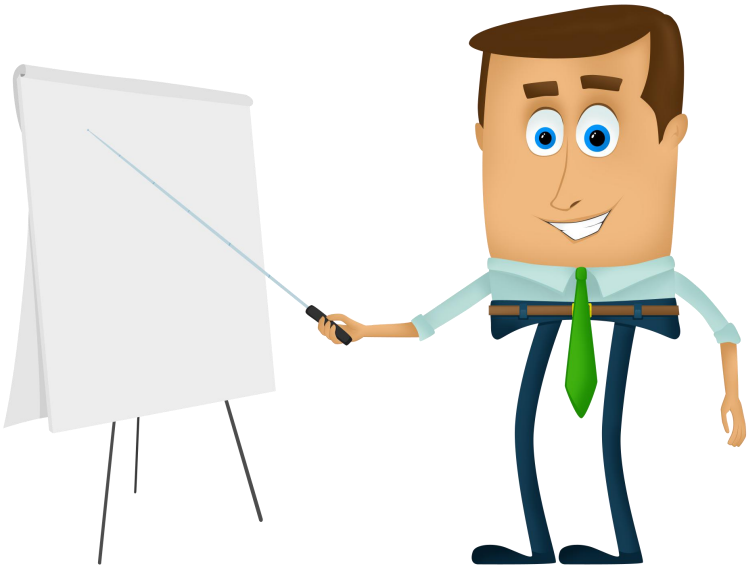
Windows synchronization objects

1. Critical Section
2. Mutex
3. **Semaphore**



Windows synchronization objects

3. Semaphore



Windows synchronization objects

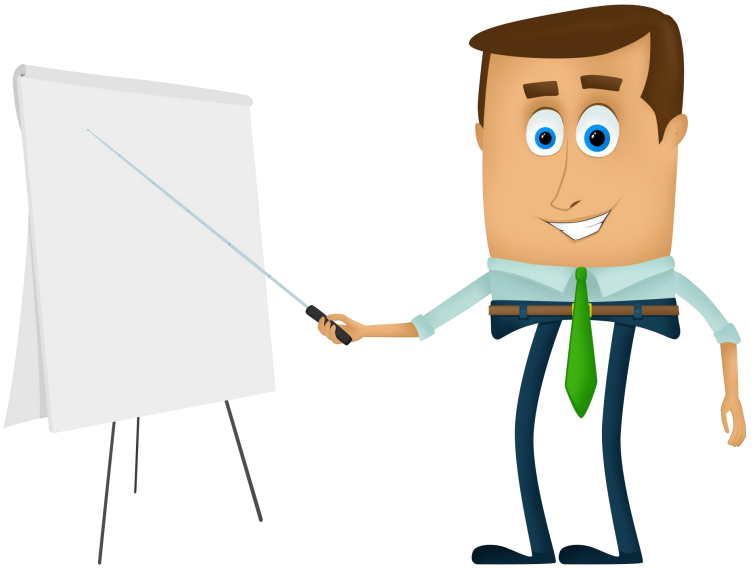
3. Semaphore

- **Usage Scenario : Waiting for Restaurant seat to be available**

Windows synchronization objects

3. Semaphore

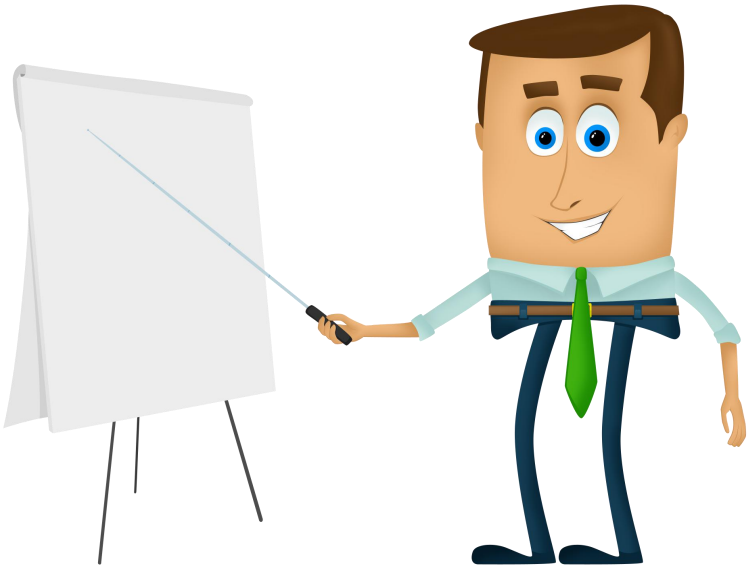
- **Inter-Process**
- **Intra-Process**



Windows synchronization objects

3. Semaphore

- Inter-Process
- Intra-Process
- **Kernel Object**

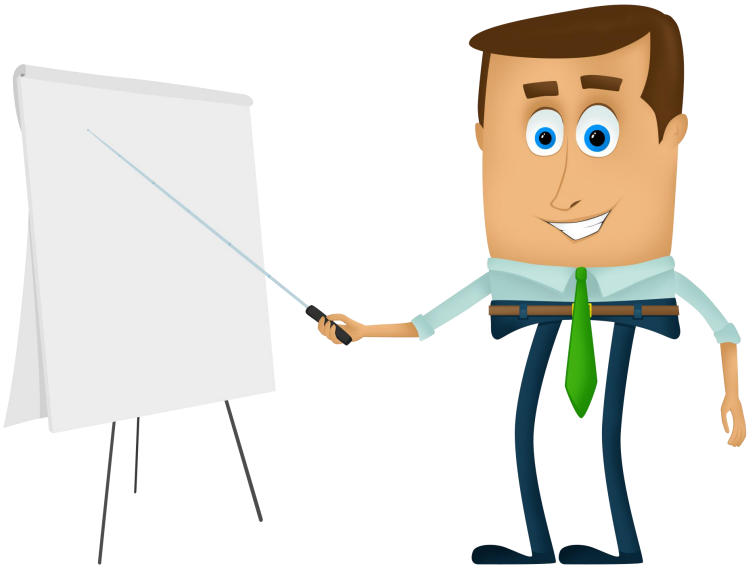


Windows synchronization objects

3. Semaphore

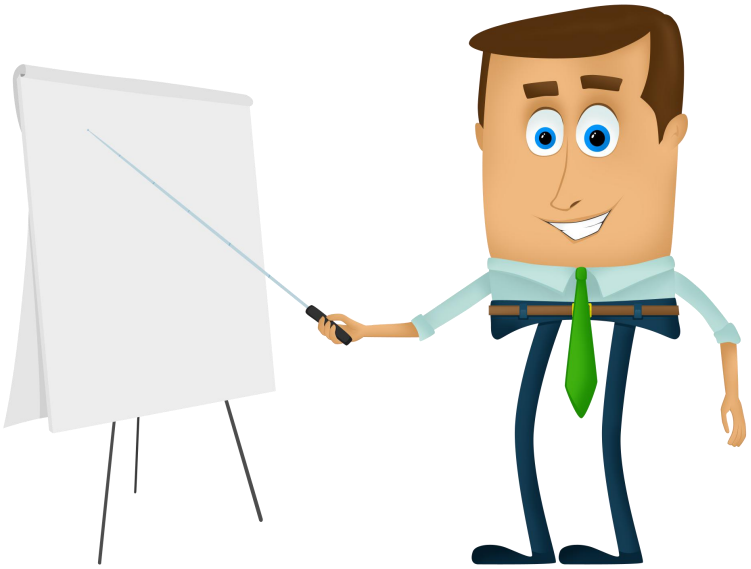
- Inter-Process
- Intra-Process
- Kernel Object

- **Win32 API : CreateSeaphore**
- **MFC : CSemaphore**



Windows synchronization objects

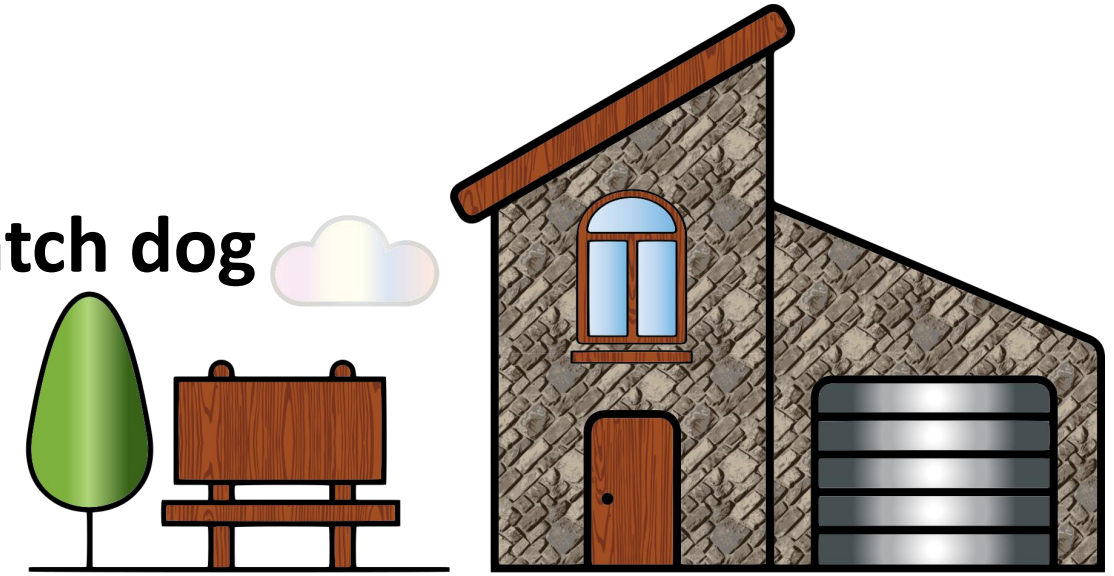
3. Event

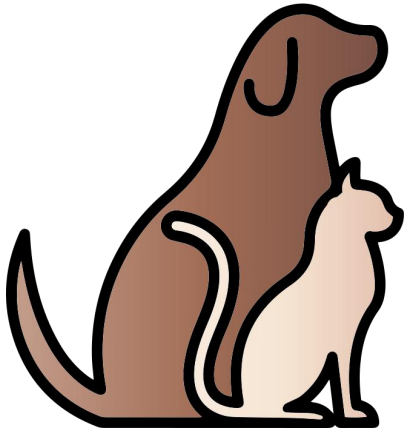


Windows synchronization objects

3. Event

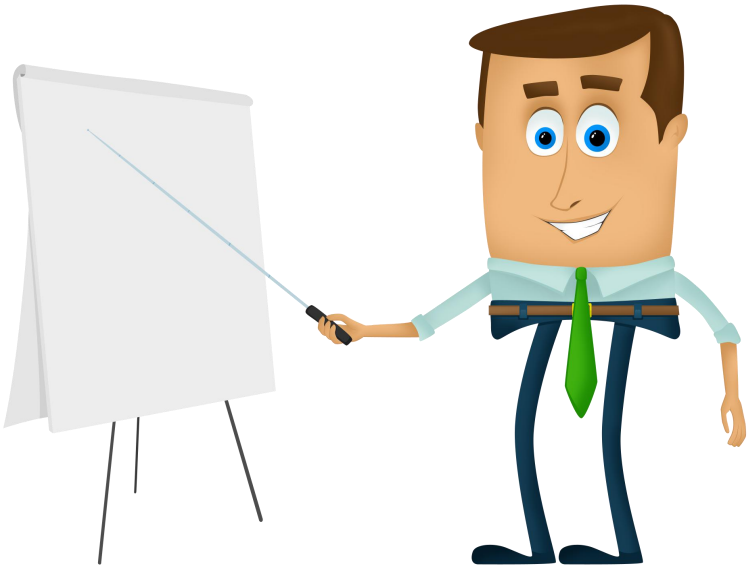
- **Usage scenario : Watch dog**





Windows synchronization objects

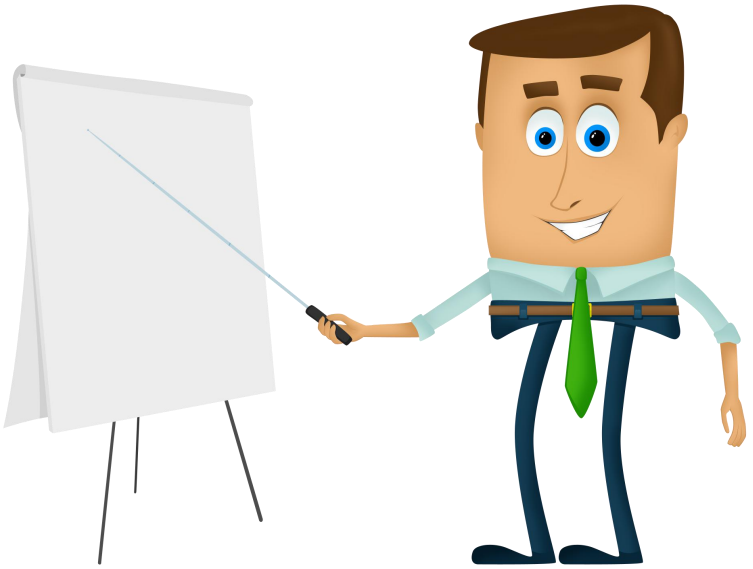
3. **Event**
   - **Inter-Process**
   - **Intra-Process**



Windows synchronization objects

3. Event

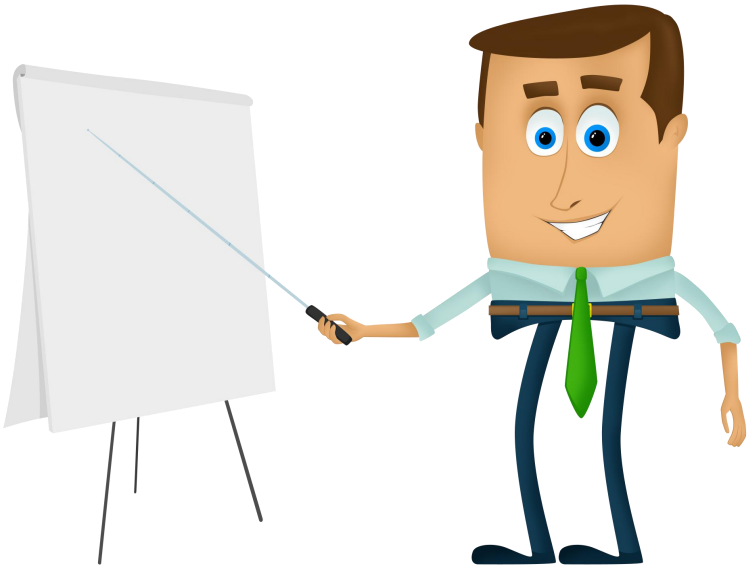
- Inter-Process
- Intra-Process
- **Based on States**



Windows synchronization objects

3. Event

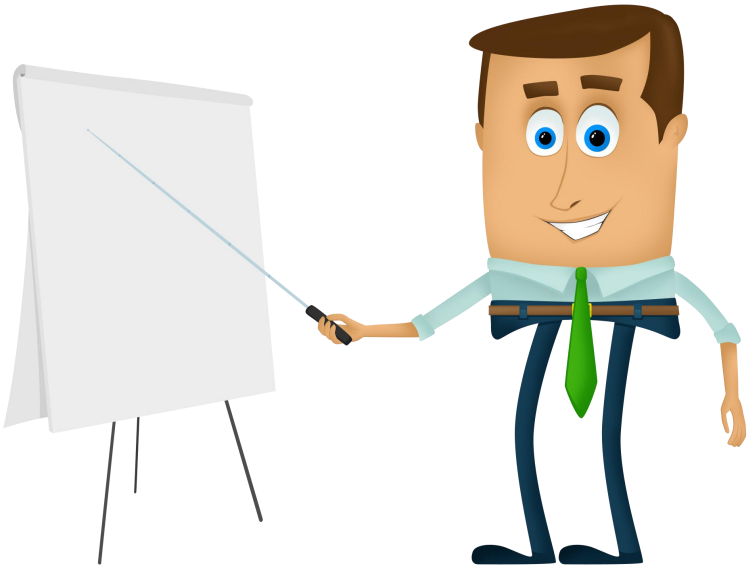
- Inter-Process
- Intra-Process
- **Based on States**
  - **Signaled**
  - **Non-Signaled**



Windows synchronization objects

3. Event

- Inter-Process
- Intra-Process
- Based on States
- **Kernel Object**



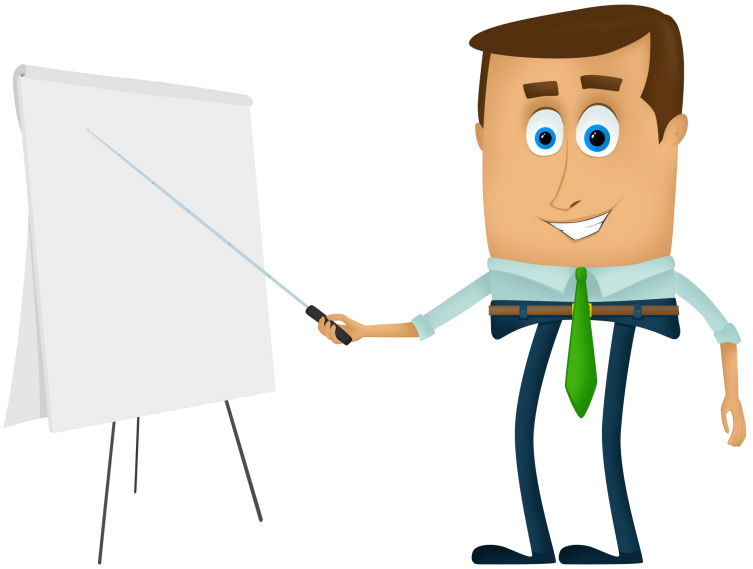
Windows synchronization objects

3. Event

- Inter-Process
- Intra-Process
- Based on States
- Kernel Object

Win32 API : CreateEvent

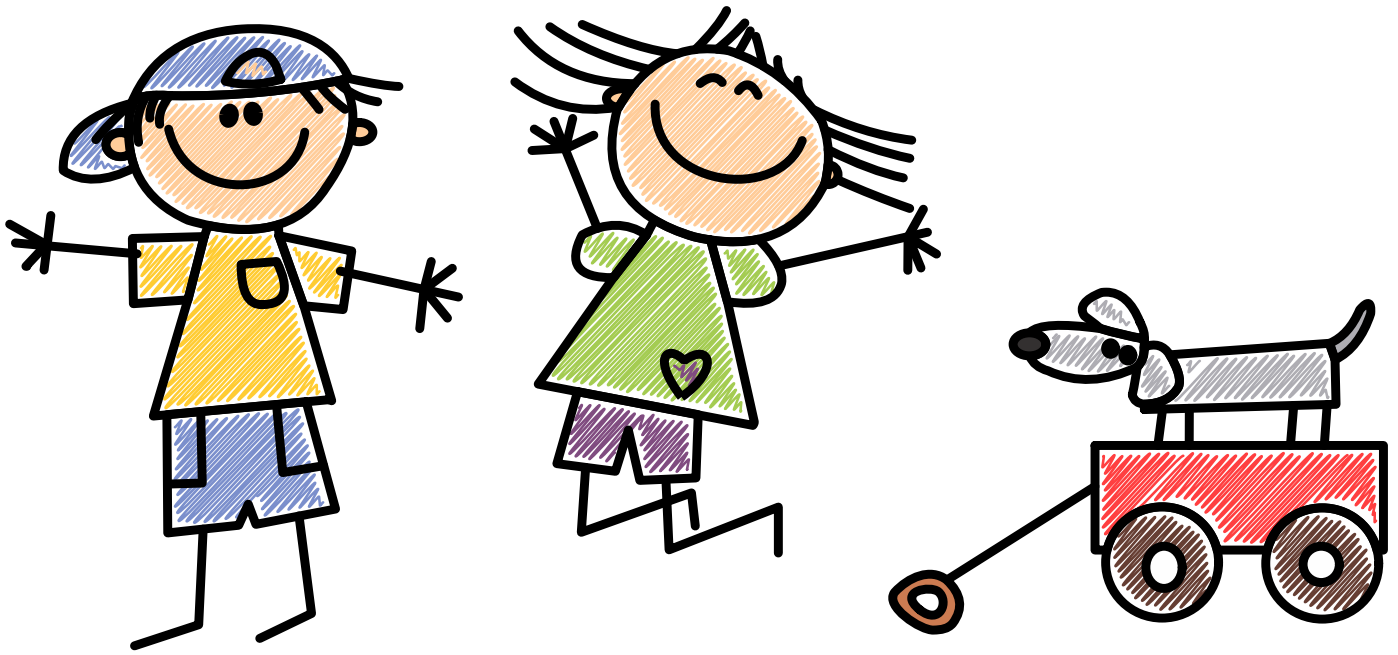
MFC : CEvent



Comparision chart

	Critical Section	Mutex	Semaphore	Event
Inter-thread	✓	✓	✓	✓
Inter-process	✗	✓	✓	✓
Kernel Obect	✗	✓	✓	✓
Object:Thread ownership ratio	1:1	1:1	1:N	No ownership
Cost	Low 	High 		

Thank you



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