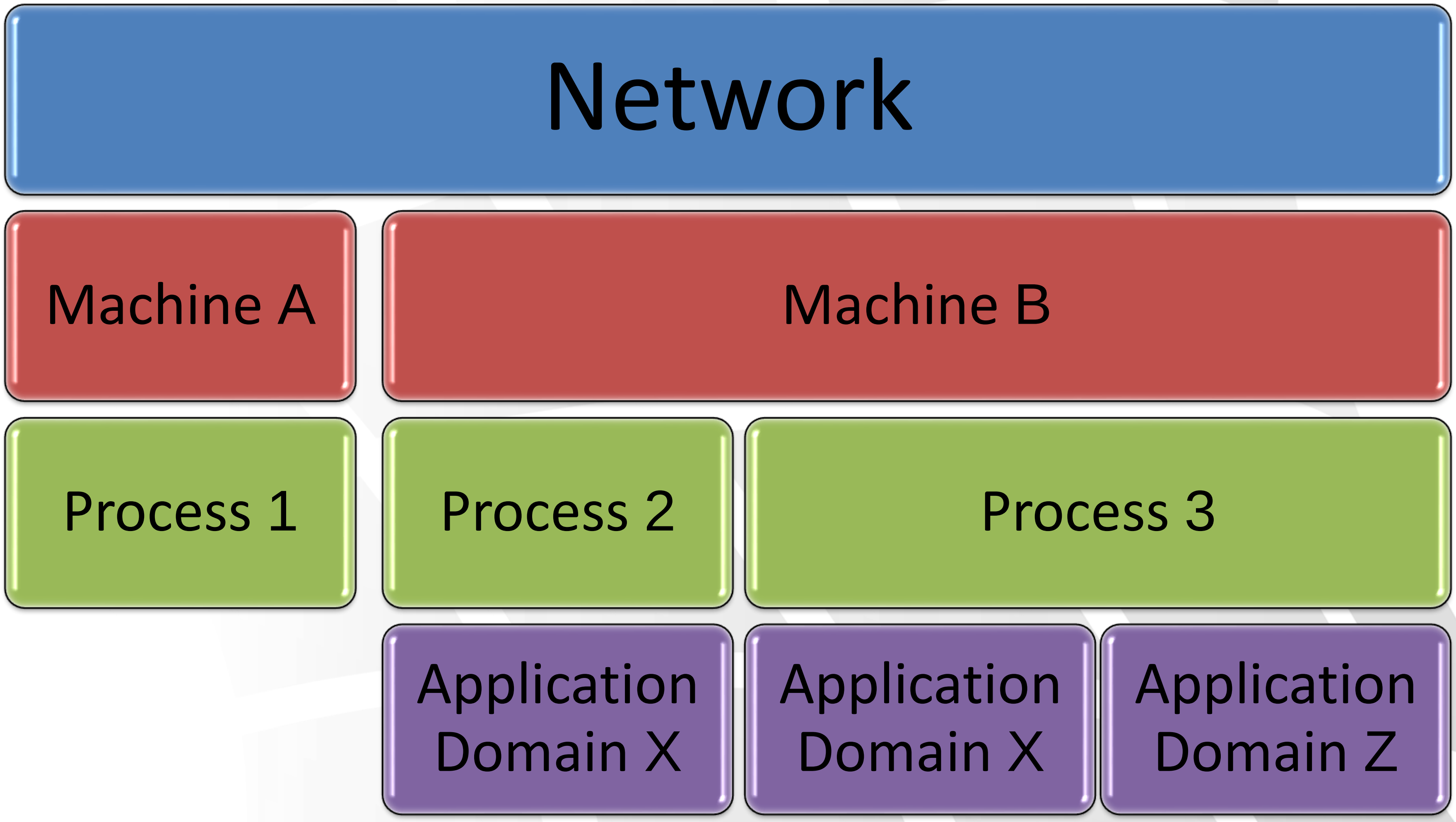
Programming the .NET Framework 4.5

Module 06 - Application Domains

In This Chapter

- AppDomains as isolation boundaries
- Creating and unloading AppDomains
- Executing code in an AppDomain
- AppDomain boundaries
- Overview of .NET Remoting
- Lab

System Isolation Boundaries



Application Domain Isolation

Shared

- Virtual memory
- Operating system handles
- Unmanaged resources

Isolated

- Managed objects
- Assemblies and types
- Configuration information

Why AppDomains?

- Reliability (fault isolation)
- Dynamic code unloading
- Security
- Configuration
- Versioning
- Monitoring

Properties of an AppDomain

- Friendly name, id
- Base directory
- Application configuration
- Security policy
- Shadow copy configuration

Things to Look Out for

- Static data is domain-private
- Not every object can cross domain boundaries

Creating an AppDomain

- AppDomain.CreateDomain

```
AppDomain domain =
    AppDomain.CreateDomain("MyFirstDomain");
Console.WriteLine("Base directory: " +
    domain.BaseDirectory);
Console.WriteLine("Id: " + domain.Id);
Console.WriteLine("Configuration file: " +
    domain.SetupInformation.ConfigurationFile);
```

Retrieving Assemblies

- AppDomain.GetAssemblies

```
Array.ForEach(
    domain.GetAssemblies(), Console.WriteLine);
//Output:
//mscorlib, Version=2.0.0.0, Culture=neutral,
//PublicKeyToken=b77a5c561934e089
```

Unloading an AppDomain

- AppDomain.Unload

```
AppDomain.Unload(domain);
domain.GetAssemblies();
//Output:
//Unhandled Exception:
//System.AppDomainUnloadedException:
//Attempted to access an unloaded AppDomain.
//   at System.AppDomain.GetAssemblies()
```

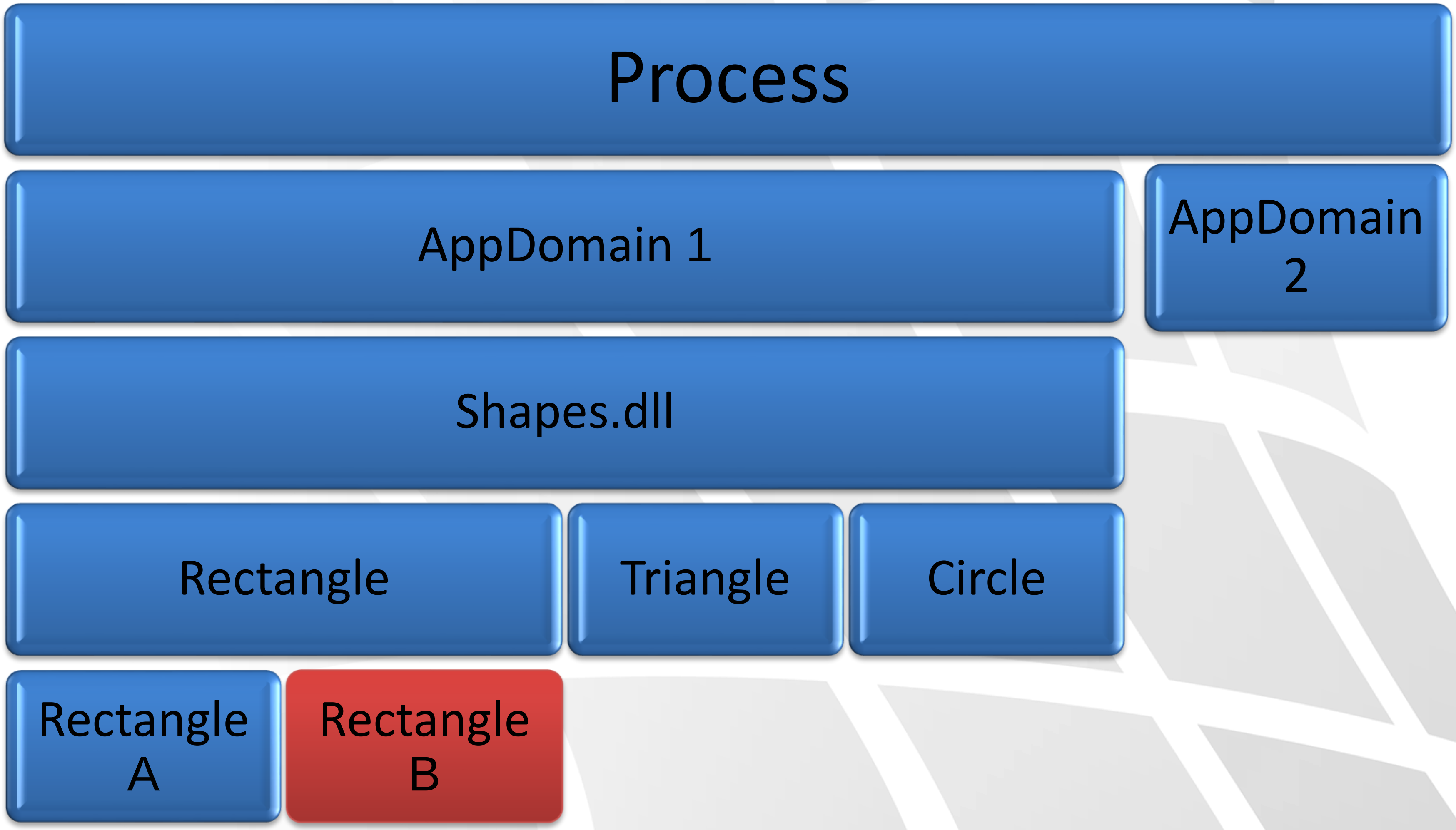
Executing Code in an AppDomain

- `AppDomainInitializer`
- `ExecuteAssembly`
- `CreateInstanceAndUnwrap`
- `DoCallback`

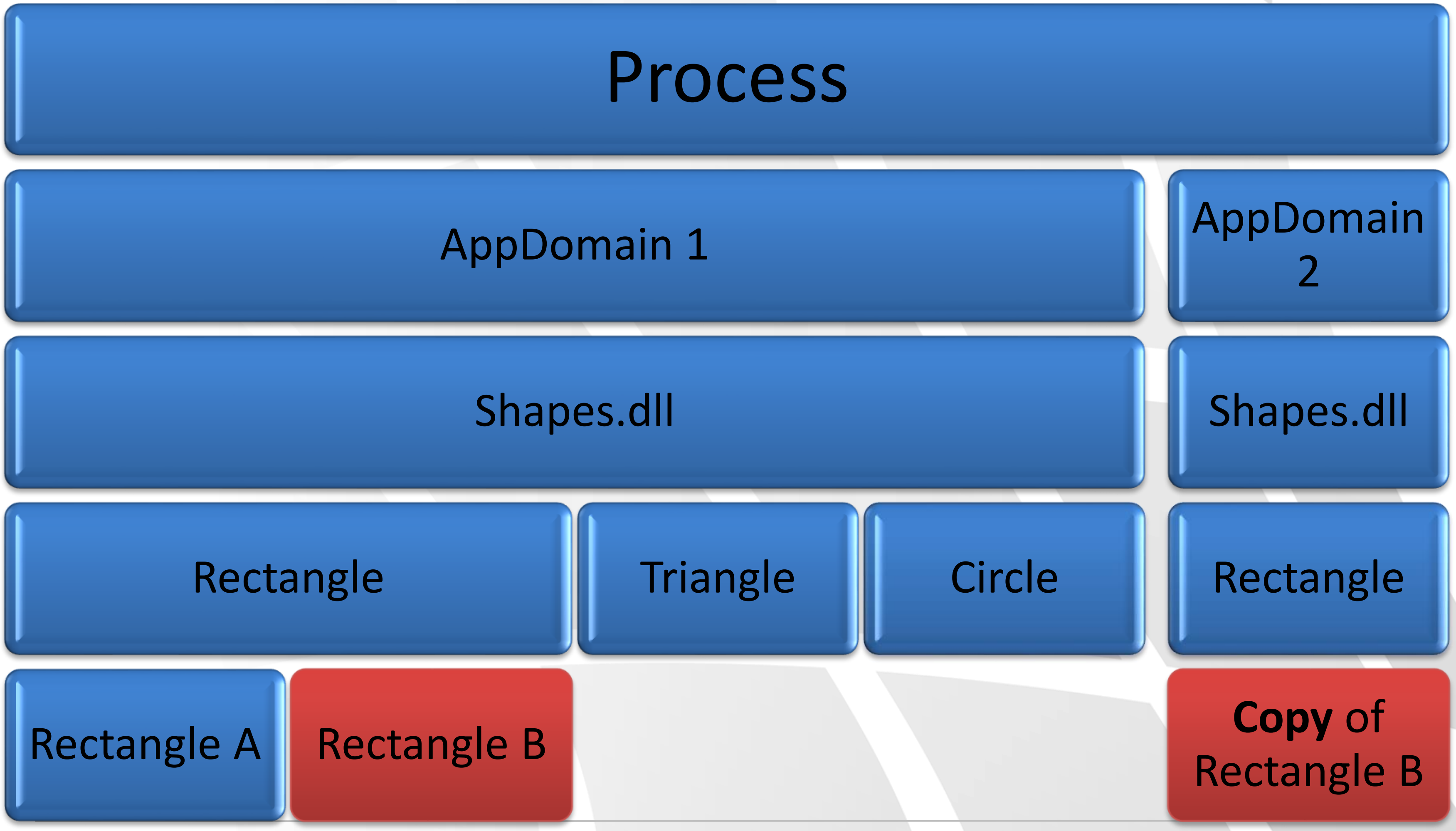
Executing Code in an AppDomain

Demo

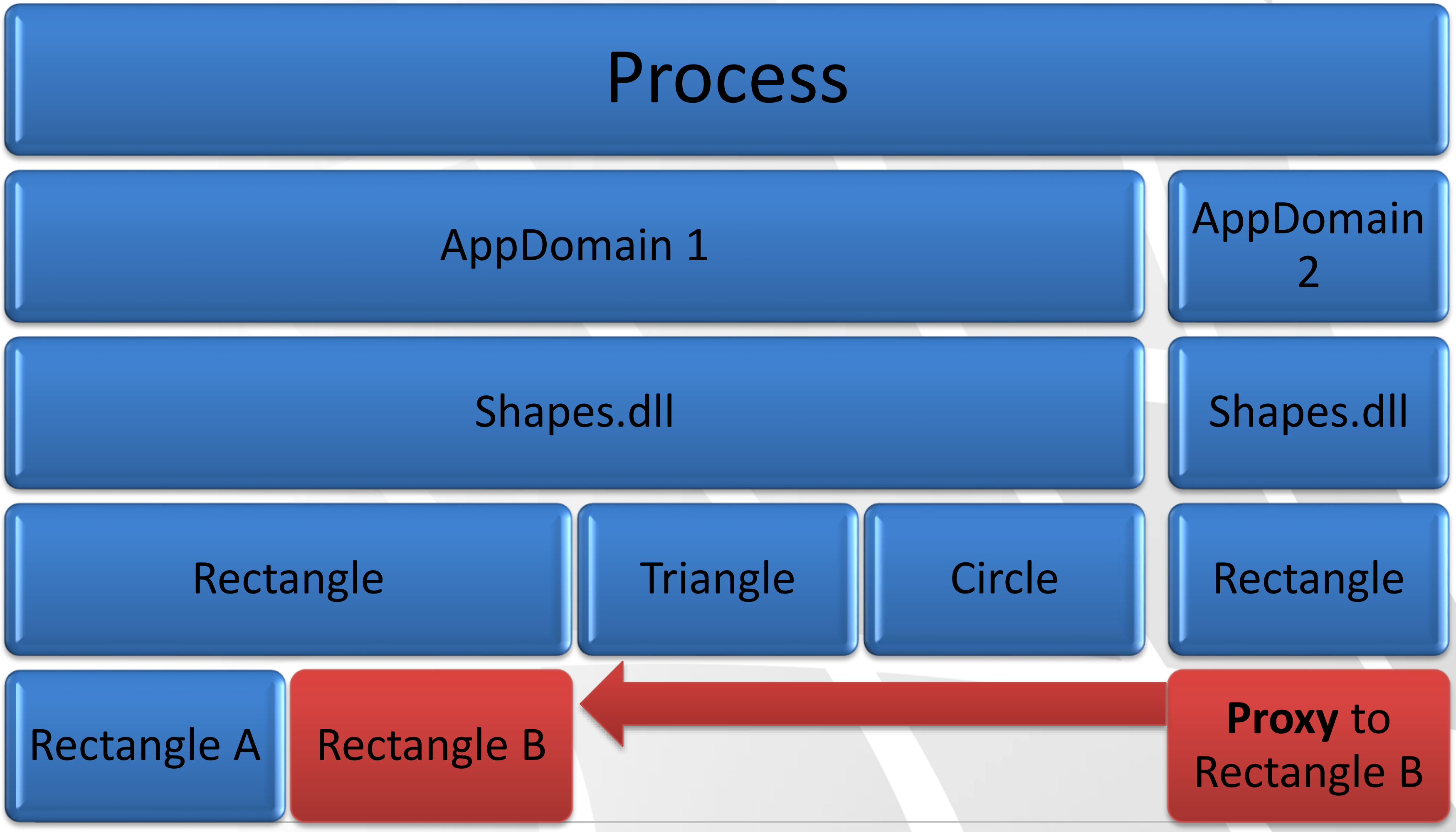
Crossing AppDomain Boundaries



Marshal-by-Value



Marshal-by-Reference



MBV vs. MBR

Demo

AppDomain Monitoring

- Monitor CPU and memory usage of individual AppDomains
- Enable through configuration, code, or hosting

```
AppDomain.MonitoringIsEnabled = true;
AppDomain domain = AppDomain.CreateDomain(...);
if (domain.MonitoringTotalProcessorTime >
      TimeSpan.FromSeconds(5)) . . .
```

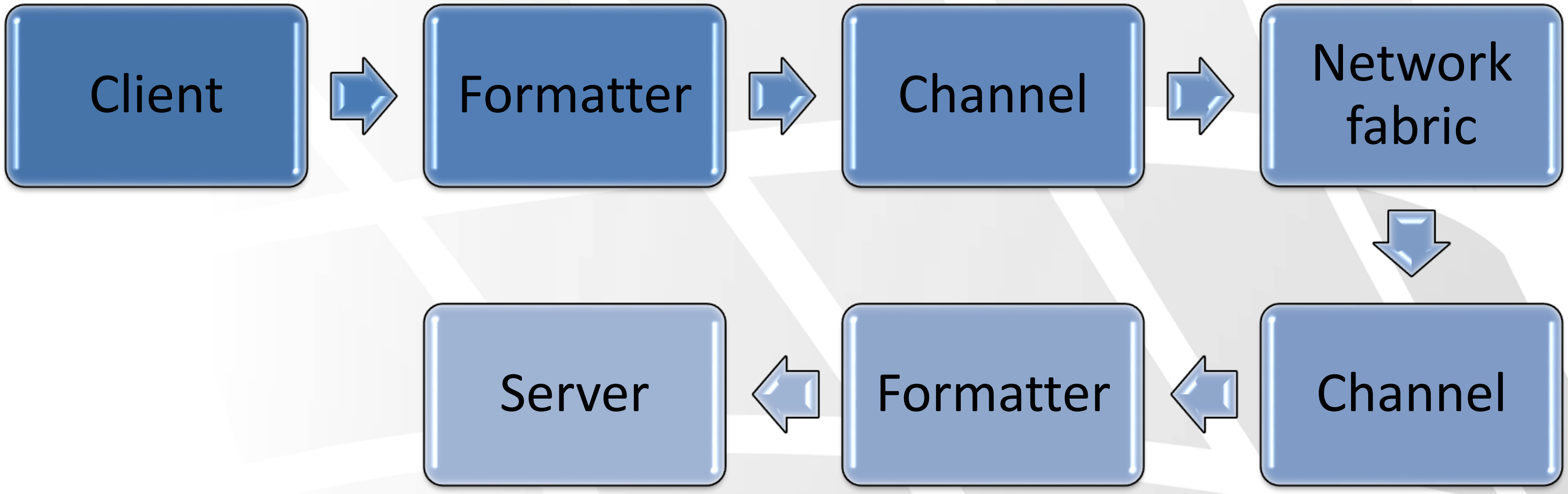
```
<configuration>
  <runtime>
    <appDomainResourceMonitoring enabled="true" />
  </runtime>
</configuration>
```

AppDomain Monitoring

Demo

.NET Remoting Overview

- Distributed computing infrastructure
- The same framework used by MBR



Remote Exec

Demo

Plugin Framework

Lab

Summary

- AppDomains as isolation boundaries
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Questions ?