Design Patterns, Multithreading

Object-oriented software design

Dr. Balázs Simon

BME, IIT

Design Patterns

Match the following OO design heuristics with the most appropriate design patterns! Use each pattern exactly once!

1. A container object should use the contained objects
2. Roots of the inheritance hierarchy should be interfaces or abstract classes
3. Contained objects should not communicate with each other directly
4. Model optional elements as containment and never as inheritance
5. Never test for the type of an object, use polymorphism instead

A. Visitor
B. Decorator
C. Null Object
D. Abstract factory
E. Mediator

1	2	3	4	5

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B	D	E	C	A

Which OO design heuristics are violated by the Strategy pattern?

- Never test for the type of an object, use polymorphism instead
- Avoid classes with only accessor methods
- Avoid classes which should be methods
- Keep related data and behavior together
- Model for behavior not for roles
- A class should not depend on its descendants

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Megoldás

Which OO design heuristics are violated by the Acyclic Visitor pattern?

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Megoldás

Which OO design heuristics are violated by the Object-Relational Mapping pattern?

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Megoldás

Multithreading

True or false

True or false

Is the following statement true or false?

The combination of atomic operations is also atomic.

True or false

Is the following statement true or false?

Solution: False

The combination of atomic operations is also atomic.

True or false

Is the following statement true or false?

The Guarded suspension pattern can be implemented using the Monitor object pattern.

True or false

Is the following statement true or false?

Solution: True

The Guarded suspension pattern can be implemented using the Monitor object pattern.

True or false

Is the following statement true or false?

A Mutex can be implemented
as a Semaphor with a counter of 1.

True or false

Is the following statement true or false?

Solution: True

A Mutex can be implemented
as a Semaphor with a counter of 1.

True or false

Is the following statement true or false?

In the case of the Readers-writer lock multiple threads can read the resource at the same time.

True or false

Is the following statement true or false?

Solution: True

In the case of the Readers-writer lock multiple threads can read the resource at the same time.

True or false

Is the following statement true or false?

The Double-checked locking pattern cannot always be implemented correctly.

True or false

Is the following statement true or false?

Solution: True

The Double-checked locking pattern cannot always be implemented correctly.

True or false

Is the following statement true or false?

When we implement an API in C#:
from inside a lock block it is
not recommended to call virtual methods,
that can be overridden by the users of the API.

True or false

Is the following statement true or false?

Solution: True

When we implement an API in C#:
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Selection

Which pattern is described by the following sentence?

Waiting until a lock is acquired and a precondition is met

- Cancellation token
- Future
- Guarded suspension
- Thread local context

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Solution

Which pattern is described by the following sentence?

Mutual exclusion and notification of other threads

- Cancellation token
- Monitor object
- Future
- Thread local context

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Solution

Which pattern is described by the following sentence?

Allow multiple threads to continue after an operation is done

- Auto reset event
- Monitor object
- Manual reset event
- Future
- Thread local context

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Solution

Which design pattern should be implemented using Double-checked locking?

A. Visitor
B. Singleton
C. Observer
D. Command
E. Strategy

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Selection

In an application, documents to be printed are coming from multiple threads. However, only one document can be printed at once. The following patterns help to synchronize the print jobs:

- ManualResetEvent
- AutoResetEvent
- Thread-local context
- Leader-followers

Selection

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Selection

We are implementing a multi-threaded web server where we would like to provide information about the clients inside the functions which are handling the requests, however, we do not want to pass this information as parameter to the functions. Which of the following patterns can help to solve this problem?

- Asynchronous completion token
- Cancellation token
- Global context
- Future
- Thread-local context

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Solution

Which Java keyword can be used to implement the Scoped locking pattern?

A. scope
B. lock
C. synchronized
D. mutex

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Solution

Which of these can be the output of the following code?

```
for (int i = 0; i < 10; i++)
    new Thread(() => Console.Write(i)).Start();
```

A. 0123456789
B. 0223555799
C. 0223556889
D. 5148963207
E. 0000000000
F. 9999999999

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Solution

Which of these can be the output of the following code?

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for (int i = 0; i < 10; i++)
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    int tmp = i;
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