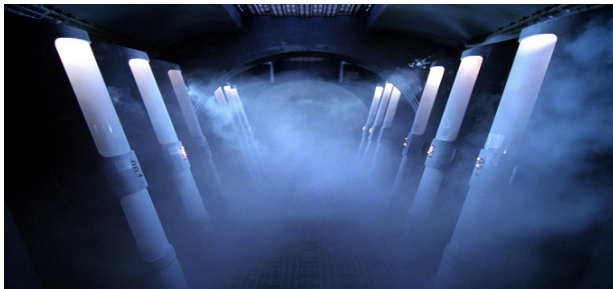


# Object Serialization

Spring 2016



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[Examples are in the repository folder `examples/serialization`.]



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- ▶ Example 2: `MioAlma.java`, `Cryogenics.java`
  - ▶ Shows how to (de)serialize our own class. Also shows the affect of the `transient` keyword.

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`<access-modifier> static long serialVersionUID = <UID>L;`
- ▶ Use the program `serialver` (bundled with Java) to generate the `serialVersionUID` for a given class. Or use Eclipse to generate it for you!

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- ▶ Going the other way requires additional processing depending upon the amount of backwards compatibility desired.

# Serialization Experiments

Examples: `MioAlma.java`, `Cryogenics.java`, `MioAlmaDos.java`.

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  - 4.1 Revert `MioAlma` back to version 1.
  - 4.2 Revive a `MioAlma` version 1 object from a freeze-dried `MioAlma` version 2 object!

- ▶ It is strongly recommended that all serializable classes explicitly declare `serialVersionUID` values, since the default `serialVersionUID` computation is highly sensitive to class details that may vary depending on compiler implementations, and can thus result in unexpected `InvalidClassExceptions`.

# Custom Deserialization

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- ▶ Example:

```
private void readObject (ObjectInputStream s)
{
    s.defaultReadObject(); //standard deserialization
    initialize(); //our custom initialization
    //call optional method after customization
    if (isRunning)
        start();
}
```

# Overriding Deserialization

- ▶ Use the `java.io.Externalizable` interface to override the serialization process.

<code>void readExternal(ObjectInput in)</code>
<code>void writeExternal(ObjectOutput out)</code>

- ▶ `readExternal`: Implement the method to restore its contents by calling the methods of `DataInput` for primitive types and `readObject` for objects, strings and arrays.
- ▶ `writeExternal`: Implement the method to save its contents by calling the methods of `DataOutput` for its primitive values or calling the `writeObject` method of `ObjectOutput` for objects, strings, and arrays.



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  - ▶ Encrypt and sign the entire object using `javax.crypto.SealedObject` and/or `java.security.SignedObject` wrapper. However, this requires managing symmetric keys.
  - ▶ For secure transport over the network, use SSL (Secure Sockets Layer) layer to encrypt the data. This requires minimal change in our code and is a widely used technique.

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- ▶ Research how to use the `Kryo` serialization framework for Java. Convert the program from the previous exercise to use *Kryo* and then time the program again.
- ▶ Research how to use the `Protocol Buffers` serialization framework for Java. Convert the program from the previous exercise to use *Protocol Buffers* and then time the program again.



- ▶ Other object serialization frameworks: Kryo, JSON, Google Protocol Buffers, Apache Avro, Facebook Thrift etc.
- ▶ Serialization (Wikipedia).  
<https://en.wikipedia.org/wiki/Serialization>
- ▶ Performance comparison of various serialization frameworks:  
<http://www.slideshare.net/AlexTumanoff/serialization-and-performance>