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Implementations of a Service-Oriented Architecture on top of Jini, JXTA and OGSA

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London e-Science Centre,
Imperial College London, UK

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ICENI: Imperial College e-Science Network Infrastructure

- Interoperable and Integrated Grid Middleware
- Service Oriented Architecture (SOA) with rich Metadata Description
- Service Federation govern by Usage Policy and Service Level Agreement
- Foundation for higher-level Services and Autonomous Composition

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ICENI Provides...

- Service Oriented Architecture
- Component Programming Model
- Scheduling Framework
- Meta-data Schemas
- User Environment

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ICENI Provides...

- Service Oriented Architecture

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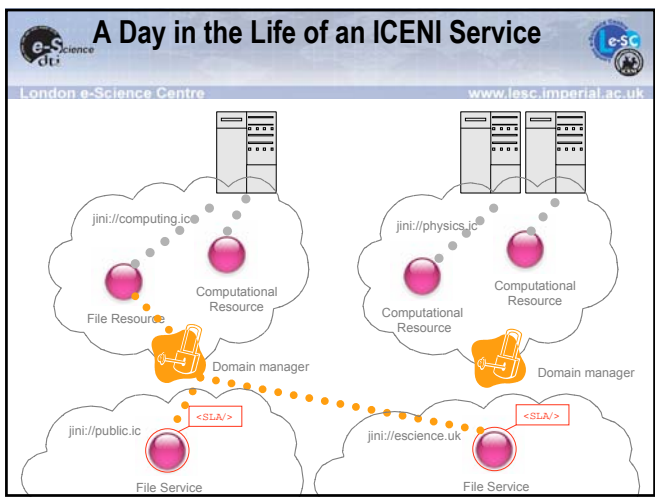
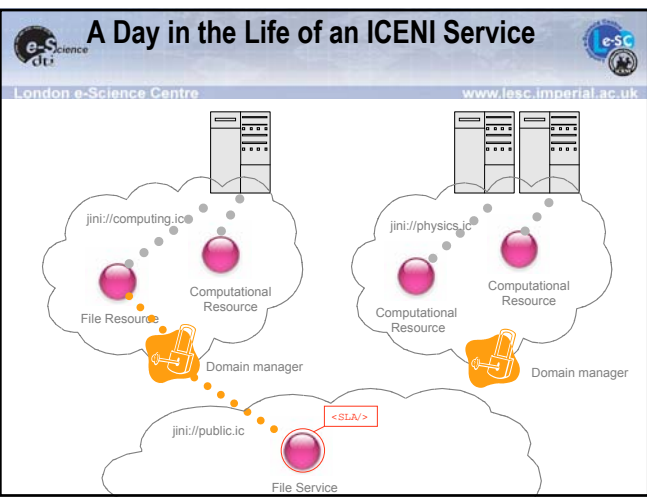
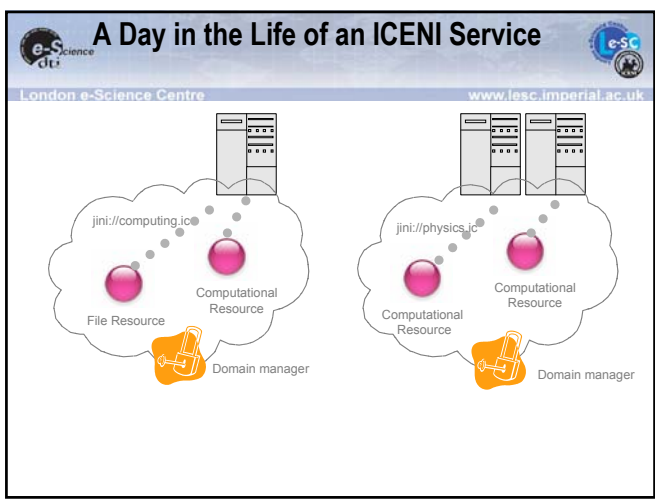
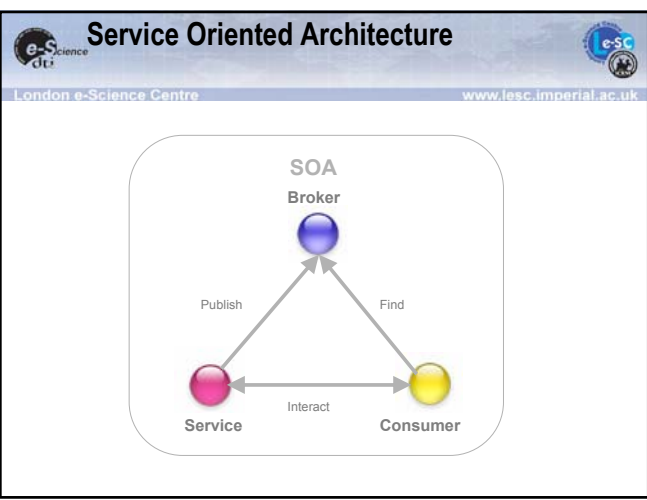
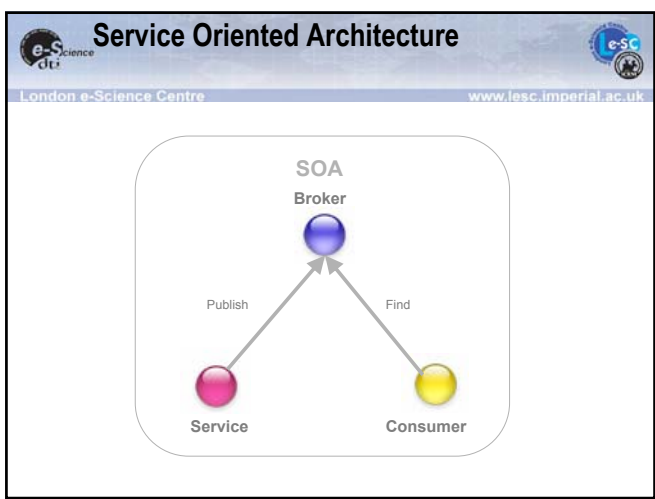
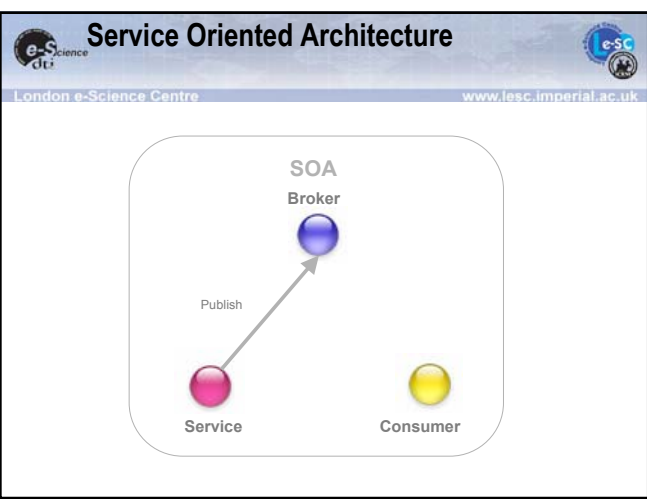
- Service Oriented Architecture
- ICENI Services
- Implementations:
 - Jini
 - JXTA
 - OGSA
- Comparison
- Conclusion

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Service Oriented Architecture

```

graph TD
    Broker[SOA Broker]
    Service[Service]
    Consumer[Consumer]
    Broker --- Service
    Broker --- Consumer
  
```



ICENI Service Interface

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```

public interface CounterService extends ResourceService {
    public int addValue(int pValue) throws IcenIServiceException;
    public int subtractValue(int pValue) throws IcenIServiceException;
    public int getValue() throws IcenIServiceException;
} // end interface CounterService

```

ICENI Service Implementation

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```

public class Counter extends Resource implements CounterService {
    public int addValue(int pValue) throws IcenIServiceException { ... }
    public int subtractValue(int pValue) throws IcenIServiceException { ... };
    public int getValue() throws IcenIServiceException { ... };
} // end class Counter

```

ICENI Access Contract

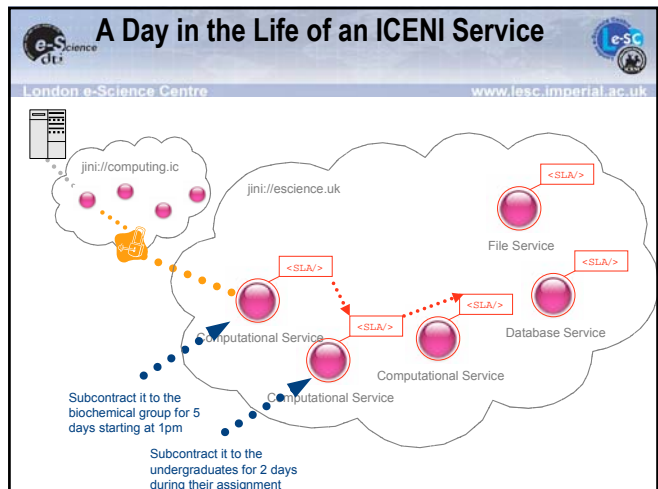
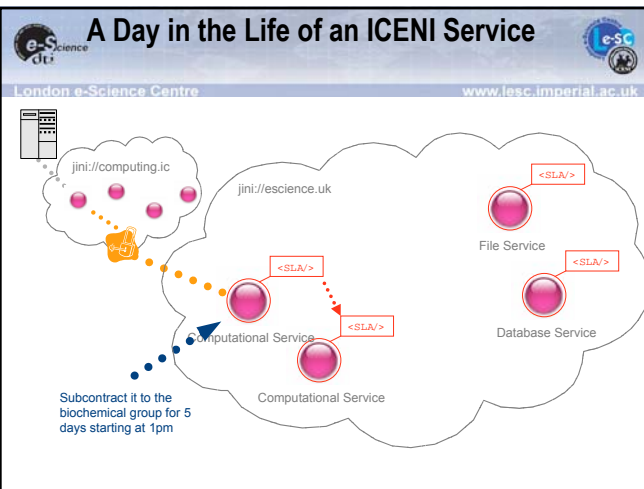
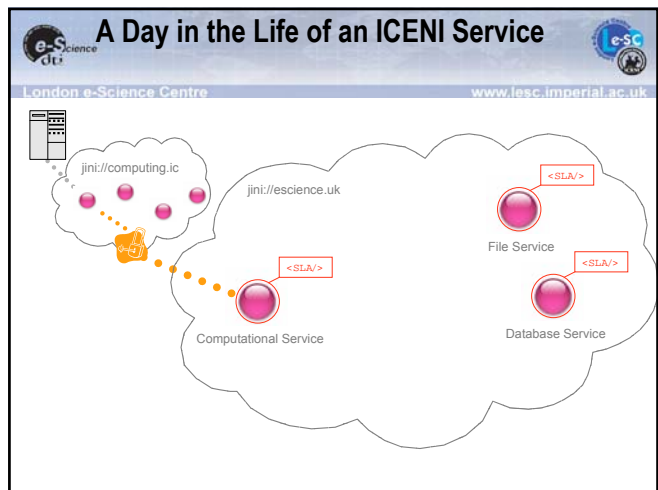
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- Defines the entities allowed or not to access the service, and the interval time the access is allowed or denied.
- Same service can be made available in different communities with different service level agreement.

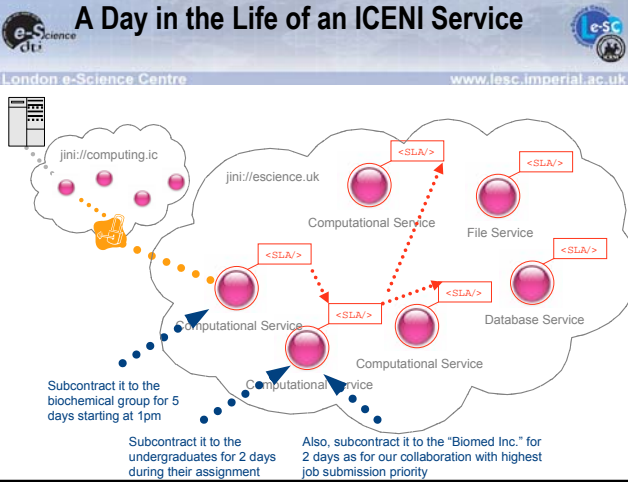
```

<publicDomain name="public1">
  <accessPolicy>
    <allow startDay="monday" stopDay="friday" stopHour="12" stopMn="00">
      <entity type="organisation" name="eScience"/>
    </allow>
  </accessPolicy>
</publicDomain>

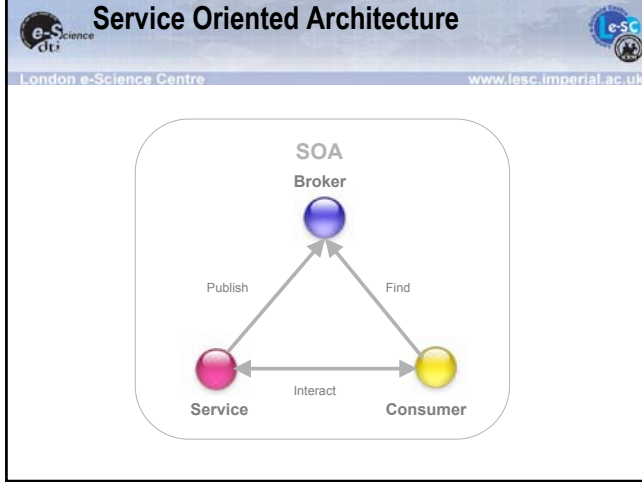
```



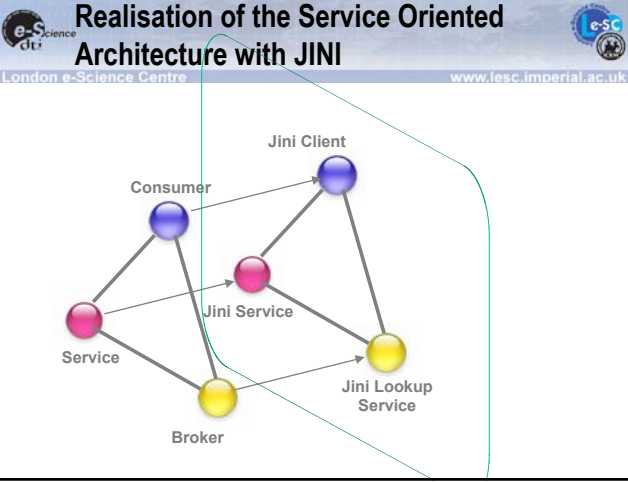
A Day in the Life of an ICENI Service



Service Oriented Architecture



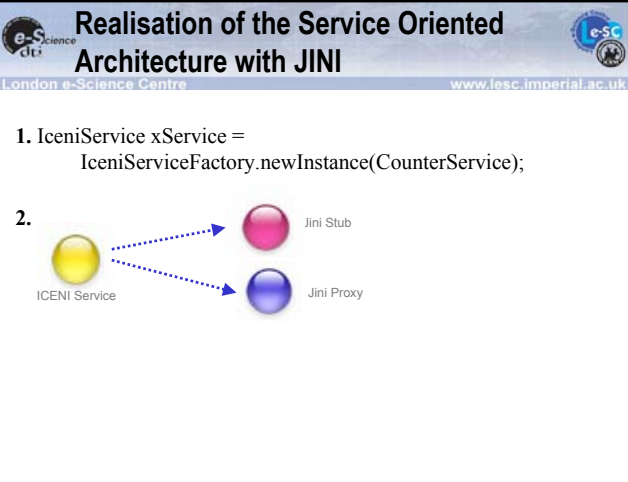
Realisation of the Service Oriented Architecture with JINI



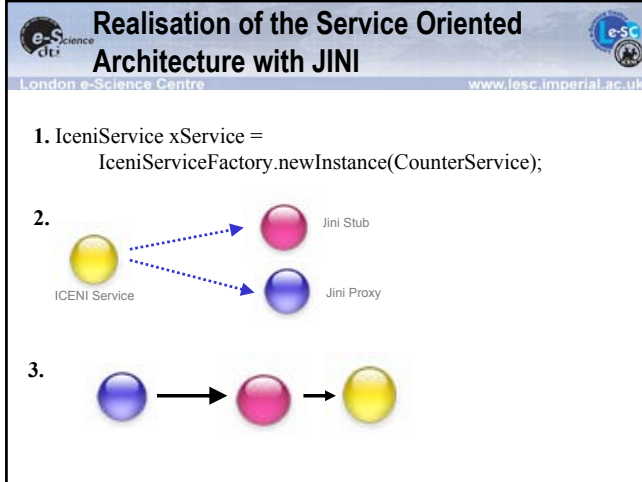
Realisation of the Service Oriented Architecture with JINI

1. `ICeniService xService = ICeniServiceFactory.newInstance(CounterService);`

Realisation of the Service Oriented Architecture with JINI



Realisation of the Service Oriented Architecture with JINI



Realisation of the Service Oriented Architecture with JINI

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1. `IceniService xService = IceniServiceFactory.newInstance(CounterService);`
- 2.
- 3.

Realisation of the Service Oriented Architecture with JINI

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1. `IceniService xService = IceniServiceFactory.newInstance(CounterService);`
- 2.
- 3.

Realisation of the Service Oriented Architecture with JINI

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- Pros
 - One to one mapping
 - Scalability
- Cons
 - Security
 - Connection through firewall

Realisation of the Service Oriented Architecture with JXTA

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Realisation of the Service Oriented Architecture with JXTA

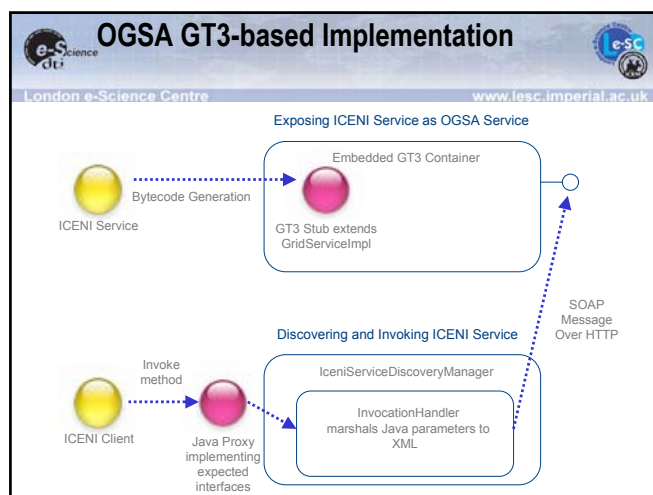
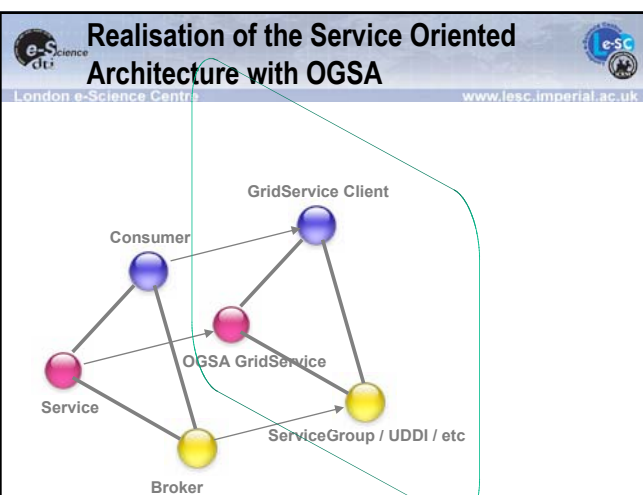
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1. `IceniService xService = IceniServiceFactory.newInstance(CounterService);`
- 2.
- 3.


Realisation of the Service Oriented Architecture with JXTA

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- Pros
 - Easy to create virtual organisation, through JXTA peergroups
 - Can overlay different invocation architectures over JXTA pipes
 - Lightweight, firewall-proof, interchangeable network protocols
- Cons
 - Security, Consistency
 - No safe removal mechanism for advertisement
 - JXTA is based on XML protocols
 - Doesn't map onto a traditional service oriented architecture




- ## Realisation of the Service Oriented Architecture with OGSA
- Pros
 - Interoperable: ICENI Client and OGSA Client can interact with ICENI services
 - Cons
 - XML-to-Java marshalling is expensive
 - GT3 is resource hungry, we need lightweight OGSI implementation.
 - XML-Java type mapping is not automatic
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- ## Discussion
- What have we learned?
 - A basic SOA is not enough for a grid middleware.
 - We need security at every level of the infrastructure
 - ➔ Bringing together the 3 implementations would provide us with a valid and robust SOA.
- 
- JINI 2.0
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- ## Future Works
- Implement the ICENI's SOA on top of JINI 2.0
 - ➔ Basic SOA + Advanced security model
 - Define a protocol allowing different implementations to interact.
 - ➔ Use of OGSA, we already have a JINI to OGSA Gateway.
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ICENI: An integrated Grid Middleware



<http://www.lesc.ic.ac.uk/iceni/>

- ICENI Open Source licence
- Project website & mailing lists
- Daily builds, regression & automated deployment tests
- Documentation, manuals & user guide

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Acknowledgements



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