AN ARCHITECTURAL PATTERN FOR ADAPTABLE MIDDLEWARE INFRASTRUCTURE

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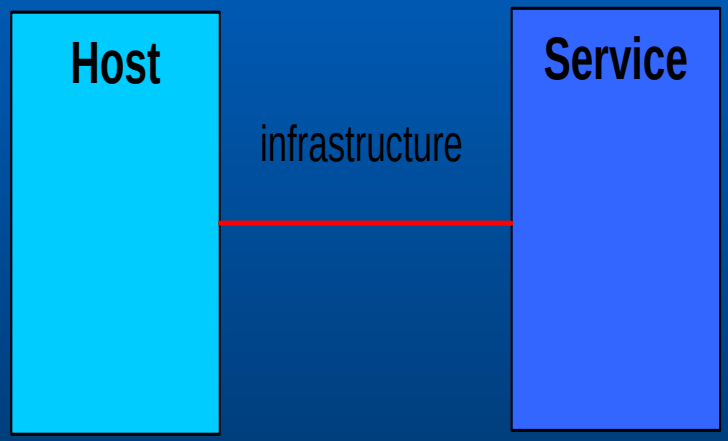
Project Goals

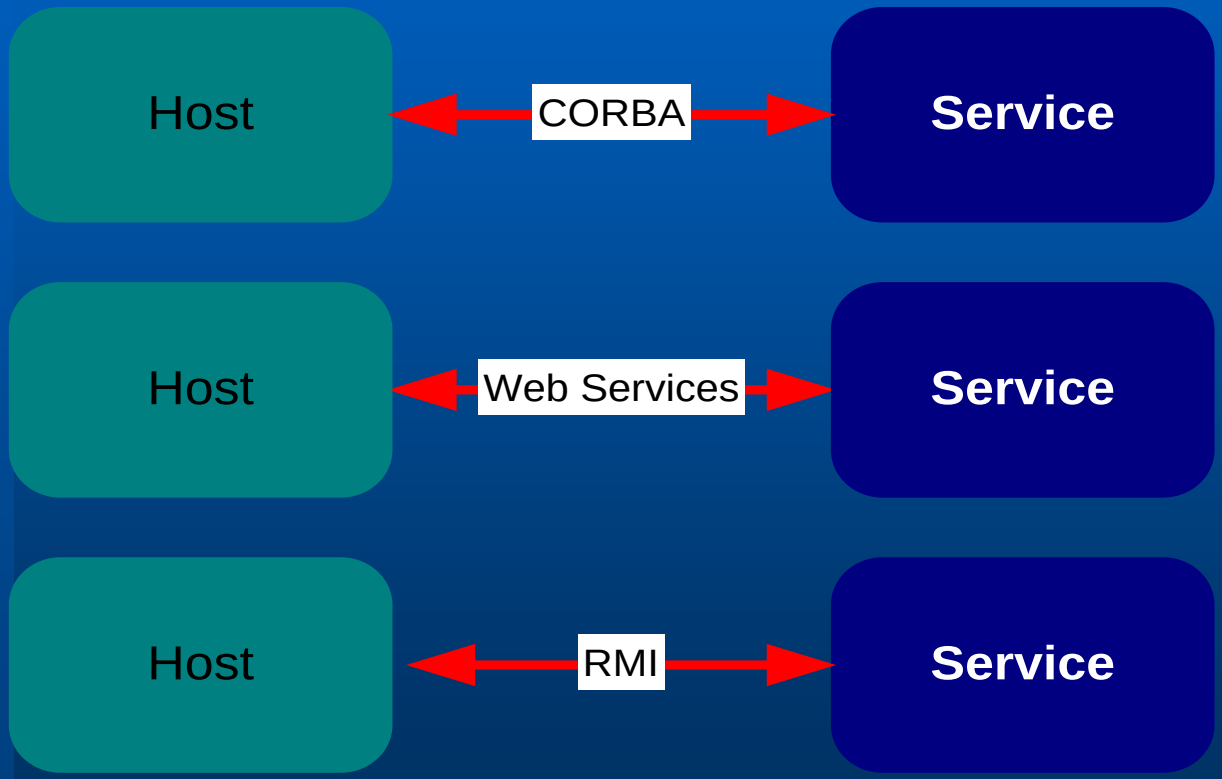
- **To define an architectural pattern that allows applications to adapt to new middlewares easily.**
  - **Separates the operations of the logic from the technology used to facilitate distributed communications**
  - **Minimal effort to adapt and stabalize.**

Problem Domain

- **Distributed computing**
  - **Accomplished with some middleware**
  - **Must have code in place on both sides to support infrastructure**



Common Implementation



Disadvantages

- **Infrastructure coupled with business logic**
  - **The business logic is intimately tied to the middleware API.**
  - **The messages are defined by the interface definition of the language for marshaling purposes.**

1st Problem: Direct Access to API

- **RMI**
  - **Client**
    - **Obtain reference to rmi stub**
    - **Pass it around and invoke remote methods on it**
  - **Server**
    - **Implement business logic in implementation of rmi interface (after all it is an interface)**
- **CORBA**
  - **Client**
    - **Narrow your reference**
    - **Pass it around and invoke methods on it**
  - **Server**
    - **Implement logic directly**

2nd Problem: Message Marshaling

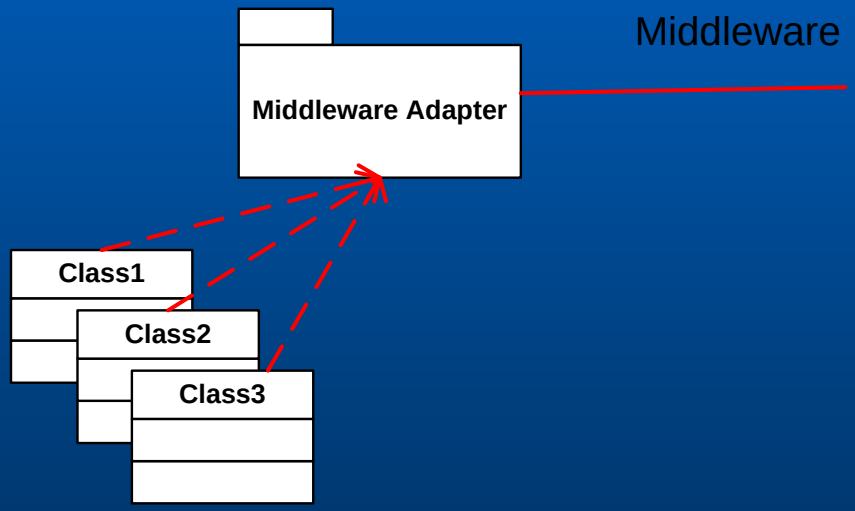
- **Complex types must be marshaled across the network.**
  - **RMI**
    - **Messages are serialized java types**
    - **Define a message type**
      - **Now the messaging is tied to the infrastructure**
  - **CORBA**
    - **Complex types are defined by the interface definition language.**
      - **The middleware does the marshaling of the complex types.**

Solution

- **Apply a behavioral pattern to both sides to decouple the infrastructure**
  - **Centralize and abstract the API to the middleware from the host application using it.**
  - **Decouple the message interpretation of complex types from the middleware infrastructure.**

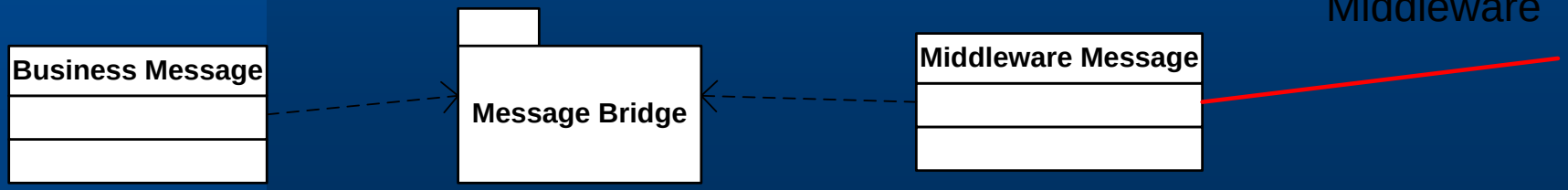
Centralize the Infrastructure

- **Wrap the middleware and never expose the API**
  - **This will decouple the technology from either side**
- **Use an adapter pattern to allow for new technologies**



Decouple the Message Passing

- **Interpret the complex types in the host application.**
  - **Perform message mapping to internal proprietary types**
  - **Use some message bridge to map the objects into a common form understood by all middlewares.**



Client Side Application Code

```
public Team GetTeamById(int teamId)

// obtain proxy to server object
ITeamService teamService = GetRemoteTeamServiceObject();

GetTeamReq req = new GetTeamReq();
req.teamId = teamId;

// get request string
string request = AppServices.ConvertObjectToString(req);

string response = teamService.GetTeamById(request);

// convert string response into team object
Team team = (Team)AppServices.ConvertStringToObject(response,typeof(Team));

// return object
return team;
```

Server Side Web Service Code

```
[WebMethod]
public string GetTeamById(string request)
{
        // forward the request to the business layer
        return new TeamService().GetTeamById(request);
}
```

Server Side Application Code

```
public string GetTeamById(string request)
{
        // this is how we convert a string into our
        // application logic request object
        GetTeamReq req = (GetTeamReq) AppServices.ConvertStringToObject(request,typeof(GetTeamReq));

        // now using a team (entity) manager obtain it's info
        TeamMgr mgr = new TeamMgr();
        Team team = mgr.GetTeamById(req.teamId);

        // now serialize the team object back into a string
        string response = AppServices.ConvertObjectToString(team);

        return response;
}
```

Conclusions

- **Only had to map message interpretation once.**
- **Each new middleware didn’t change any of my application logic.**
  - **No re-compiling**
  - **No re-testing**
- **We were able to adapt to each new middleware easier.**

References

- Mullender, Maarten. *Some Architectural Patterns for the Enterprise*, Webcast, Microsoft 2002.
  - See http://www.microsoft.com/usa/webcasts/ondemand/960.asp
- .NET Remoting, Tutorial, Microsoft 2002.
  - See http://msdn.microsoft.com/library/default.asp?url=/library/en-us/dndotnet/html/hawkremoting.asp
- .NET Remoting, Tutorial, 2002.
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