



Assessment of Distributed Object Middleware

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Background

- *Sept '98* (15 mos): Joint project GSFC/ARC/SJSU - ECS Distributed Object Middleware & Alternative Technology
 - *Nov '98* (18 mos): grant to SJSU – Assessment of Distributed Object Middleware
- *Objective*: Technology assessment & performance evaluation of alternative technology to OODCE within EOSDIS



Tasks

- Develop test environment
- Examine ECS Middleware
- Analyze Subscription Server & Design alternative
- Investigate alternatives to OODCE/DCE interface
- Investigate alternatives to CDS – using LDAP
- Evaluate CORBA/DCOM bridges
- Evaluate CORBA/DCE bridge

<http://www.engr.sjsu.edu/fatoohi/eosdis>



Develop test environment

- Acquired & installed DCE, OO-DCE, CORBA, ECS IDLs, ... at SJSU
- Lab has Solaris (UltraSPARC II), NT (Pentium II), AIX (RS6000) machines



Examine ECS Middleware

(D. McNab, R. Fatoohi, T. Lasinski)

- Observations on ECS:
 - Problems w/ DCE: non O-O, complexity, ...
 - Lack of abstraction model
 - Lack of COTS usage
- Future Directions:
 - Hard to extract DCE due to crosstalk & abstraction violation
 - Replacement w/ non COTS component
 - Replacement w/ COTS – CORBA

<http://www.engr.sjsu.edu/fatoohi/eosdis/mcnab.html>



Analyze Subscription Server & Design Alternative

(R. Maheshwari & R. Fatoohi)

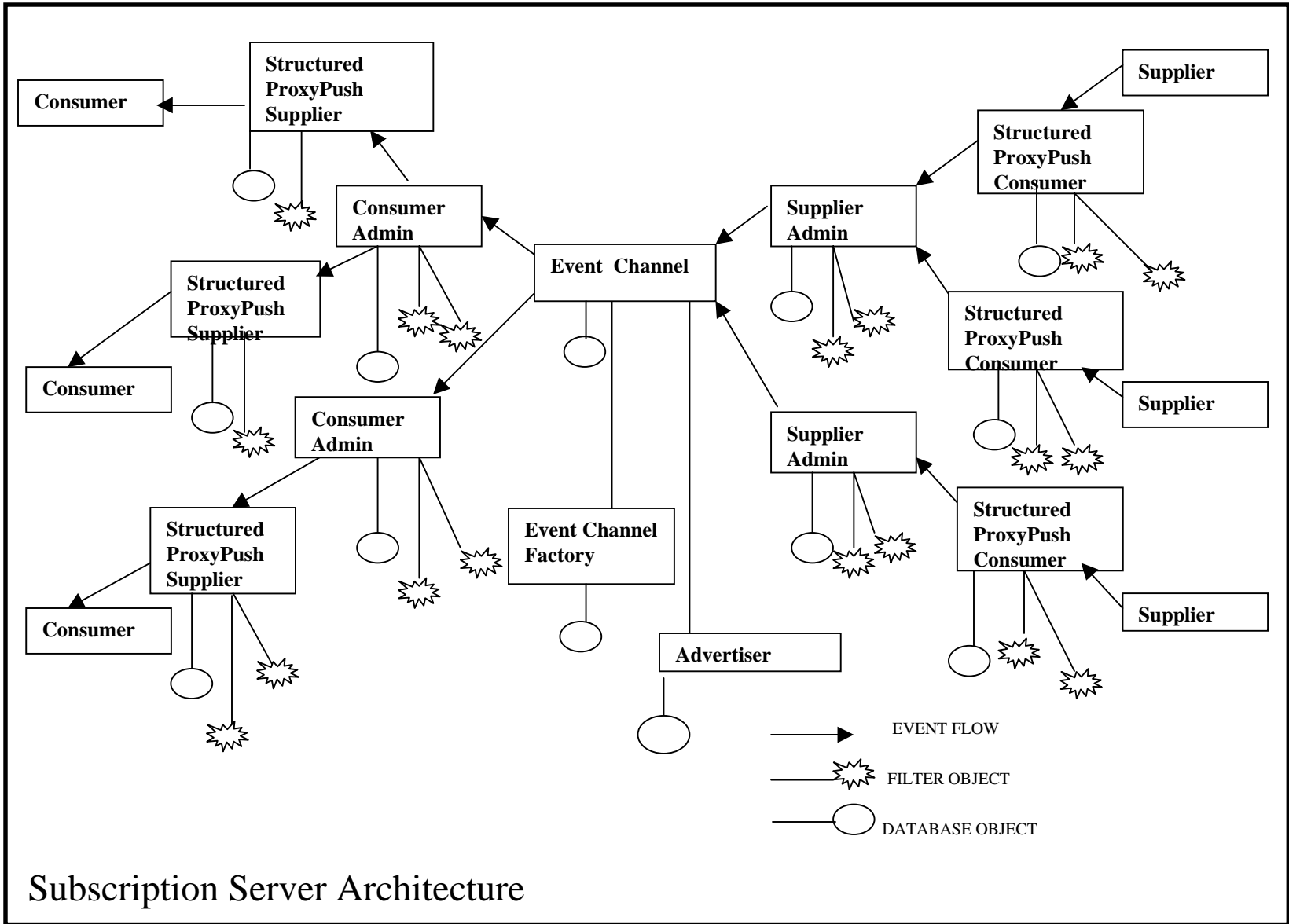
- Analyzed ECS Subscription Server
- Designed & implemented subscription server based on OMG Notification Service
 - Uses Structured Push Style communication
 - Tested for Auction Alert System

<http://www.engr.sjsu.edu/fatoohi/eosdis/Subscription.pdf>



Main Features of Designed Subscription Server

- Push Type Communication Model
- Structured Events
- Event Forwarding Filters
- QoS properties: Connection Reliability & Event Reliability
- Admin properties: MaximumSuppliers, MaximumConsumers & MaximumQueueLength
- In memory persistent objects
- Ability to restore state
- An advertiser which advertises offers made by suppliers & subscriptions made by consumers





Investigate alternatives to CDS

(S. Ahmed & R. Fatoohi)

- Evaluated Triangulum bridging products that allow replacing CDS w/ LDAP
- Using LDAP as generic Naming & Directory Service to replace others: CORBA Naming, RMI Registry & CDS
 - Develop CDS Service Provider Interface API as plug-in to JNDI 1.2 API
 - Testing using online bill payment system
http://www.engr.sjsu.edu/fatoohi/eosdis/jndi_ldap_java.html



DCOM/CORBA Bridges

(Q. Wang, C. Zheng & R. Fatoohi)

- 2 bridges: ObjectBridge by Visual Edge & OrbixCOMet by IONA
 - Both bi-directional & dynamic
- NT 4.0 w/ Pentium II 233 MHz, 128 MB
- C++ (both) , Java & Applet (ObjectBridge)
 - Same language for both client & server
- *Count*: Invokes method to increment variable 1000 times & measures average response time
- **C**: Client, **S**: Server, **B**: Bridge; **X**, **Y**, **Z**: 3 machines; all results in milliseconds.



ObjectBridge C++ Client & Server

	CORBA Server	DCOM Server
CORBA	C & S on X: 0.397	C, B & S on X: 1.525
	C on X, S on Y: 0.991	C & B on X, S on Y: 1.604
		C on X, B & S on Y: 1.702
C		C on X, B on Y, S on Z: 1.834
DCOM	C, B & S on X: 0.841	C & S on X: 0.23
	C & B on X, S on Y: 1.141	
	C on X, B & S on Y: 1.082	C on X, S on Y: 1.262
C	C on X, B on Y, S on Z: 1.191	



DCOM/CORBA Bridges: Observations

- ObjectBridge is faster than OrbixCOMet
- Each bridge adds ~ 0.5 ms overhead
- In general, C++ outperforms Java
- Bridge location impact is insignificant
- Java Applet is slow

<http://www.engr.sjsu.edu/fatoohi/Bridge.pdf>

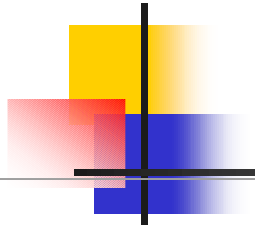
<http://www.engr.sjsu.edu/fatoohi/eosdis/CharltonReport.pdf>



DCE/CORBA Bridge

(V. Gunwani & R. Fatoohi)

- DCE-CORBA bridge by Inprise
- Unidirectional: CORBA client -> DCE server
- Acts as CORBA server (<- CORBA client) & DCE client (-> DCE server)
- Supports VisiBroker ORB only
- Generates CORBA IDL from DCE IDL
- Solaris 2.5, UltraSPARC Iii 333 MHz, 128 MB
- Client language: C++, Java, Java Applet



DCE-CORBA Bridge

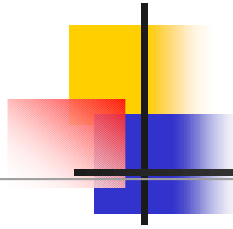
	DCE Server	CORBA Server
DCE C	C & S on X: 0.698	N/A
	C on X, S on Y: 1.089	N/A
C++ CORBA C	C, B & S on X: 7.832	C & S (C++) on X: 0.583
	C & B on X, S on Y: 7.996	
	C on X, B & S on Y: 7.856	C on X, S (C++) on Y: 0.842
	C on X, B on Y, S on Z: 7.475	
Java CORBA C	C, B & S on X: 8.334	C & S (Java) on X: 1.472
	C & B on X, S on Y: 8.271	
	C on X, B & S on Y: 7.569	C on X, S (Java) on Y: 1.401
	C on X, B on Y, S on Z: 7.768	
Java applet CORBA C	C, B & S on X: 11.326	C & S (Java) on X: 4.373
	C & B on X, S on Y: 10.909	
	C on X, B & S on Y: 28.161	C on X, S (Java) on Y: 25.807
	C on X, B on Y, S on Z: 29.661	



DCE/CORBA Bridge: Observations

- Delay through bridge: 7 ms
- CORBA IIOP is bit faster than DCE RPC
- C++ faster than Java & much faster than Java Applet
- Bridge location impact is insignificant

<http://www.engr.sjsu.edu/fatoohi/eosdis/Vandana.pdf>



OODCE-CORBA Bridge

	OODCE Server	CORBA Server
OODCE Client	C & S on X: 0.797	N/A
	C on X, S on Y: 1.127	N/A
C++ CORBA Client	C, B & S on X: 7.461	C & S (C++) on X: 0.583
	C & B on X, S on Y: 8.041	
	C on X, B & S on Y: 7.510	C on X, S (C++) on Y: 0.842
	C on X, B on Y, S on Z: 7.805	
Java CORBA Client	C, B & S on X: 7.847	C & S (Java) on X: 1.472
	C & B on X, S on Y: 7.973	
	C on X, B & S on Y: 7.626	C on X, S (Java) on Y: 1.401
	C on X, B on Y, S on Z: 8.083	



Alternatives to OODCE/DCE interface

(D. Jensen, S. Gawai & R. Fatoohi)

- OODCE over IIOP
 - Motivated by Java RMI over IIOP
 - IIOP is mature & well-supported technology
 - No change to application code
 - Work in progress
- Source-level Migration
 - Encapsulate CORBA stubs & skeletons within OODCE-style classes
 - Use idl++, ORB & converter

<http://www.engr.sjsu.edu/fatoohi/eosdis/ASMOC.pdf>