



# SOA Design & Implementation

## *Lessons Learned*

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# Agenda

- Introductions
- What's a SOA?
- Leverage What You Build -- with a Portal
- “Future-Proof”
- Implement Incrementally
- Successful Services We've Deployed
- Recommendations

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- Recommendations

# Introductions

- Who am I?
- What is Bluedog?
- Where'd we come up with this?

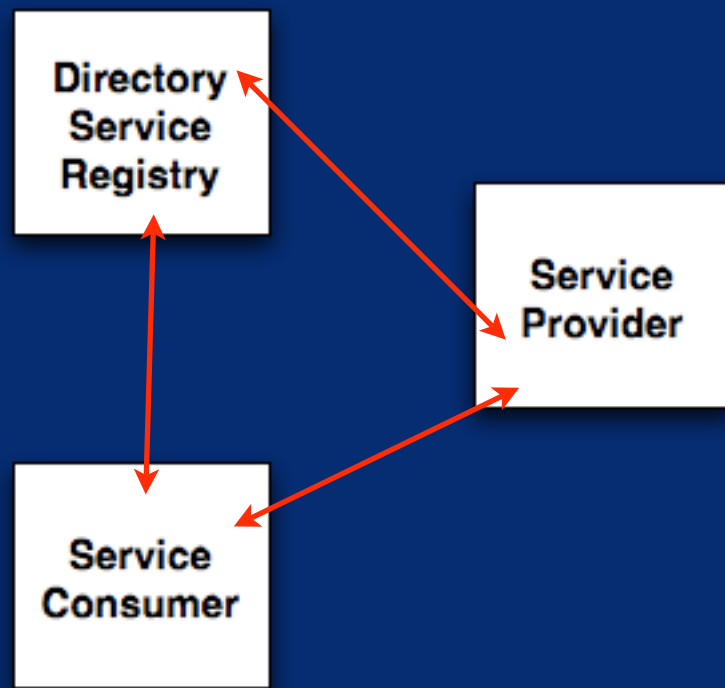


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# What's a SOA? the archetype

## Archetypal SOA



An enterprise environment to deploy reusable standards-based software components.

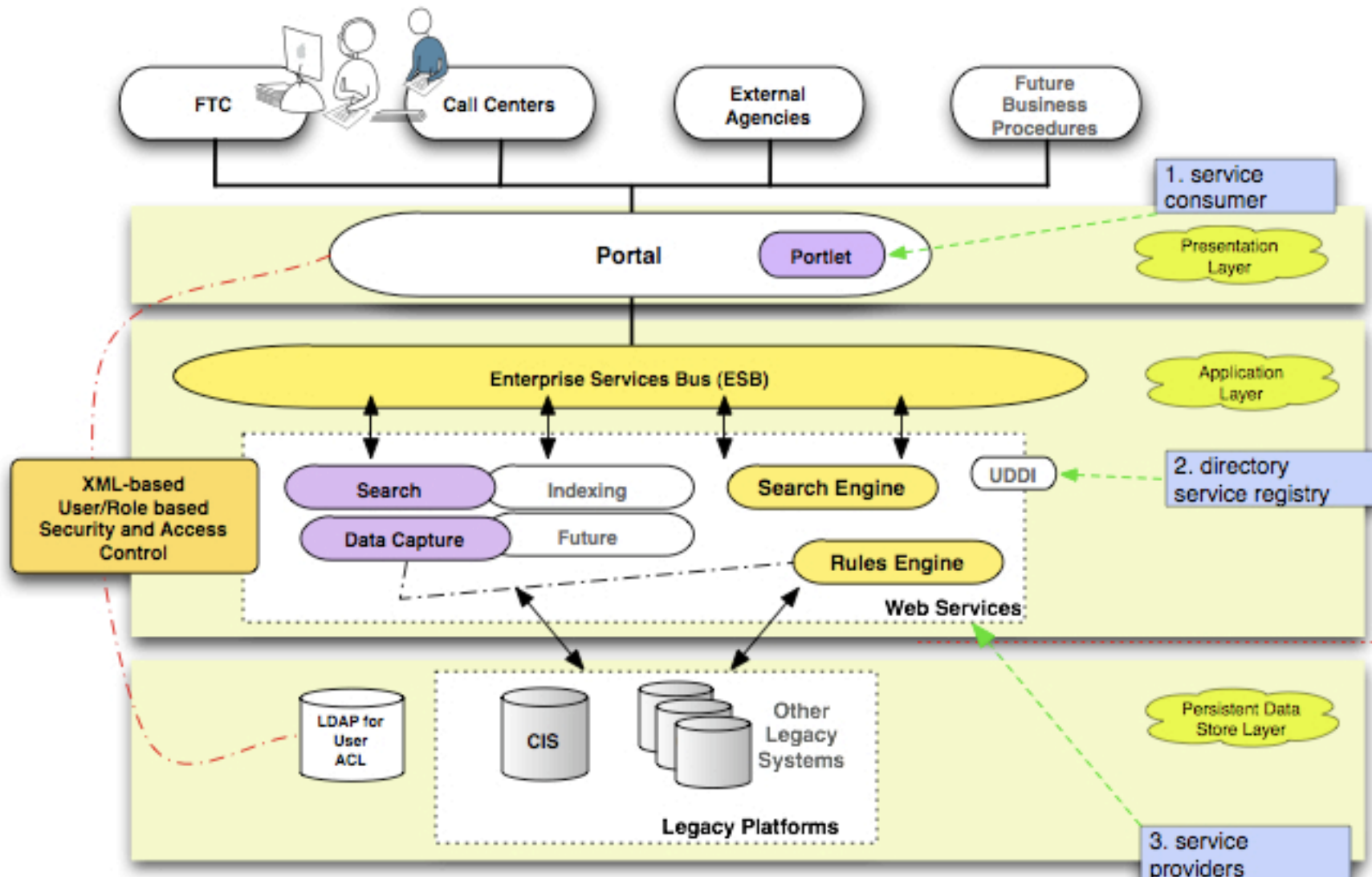
Driven by business users—not the IT department.

# What's a SOA? why do it right

To achieve the broad benefits of service-oriented architecture — reuse, agility and real time governance — the design methodology must be deliberate.

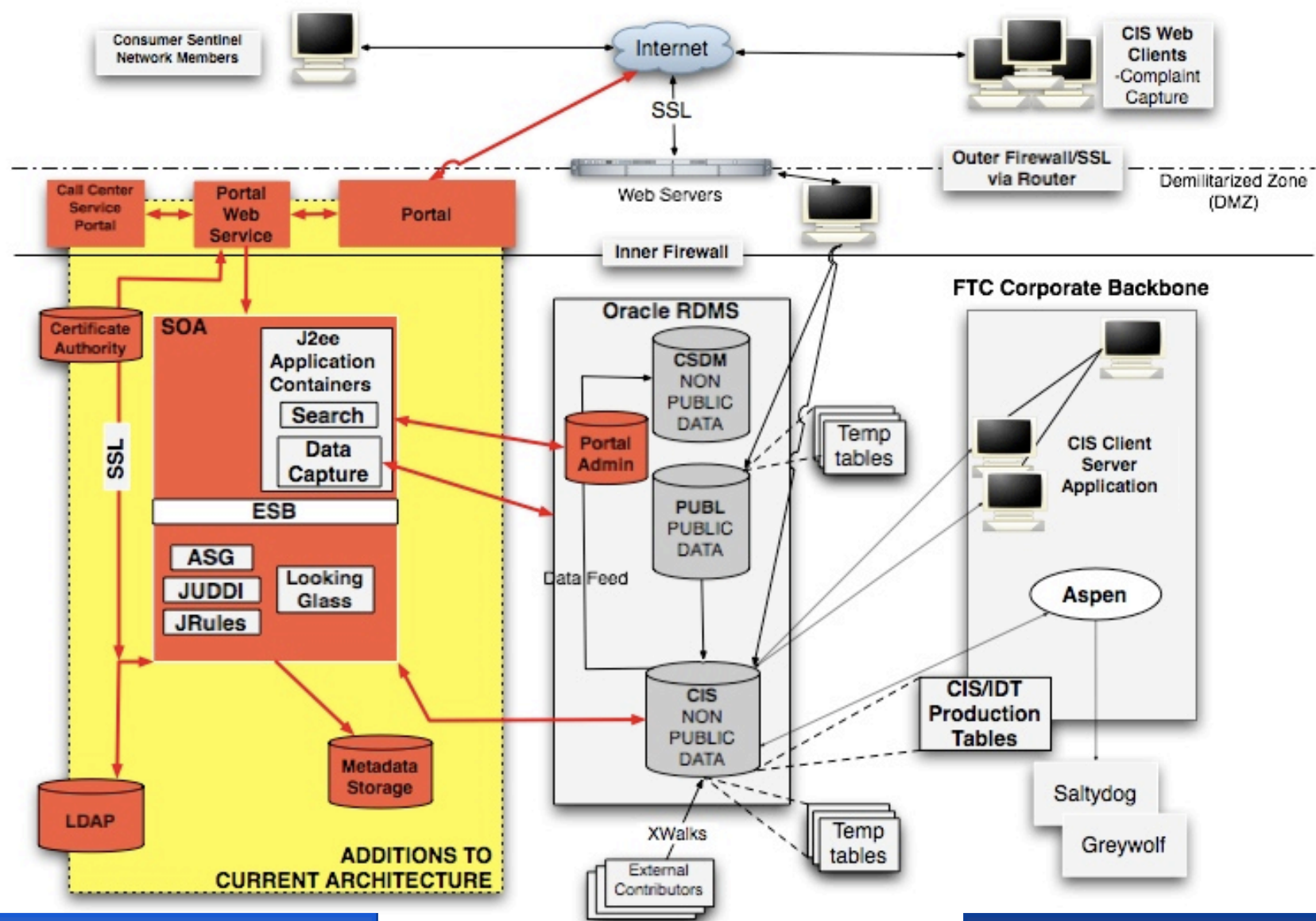


# What's a SOA? at the ftc





# What's a SOA? at the ftc



# What's a SOA? approach

- Craft Strategy to Migrate to a New Enterprise Model
- Start with the Archetype SOA
- Understand and Map Requirements to Existing and Planned Systems & Components
- Focus on Minimal Disruption, Performance and Cost Control

# What's a SOA? how we did it

Requirement	Technology	Rationale
Be a SOA (!)	web services, UDDI	Loosely coupled; 'plug-n-play'
Flexible architecture	Linux, Apache, Jboss	Unix, J2EE familiarity
Ease of product/ component integration	WSDL/SOAP/XML	swap services, connect and use services easily
High-availability	Cluster, mirror servers, many app instances	Scales well, redundant
Use of open standards	WS-I	Standardized interfaces, well- known, interoperable

# What's a SOA? nuts-n-bolts

Stick with Standards! WS-I defines core interoperability. Web services management capabilities that will be configured and managed in the portal:

**Auditing/Logging:**

keeping a complete, persistent record of SOAP requests and faults

**Reliability:**

configuring message delivery based on the WS-Reliability standard, use ESB, ASG

**Security:** configuring authentication, integrity with digital signatures, and confidentiality with encryption based on the WS-Security standard, using ASG, LDAP, CA

**Web services lifecycle management:**

enabling and disabling services and their managed capabilities (jUDDI, ASG)

**Deployment:**

configuring standard deployment plans for web services based on J2EE 1.4 standards

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# Leverage What You Build

With a Portal and other New Technologies

- Portal
- Enable Single-Sign-On with an LDAP
- Open Source is Your Friend, and
- Scale for High Capacity

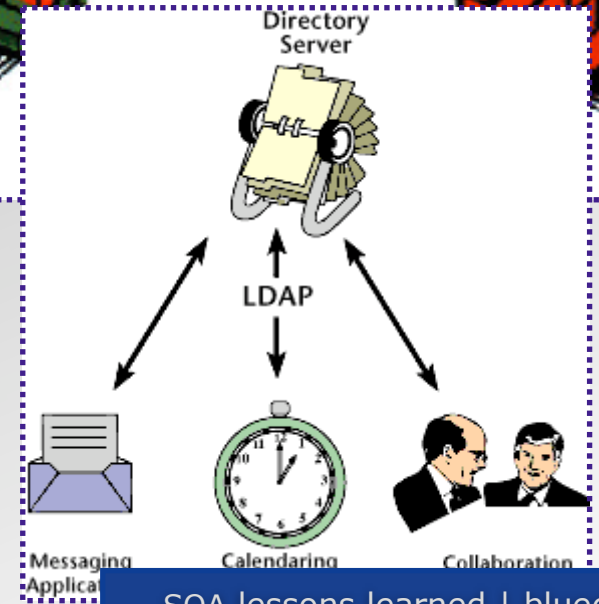
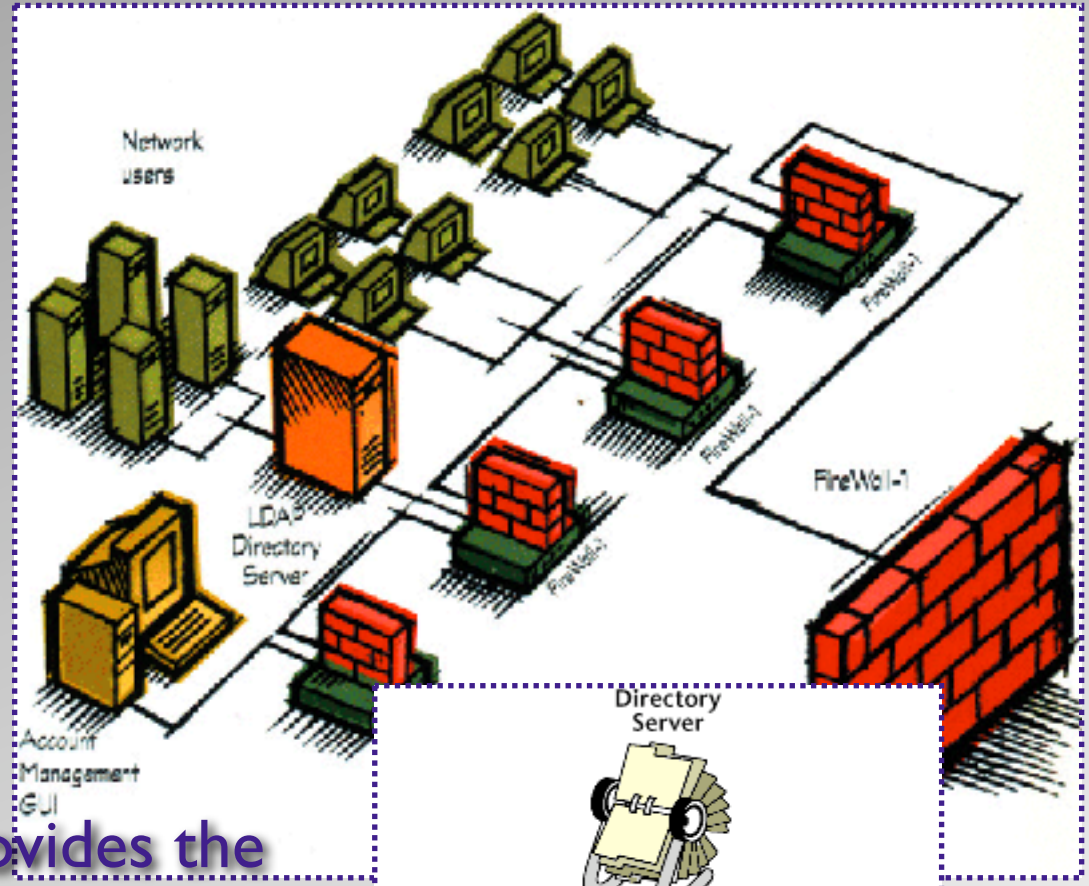


# New Technologies, portal-based

(1 of 4)

**Portal** provides the human interface to both the 'front end' and the 'back end' management.

The LDAP directory service provides the single repository of user information so single-sign-on works, secure and easy management of users, groups and roles is possible



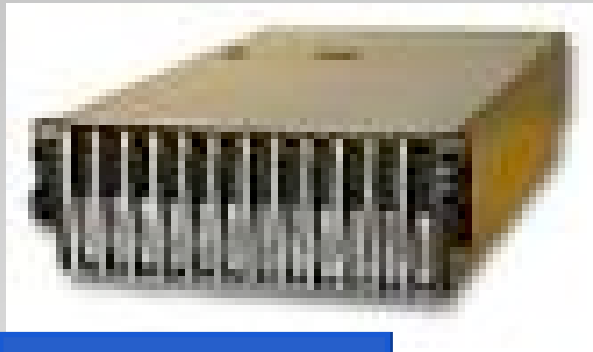


# New Technologies, Linux

(2 of 4)



**Linux** (gentoo distribution) provides a reliable, secure and high performance operating system that is as familiar as any flavor of UNIX

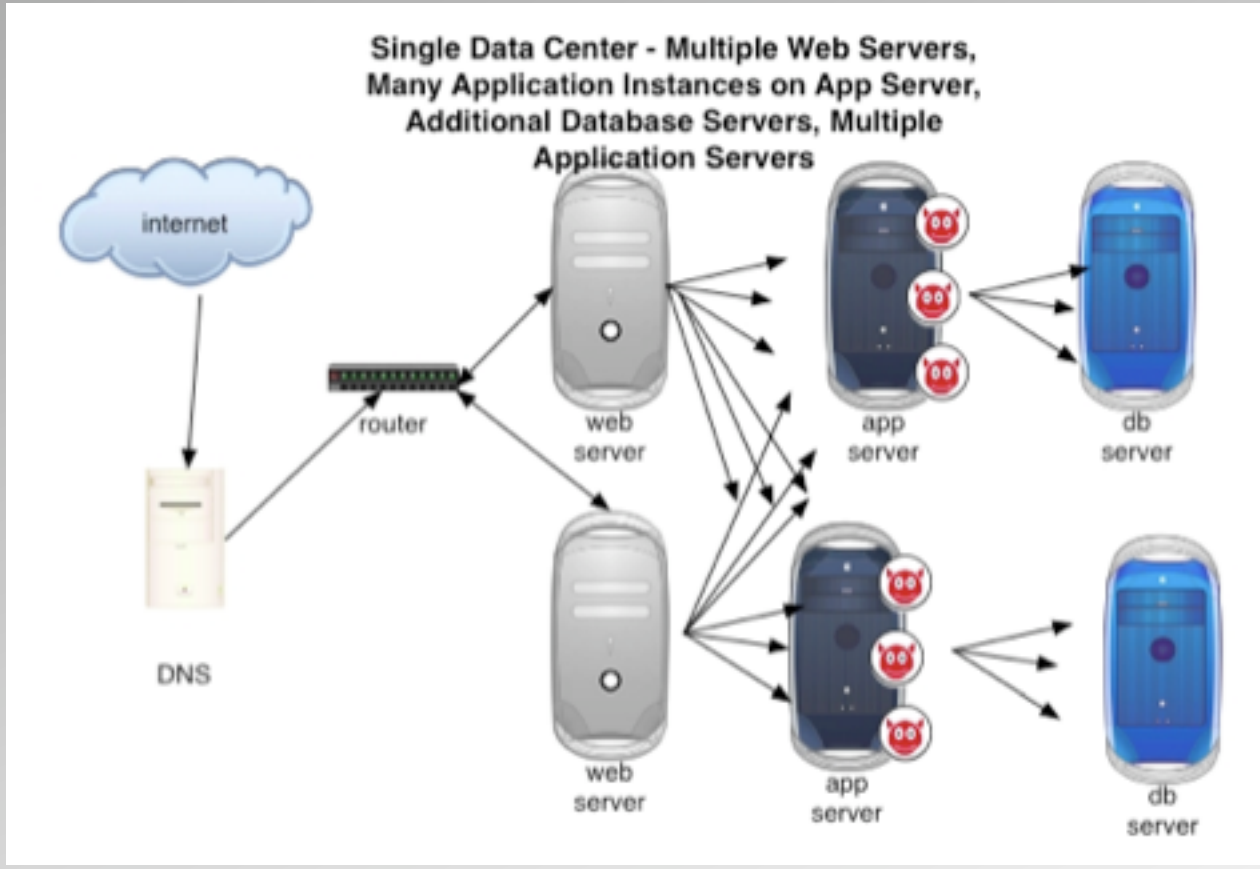


- Build optimized kernel for processor
- Install only system components needed (more secure, less overhead)
- Portage means easy package management (check dependencies, easy distribution)

# New Technologies, web services

(3 of 4)

**Web Services** are the “brains” of the SOA; almost all components are deployed as such, and run in JBoss application server environment. Deploys easily; less code means less to break, regression tested for reliability



# New Technologies, web services

(4 of 4)

- Scale for High Capacity
- Shared editing context (one query, done w/ DB, shared across instances of the web service)
- Single DB connection per instance (not 150)
- Need more capacity? Add more instances, more servers

# Leverage What You Build

With a Portal and other New Technologies

- Easy to Manage for the IT Department
- Make Services Discoverable
- Expose the Services with an Eye to Growth using an ESB
- Rules Engine Approach Means No Source Code Recompiles for Changes
- Scale for High Capacity



# Easy to Manage, portal-based (1 of 8)

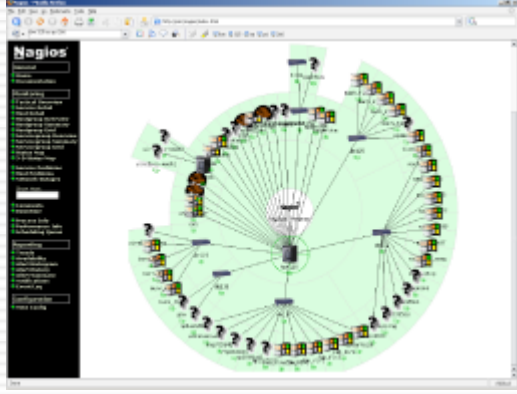
**Nagios** monitors systems & processes

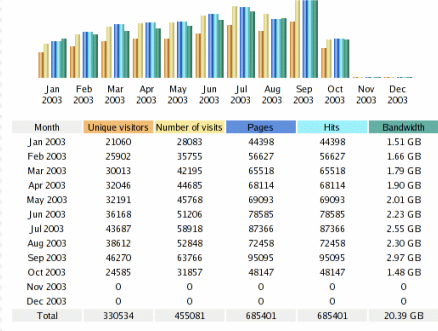
**AWstats** provides web log analysis

**Webmin** provides GUI for systems admin

**PORTAL**

Systems
ESB
Web Services






Month	Unique visitors	Number of visits	Pages	Hits	Bandwidth
Jan 2003	21060	28083	44398	44398	1.51 GB
Feb 2003	25902	35755	56627	56627	1.66 GB
Mar 2003	30013	42195	65518	65518	1.79 GB
Apr 2003	32046	44685	68114	68114	1.90 GB
May 2003	32191	45768	69093	69093	2.01 GB
Jun 2003	36168	51206	78585	78585	2.23 GB
Jul 2003	43687	58918	87366	87366	2.55 GB
Aug 2003	38612	52848	72458	72458	2.30 GB
Sep 2003	46270	63766	95095	95095	2.97 GB
Oct 2003	24585	31857	48147	48147	1.48 GB
Nov 2003	0	0	0	0	0
Dec 2003	0	0	0	0	0
<b>Total</b>	<b>330534</b>	<b>455081</b>	<b>685401</b>	<b>685401</b>	<b>20.39 GB</b>

**State Breakdowns For Host Services:**

Service	% Time OK	% Time Warning	% Time Unknown	% Time Critical	% Time Undetermined
PING	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
Processor Load	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
Total Cache Buffers	25.19% (47.36%)	27.99% (52.64%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
Dirty Cache Buffers	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
Long Term Cache Hits	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
LRU Sitting Time	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
Connections	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
SYS Volume	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
USER Volume	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
Packet Receive Buffers	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
DS Database	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
Logins	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%
SAP Entries	53.18% (100.00%)	0.00% (0.00%)	0.00% (0.00%)	0.00% (0.00%)	46.82%



# Easy to Manage, portal-based (2 of 8)

**Portage** provides means to handle routine patches, deployment of new web services

**PhpLDAP** provides GUI for user administration

**PORTAL**

Systems

ESB

Web Services

The screenshot illustrates a portal interface with three main sections: **Systems**, **ESB**, and **Web Services**. The **Systems** section shows a dashboard for 'LEVENTA' with categories like Templates, Machines, and Servers. The **ESB** section displays a tree view for 'My LDAP Server' with various organizational units and users. The **Web Services** section shows a 'New Samba3 User Account' form with fields for UID Number, Samba SID, First name, Last name, User name, User Password, Encryption, Samba Password, Login Shell, Container, User Group, Windows Group, and Home Directory.

# Easy to Manage, portal-based (3 of 8)

**Web Services** are deployed into JBoss, and instances are configured and controlled in one interface

**PORTAL**

Web Services    Systems    ESB

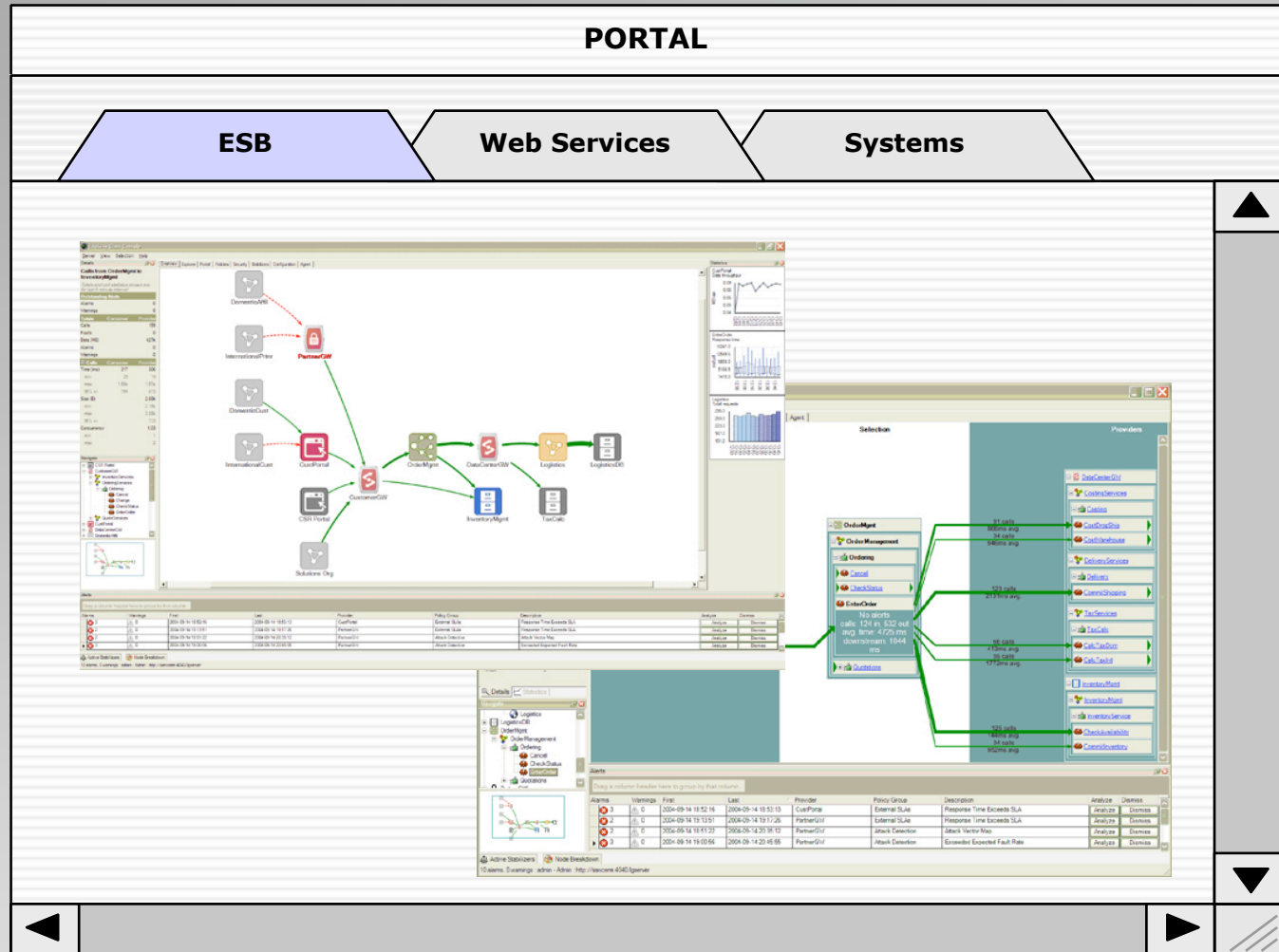
Name	Host - Port	Status	Start - Stop	Auto Recover	Refuse New Sessions	Scheduled	Next Shutdown	Statistics						Configure	Delete
								Trans-actions	Active Sessions	Average Trans-action	Average Idle Period	Deaths	WOSTats		
SciQ-1	136.159.110.40:2006	ON	ON	ON	OFF	OFF	-	912	58	0.476	640.112	-	WOSTats	Config	Delete
SciQ-2	136.159.110.40:2007	ON	ON	ON	OFF	OFF	-	413	29	0.31	1234.782	-	WOSTats	Config	Delete
SciQ-3	136.159.110.40:2008	ON	ON	ON	OFF	OFF	-	551	28	0.49	925.367	-	WOSTats	Config	Delete
ALL INSTANCES:			ON	ON	ON	ON		1876	115	0.444	854.810	Clear Deaths	0.00 TPM	Config	

Add 1 instance(s) on host: 136.159.110.40



# Easy to Manage, portal-based (4 of 8)

**ASG Looking Glass** provides view into web services activities. Drill down to view performance of chains of services



# Easy to Manage, portal-based

(5 of 8)

**Sonic ESB** provides console view of JMS and translation pipeline activities

**PORTAL**

ESB      Web Services      Systems

Tag	Value	Type
SearchGroupData		
SearchDataElement		
name		
value		
ItemDetail		
Classification	00042	
Description	Regulation wooden bat (Tee Ball)	

# Easy to Manage, portal-based (6 of 8)

**UDDI** is used as the directory of web services, and provides an interface to publish relevant information about available processes

The screenshot displays a web portal titled "PORTAL" with navigation tabs for "Web Services", "Systems", and "ESB". The main content area is the "Business Service Console" for "systin Publication Registry (Developer)". It features a left-hand navigation tree with categories like Catalog, Providers, Services, Endpoints, Interfaces, Resources, WSDL, XSD, XSLT, and XML. The main panel shows a "List of WSDL services" with a search filter and a table of 16 items. The table columns are Name, Usage, Certification, and Edit. The services listed include AccountService, AddCustomerService, BillPaymentService, CheckOrderService, CustomerNotificationService, DirectDepositAdvanceService, ElectronicFormsService, EmployeeList, Holiday request service, and MonetaryTransactionService.

Name	Usage	Certification	Edit
AccountService	Accounts	Certified	[Edit]
AddCustomerService	Customer Account Management	Pending	[Edit]
BillPaymentService	Bill Payments	Certified	[Edit]
CheckOrderService	Check Order, Reorder	Pending	[Edit]
CustomerNotificationService	Customer Account Notification Management	Certified	[Edit]
DirectDepositAdvanceService	Direct Deposits	Pending	[Edit]
Endpoint name: http://company.com/accountsvc/directDepositAdvance			
Description: vsd!type representing port			
ElectronicFormsService	Electronic Forms Management	Certified	[Edit]
EmployeeList	Holiday Request Form	Certified	[Edit]
Holiday request service			[Edit]
MonetaryTransactionService	Monetary Transactions	Certified	[Edit]

# Easy to Manage, portal-based (7 of 8)

**JRules** is used as the repository of business logic, managed by the business customers

**PORTAL**

Web Services      Systems      ESB

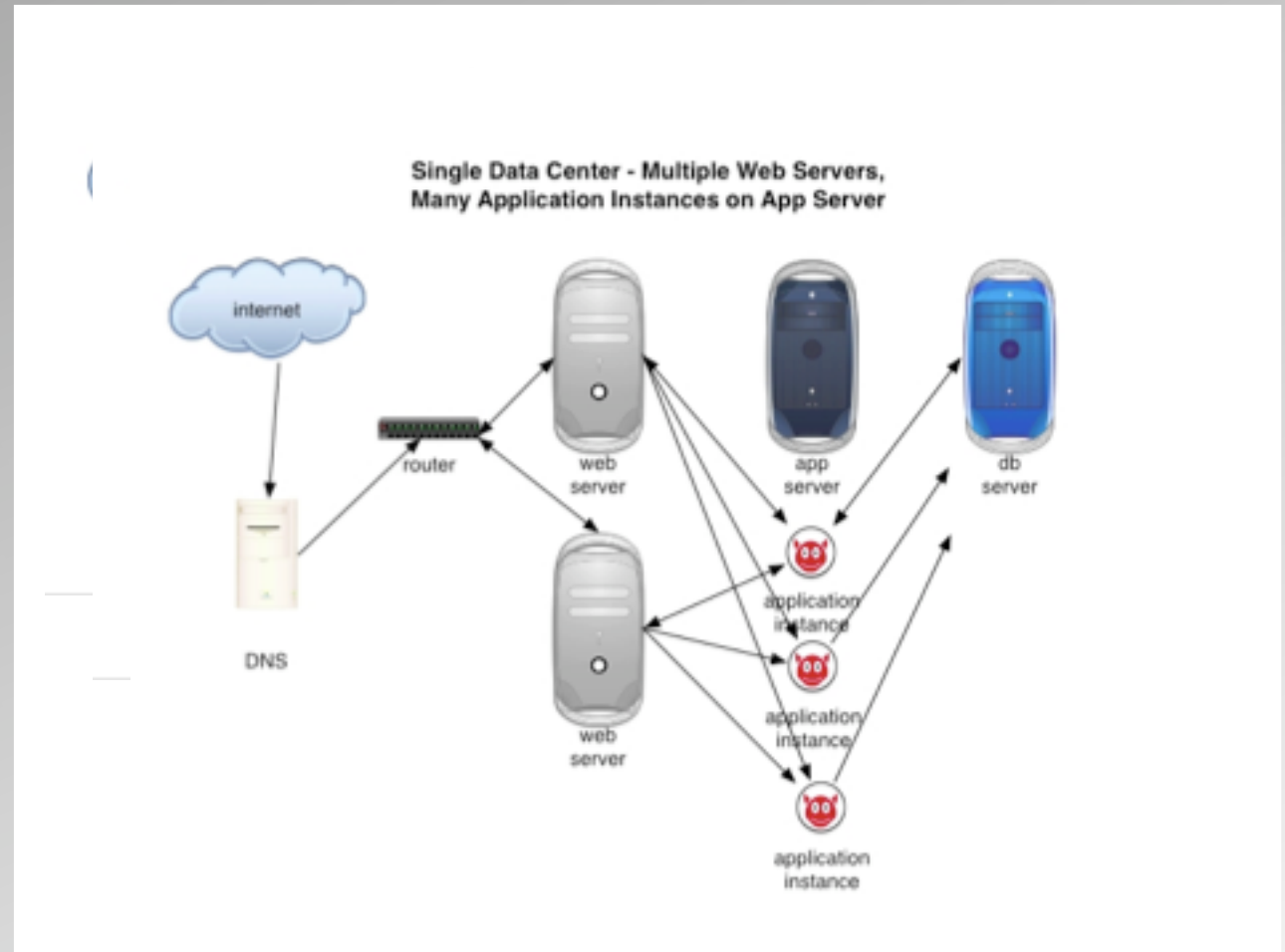
The screenshot displays a web-based portal interface for managing business rules. At the top, the word "PORTAL" is centered. Below it, three navigation tabs are visible: "Web Services" (highlighted in blue), "Systems", and "ESB". The main content area features a window titled "JLOG Rule Builder - PurchaseTransaction". This window includes a menu bar (File, Edit, View, Project, Ruleset, Debug, Profile, About), a toolbar, and a tree view on the left showing a hierarchy: WebShop > PurchaseTransaction > CDPromotion. The main editor area shows a rule configuration for "CDPromotion" with the following logic:

```
Packet: [Rule Name: CDPromotion, Priority: default]
If:
  the customer purchase of : CD is greater than : $ 200. [±]
Then:
  apply a : 5 % [±] discount
  and display the message ' : You've earned a 5% discount on your CDs! '
documentation:
  Marketing compact disc promotion.
```

At the bottom of the rule editor, there are tabs for "Rulesets", "Classes", and "Engines", with "CDPromotion" selected. A status bar at the bottom of the window displays the message: "Checking the PurchaseTransaction ruleset. The Ruleset PurchaseTransaction is correct." Below this, a "Messages" section shows: "The Ruleset PurchaseTransaction is correct". The entire portal interface is framed with navigation arrows on the sides and bottom.

# Easy to Manage, portal-based (8 of 8)

**Scaling** means adding more instances on existing servers, or adding more servers with instances, or both



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# “Future-Proof”

## Architect to be:

- Highly Available
- Reliable
- Easy To Manage



# “Future-Proof”

- Web services are J2EE applications — as long as developers stick to WS-I specifications, building is easy, ‘plug-n-play’ works
- With the Linux cluster, add more blades to increase capacity (number of concurrent connections), and
- Move incrementally away from 1980s, 1990s models to SOA, without disruption

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# Implement Incrementally

- SOA environment is deployed in isolation from current one
- Deploy web services that communicate into the existing environment, but continue to run the current environment intact, and
- As new web services replace legacy components, switch them off with little disruption to users

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# Successful Services we've deployed

(1 of 6)

**GMS Dashboard** daily work processes for 1,200 Grants Managers at the Office of Justice Programs

program: All Programs  
State: IL  
Grant Manager: All Grant Managers  
Fiscal Years: 2004

REPORT RESULTS (58 TOTAL ROWS) Printable Version ([HTML](#) | [Excel](#))

Office	PROGRAMS	APPLICATION NUMBER	STATUS	GROUP	ROLE	ENTERED	DAYS ELAPSED
BJA	BJA FY 04 Ad Drug Ct	<a href="#">2004-F1616-IL-DC</a>	Assigned	PO	Grant Manager	06/16/2004	28.26
BJA	BJA FY 04 Ad Drug Ct	<a href="#">2004-F1619-IL-DC</a>	Assigned	PO	Grant Manager	06/16/2004	28.26
BJA	BJA FY 04 Ad Drug Ct	<a href="#">2004-F1954-IL-DC</a>	Assigned	PO	Grant Manager	06/16/2004	28.26
BJA	BJA FY 04 Byrne	<a href="#">2004-F1483-IL-DB</a>	Grantee Notified Accepted	OCCD	Administrator	06/10/2004	33.95
BJA	BJA FY 04 CASOM	<a href="#">2004-F0454-IL-WP</a>	Denied	PO	Grant Manager	06/14/2004	30.17
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F2358-IL-DD</a>	Pending	PO	Grant Manager	06/07/2004	37.17
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F2358-IL-DD</a>	Pending	OCFMD	Financial Analyst	05/13/2004	62.08
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F2424-IL-DD</a>	Pending	PO	Program Manager	07/14/2004	0.2
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F2444-IL-DD</a>	Pending	PO	Grant Manager	06/16/2004	28.06
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F2444-IL-DD</a>	Pending	OCFMD	Financial Analyst	06/16/2004	28.06
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F2460-IL-DD</a>	Pending	PO	Grant Manager	07/09/2004	5.17
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F2460-IL-DD</a>	Pending	OCFMD	Financial Analyst	07/09/2004	5.17
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F2466-IL-DD</a>	Pending	PO	Grant Manager	07/07/2004	7.29
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F2466-IL-DD</a>	Pending	OCFMD	Financial Analyst	07/07/2004	7.29
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F3165-IL-DD</a>	Pending	PO	Grant Manager	06/22/2004	22.2
BJA	BJA FY 04 Cong Mand	<a href="#">2004-F3165-IL-DD</a>	Pending	OCFMD	Financial Analyst	06/18/2004	25.98
BJA	BJA FY 04 Enh Drg Ct	<a href="#">2004-F0461-IL-DC</a>	Assigned	PO	Grant Manager	06/16/2004	28.26
BJA	BJA FY 04 GREAT	<a href="#">2004-F2975-IL-DD</a>	Pending	PO	Grant Manager	07/09/2004	5.13
BJA	BJA FY 04 GREAT	<a href="#">2004-F2975-IL-DD</a>	Pending	OCFMD	Financial Analyst	07/09/2004	5.13
BJA	BJA FY 04 GREAT	<a href="#">2004-F3029-IL-DD</a>	Change Requested	PO	Grant Manager	07/09/2004	5.17
BJA	BJA FY 04 GREAT	<a href="#">2004-F3032-IL-DD</a>	Pending	PO	Grant Manager	07/01/2004	13.09
BJA	BJA FY 04 GREAT	<a href="#">2004-F3032-IL-DD</a>	Pending	OCFMD	Financial Analyst	07/01/2004	13.09
BJA	BJA FY 04 GREAT	<a href="#">2004-F3040-IL-DD</a>	Assigned	PO	Grant Manager	07/07/2004	6.98
BJA	BJA FY 04 GREAT	<a href="#">2004-F3046-IL-DD</a>	Assigned	PO	Grant Manager	07/08/2004	6.08
BJA	BJA FY 04 GREAT	<a href="#">2004-F3053-IL-DD</a>	Pending	PO	Grant Manager	07/01/2004	13.09

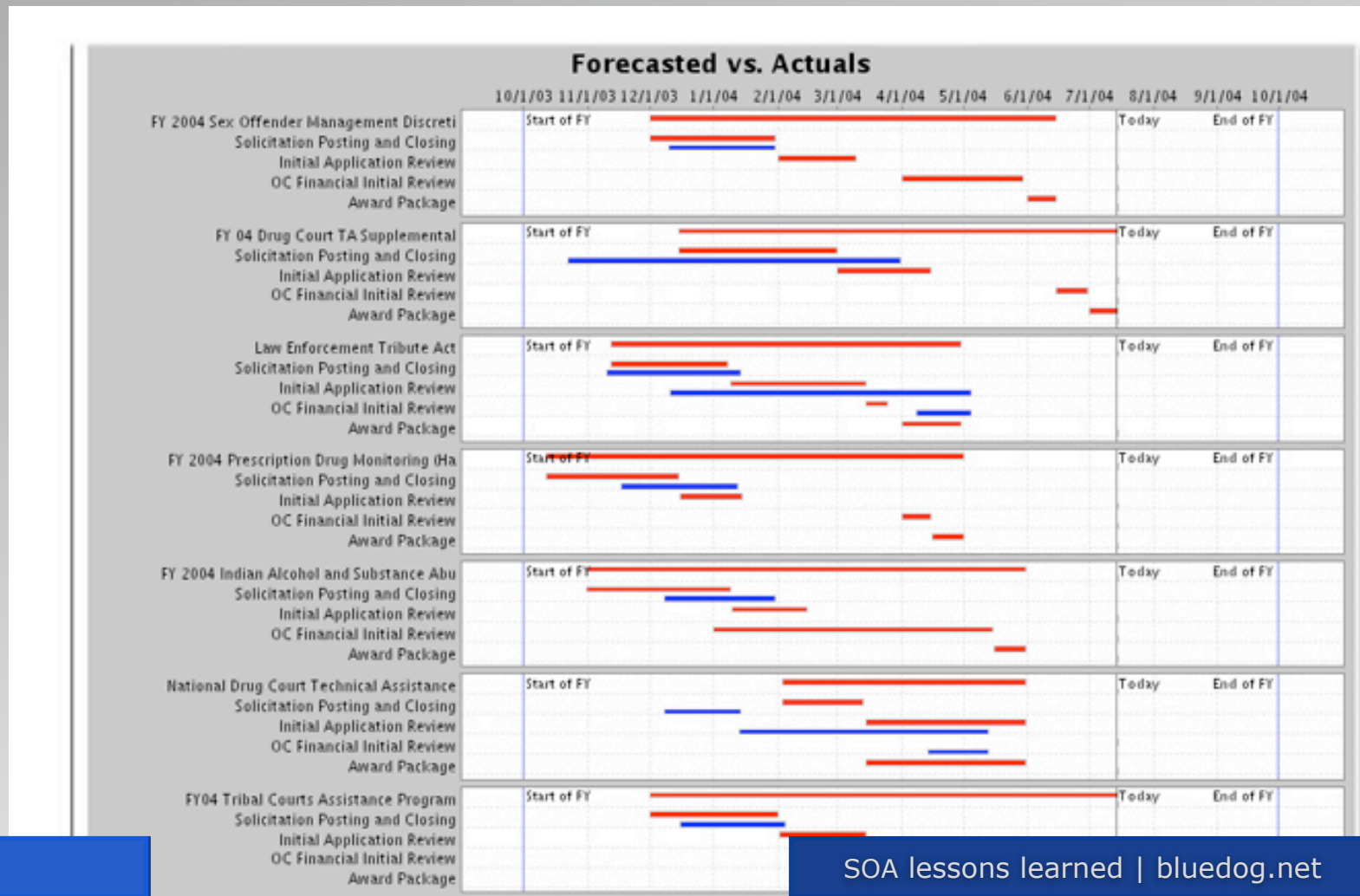
Generated: 07/14/2004 15:56:46 Page 1 of 3 [»](#) [»»](#)



# Successful Services we've deployed

(2 of 6)

**Forecaster** helps the I3 Program Office predict work loads for the coming fiscal year, then track progress during the year



# Successful Services we've deployed

(3 of 6)

**Priority Monitoring Assessment** uses sophisticated algorithm to help with Grant Monitoring — which of my thousands of grantee sites should I visit?

Office: Bureau of Justice Assistance  
 Program: Project Sentry  
 State(s): AK, AZ, AR, CA, CO, CT, DE, DC, FL, GA, HI, ID, IL, IN, IA, KS, KY, LA, ME, MD, MA, MI, MN, MS, MO, MT, NE, NV, NH, NJ, NM, NY, NC, ND, OH, OK, OR, PA, RI, SC, SD, TN, TX, UT, VT, VA, WA, WV, WI, WY, AS, GU, MH, PW, PR, TT, MP, VI, CN, EU, FM, and AL  
 Generated: July 14, 2004 04:37:47 PM

[Print Report](#)  
[View 1st time Grantees](#)

<< Back

1st Grant?	Grant	Grantee	Manager	Score
	2004 Project Safe Neighborhoods Competative Grant Program	State of Wisconsin	Brent Eckberg	225
	Community Wide Violence Intervention and Prevention Initiative	The Rosamond Gifford Charitable Corp.	Michael Austin	225
	FFY 2004 Project Safe Neighborhoods	New York State Division of Criminal Justice Services	Michael Austin	225
	Project Safe Neighborhoods Enforcement and Public Education Program to Eliminate Illegal Gun Crime	Virginia Association of Chiefs of Police	Tahitia Barringer	225
	Fy 2004 Project Safe Neighborhoods Northern District of California	Governors Office of Emergency Services	Muriel Collins	225
!	The Illinois Criminal Justice Information Authority has been selected as the fiscal agent by the Office of the U.S. Attorney for the Northern District of Illinois. At this point, the PSN Task Force i	Illinois Criminal Justice Information Authority	Michael Dever	225
!	Project Safe Neighborhood, Gun Violence Reduction	Florida Department of Law Enforcement	Naydine Fulton-Jones	225
!	Project Safe Neighborhoods	Citizens Crime Commission of Delaware Valley	TBD TBD	225
	Northern District of Georgia Project Safe Neighborhoods Grant Program	Georgia Criminal Justice Coordinating Council	Joyce Mosso	225
!	Fiscal Agent for Montana's Project Safe Neighborhood Grant	State of Montana	E. Tracey Willis	225
	2004 Project Safe Neighborhood Northern Ohio District	Ohio Office of Criminal Justice Services	Carla Daniels	225
!	Project Safe Neighborhoods national initiative to reduce gun crimes	Greater Dallas Crime Commission	Sonya Dimas	225



# Successful Services we've deployed (4 of 6)

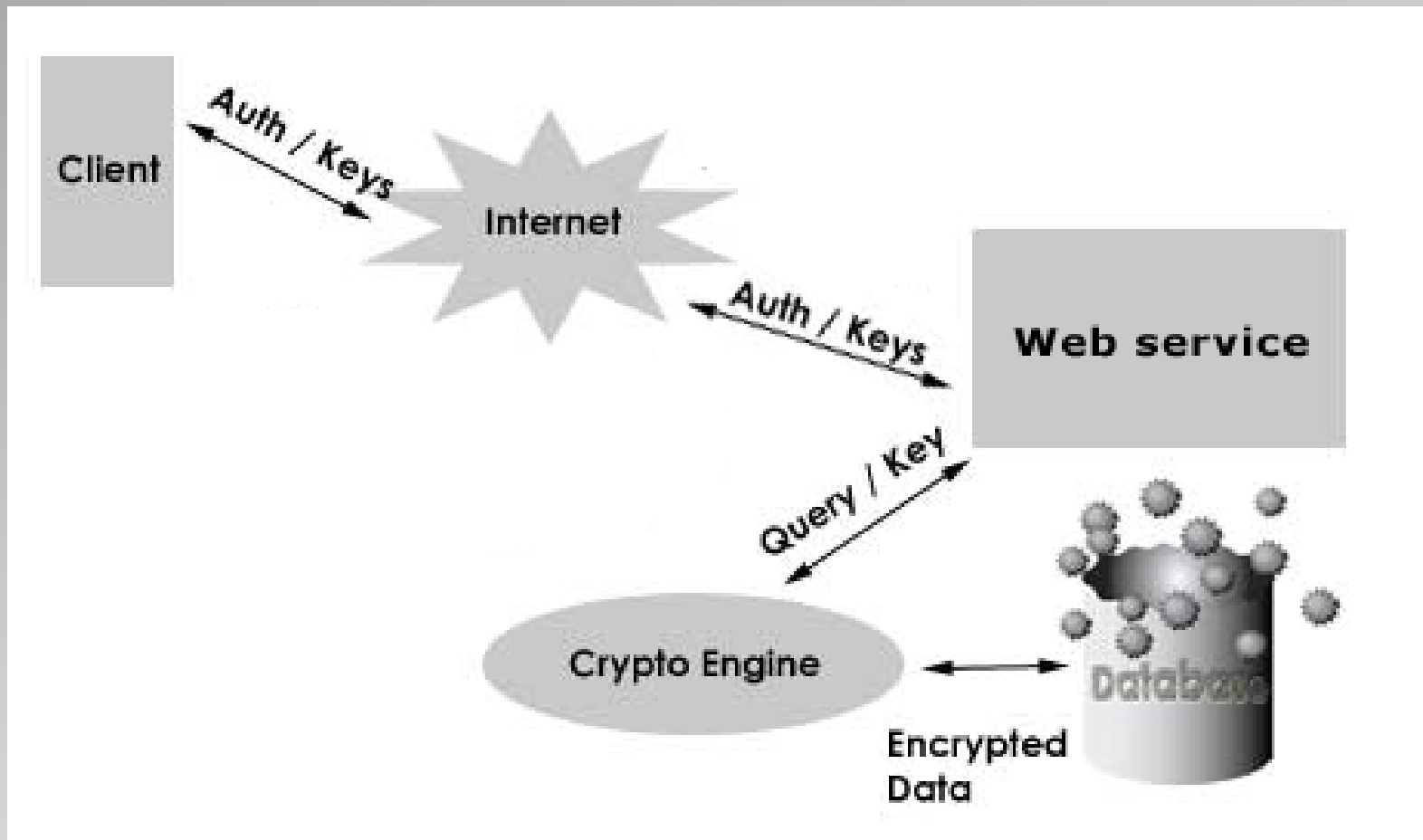
**Consumer Information System** call center console where the FTC processes thousands of consumer fraud and identity theft complaints daily

The screenshot displays the 'FTC CISI4 Search Rev. 1.0 3/22/06' web application. At the top, it shows a welcome message for 'FTC Admin' and navigation links for 'Debug On', 'Logout', 'FTC Admin', and 'Change Role'. The main content area is titled 'CIS COMPLAINT EDIT' and features a 'Complaint Reference No.' field with a dropdown menu set to 'CIS Complaint' and a 'Change Type' button. Below this are three tabs: 'Transaction', 'Company', and 'Consumer'. The 'COMPLAINT INFO' section contains several input fields: 'Created By:', 'Updated By:', 'Amount Requested:' (with a '(Numbers Only)' note), 'Amount Paid:' (with a '(Numbers Only)' note), 'Date Contacted:' (with a '(MM/DD/YYYY)' note), 'Contact Type:' (a dropdown menu showing 'Complaint'), 'Source:', 'Agency Contact:', 'Product/Service Code:', 'Law Violation:', and 'Statute/Rule:'. On the right side, there is a 'SYSTEM MESSAGES' section, a 'TURN HELP ON' section with a 'Report a problem' button and a 'Search' button, and a 'NAVIGATION' section with links for 'Quick Search', 'Advanced Search', 'My Preferences', 'My Alerts', 'My Search Tools', '4 Notifications', 'Start New Call', and 'Application Preferences'.

# Successful Services we've deployed

(5 of 6)

**Database Encryption Web Service** that secures sensitive data in real time in the database, preventing theft/loss



# Successful Services we've deployed

(6 of 6)

**CIS Law Enforcement Web Portal** grants law enforcement personnel at the Federal, State and Local (and from select other countries) limited access to select data

**Federal Trade Commission**  
CISI4 Complaint Page

OMB:

---

**IDT Reference**  
Reference   
Contact Type   
Source   
Agency Contact

**External Transaction**  
Originator's Ref  Entry Date  Receipt Date

**Audit Information**  
Organization   
Created By  Updated By   
Created Date  Updated Date

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# Recommendations planning

1 of 3

- Define organization-centric governance that establishes the model for success
- Use architectural blueprints and patterns, and
- Employ project portfolio techniques to baseline, manage and evolve

# Recommendations operations

2 of 3

- Run the SOA as a 'pilot' with subset of users until declared 'live' while everyone gets comfortable with it, and
- Knowledge transfer is a key aspect of the change management process — for end users and the IT department



# Recommendations communicate

3 of 3

- Define What Success Means
- Get Stakeholder Buy-in, and
- Show Progress

# Last words...

- SOA is an approach to building software systems that focuses on business level services and the invocation mechanisms used to call these services.
- Within this architecture, each of the services is an independent functional entity that possesses a well-defined, invocable, interface. These services can each be called in defined sequences to form business processes.

# ...really last words

key aspects to keep in mind:

- The services provided are at the business level – not at a low level functional API like level.
- The services are capable of being invoked via external systems.
- That the business process behind the system can be represented explicitly and used as the basis of the systems flow-of-control.



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