SOA Patterns

Arnon Rotem-Gal-Oz
Biometrics Line Development Manager
Rafael LTD.
Haifa, Israel
arnon@rgoarchitects.com

Everybody wants SOA because it is oh so wonderful…

Everybody forgets that every rose has its thorns
Well, we can always buy SOA, right?

Solving SOA pains with patterns

Virtual Endpoint
Service Instance
Blogjecting Watchdog
Gridable Service
Choreography
Transactable Service
Parallel Pipes
Saga
Client/Server Service
Aggregated Reporting
Service Monitor

How do you present a lot of patterns without getting here?!
Metropolis Chief of Police: “We need to completely revamp all our software systems.”
Software architecture is... 

What the software architect does

- Collection of the fundamental decisions about a software product/solution designed to meet the project’s quality attributes. 
- Includes the main components, their main attributes, and their collaboration. 
- Expressed in several levels of abstraction (depending on the project’s size). 
- Architecture is communicated from multiple viewpoints. 
- Tradeoffs are made explicit.

![Diagram showing relationships between service consumer, service, policy, end point, contracts, and messages.](image-url)
Dilemma: Data Propagation

Under all conditions, the freshness of the positions and statuses of all the police units will be better than 2 seconds (the time from change to update).
Objects in a Process

Requestor

Replier

Computer A

Consumer (requestor)

Process A

Computer B

Service (replier)

Process B

Services

Request/Reply

Service Consumer

Request

1. Request

Service

Reply

2. Synchronous processing

3. Reply

Inversion of Communications
Fallacies of distributed Computing

The Network is reliable
Latency is zero
Bandwidth is infinite

The Network is Secure
Topology doesn’t change
There is one administrator

Transport cost is zero

The Network is homogenous
Avoid RPC Over SOA

Dilemma: Cross-Service Transactions

Register Incident ➔ Dispatch ➔ Tasks

Scenario (Integrity > Consistency)
Under all conditions, an incident accepted by the system cannot get lost
ACID Transactions

Service B

1. Begin TX

2. Request

2. Reply

4. Commit TX

Service A

Service Transaction Root Transaction Support Contract End Point

1. Begin TX

2. Get/Read Message

3. Handle Message

Message Pump Message Handler Service

Transaction Support

Saga

Prepare/commit/undo

Protocol Registration Coordinator

Perform Activity Compensate

Create context Initiator

Consumer

Activities and replies

Activities and replies

Service Business Logic

Perform Activity Compensate Participator
Avoid the coupling of cross-service transactions

Dilemma: Reporting & BI

Scenario (Usability->Reporting)

Under normal conditions, The chief of police will have on his dashboard near real-time gauges of the following KPIs:
Number of incident per hour, avg. time to arrive at a crime scene, number of patrol car breakups during answering incidents ....
Aggregated Reporting

- Subscribed/Poll data
- Load
- Save Data
- Join
- Clean
- Transform
- Transpose
- Produce reports
- Report
- ODS
- Aggregated Reporting Service

EndPoint

Pre-Proce

Convert

Request

Aggregated Reporting
Adding a specific BI contract is not a good idea.

Dilemma: UI integration

Scenario (Constraints> Operations)
While the police department is transitioning to the new system, the emergency response center must continue to operate.
**Client/Server/Service**

- Legacy UI
- Business logic
- Service bridge
- Server logic
- Service A
- Service A

**Dilemma: Dynamism**

Scenario (Flexibility vs. Business Processes)

Under normal conditions, updating work procedures (expected to happen quarterly/yearly) will take less than a week.
Workflodize

Orchestrated Choreography

VOTE
Be careful of using workflows everywhere

Think carefully about service granularity

PERFORMANCE & SCALABILITY
Dilemma: peak Loads

Scenario (Performance- Scalability)
In case of unexpected emergency, the emergency response center would be able to handle 5 times the usual case load.

Gridable Service

Decoupled Invocation
Dilemma: Throughput

Scenario (Performance > Latency)
Under normal conditions a call can be handled end-to-end in 30 seconds or less.

Scenario (Performance > Throughput)
On a busy night the Emergency Center would be able to handle up to 500 calls per hour.

Service Instance

[Diagram showing the flow of a service instance, including End point, Distribute, Dispatcher, Edge, Service Business logic, and Service Instance, with distributed reception and request processes.]
Parallel Pipelines

<table>
<thead>
<tr>
<th>Key</th>
<th>SOA Component</th>
<th>Pattern Component</th>
<th>Concern/attribute</th>
</tr>
</thead>
<tbody>
<tr>
<td>Edge</td>
<td>Request</td>
<td>Reaction</td>
<td>Request 1</td>
</tr>
<tr>
<td>Request 1</td>
<td>Perform Task</td>
<td>Request 2</td>
<td>Perform Task</td>
</tr>
<tr>
<td>pipeline</td>
<td>EndPoint</td>
<td>pipeline</td>
<td>EndPoint</td>
</tr>
<tr>
<td>pipeline</td>
<td>EndPoint</td>
<td>EndPoint</td>
<td>Perform Task</td>
</tr>
<tr>
<td>pipeline</td>
<td>EndPoint</td>
<td>EndPoint</td>
<td>Perform Task</td>
</tr>
<tr>
<td>pipeline</td>
<td>EndPoint</td>
<td>EndPoint</td>
<td>Perform Task</td>
</tr>
<tr>
<td>Service</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
What's in a 9

Scenario (Availability - Hardware failure)
During an operation, when a server crashes the COP will continue functioning within less than a minute.

Failsafe hardware

Status Technologies
FT Server

Virtual Endpoint

Virtual Endpoint
Location Transparency
Request
Request
Request
Request
Service
Request
Dilemma: Interfacing with the outside world

Scenario (Security > Access control)
Under all conditions, prevent unauthorized access, information disclosure and tampering from the patrol’s car’s interfaces to the Department of Motor Vehicles (retrieving driver’s licenses and car registrations)

Edge Component

Validate Security
Audit
Transform
Load Balance
Etc.

Service Business Logic
Dilemma: Autonomy and Management

Scenario (Security > Governance)
During development and operations, the enterprise architecture team will be able to ensure all services use secured channels.

Scenario (Reliability > MTTR)
Under normal operations, the time to discover a faulty service will be shorter than 2 minutes.

Blogjecting Watchdog

Edge
EndPoint

Monitor
Request
Report

Service

Watchdog

Edge

Agent

Monitor

Heal

Log

Monitor

Report

Monitor

Service Monitor

Collect

Metrics

collection

Fault

Monitoring

Security

monitoring

Policy
governance

Notify

Control

Act

Status

Status

Commands

Edge/Service

Edge/Service
Mind the gap

Decision: Certificates for authentication & authorization
Implementing a Service Firewall

Getting to SOA is a long journey...
THANK YOU

Arnon Rotem-Gal-Oz
www.rgoarchitects.com
aron@rgoarchitects.com