Performance and Status Monitoring of JavaEE Business Applications

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Roadmap

- Project Description
- SOAP WebService
- JavaEE
- JMX
- Project Constraints
- GC Statistics Without Storing Data Points?
- TimerService Monitoring

Project Description

- Customer: ISC-EJPD
- Implement the ApplicationCheck WebService
  → Provide Status Information about the Application

- Configurable, Extendable, Generic

SOAP WebService

- Network Socket on a defined Path & Port
- Client sends a Message and receives a Response (both XML)
- Message and Response Schema defined through a WSDL

ApplicationCheck – WebService

Requirements:

- 1 Predefined “query” message
- Server performs checks and returns a result
- Results can be nested

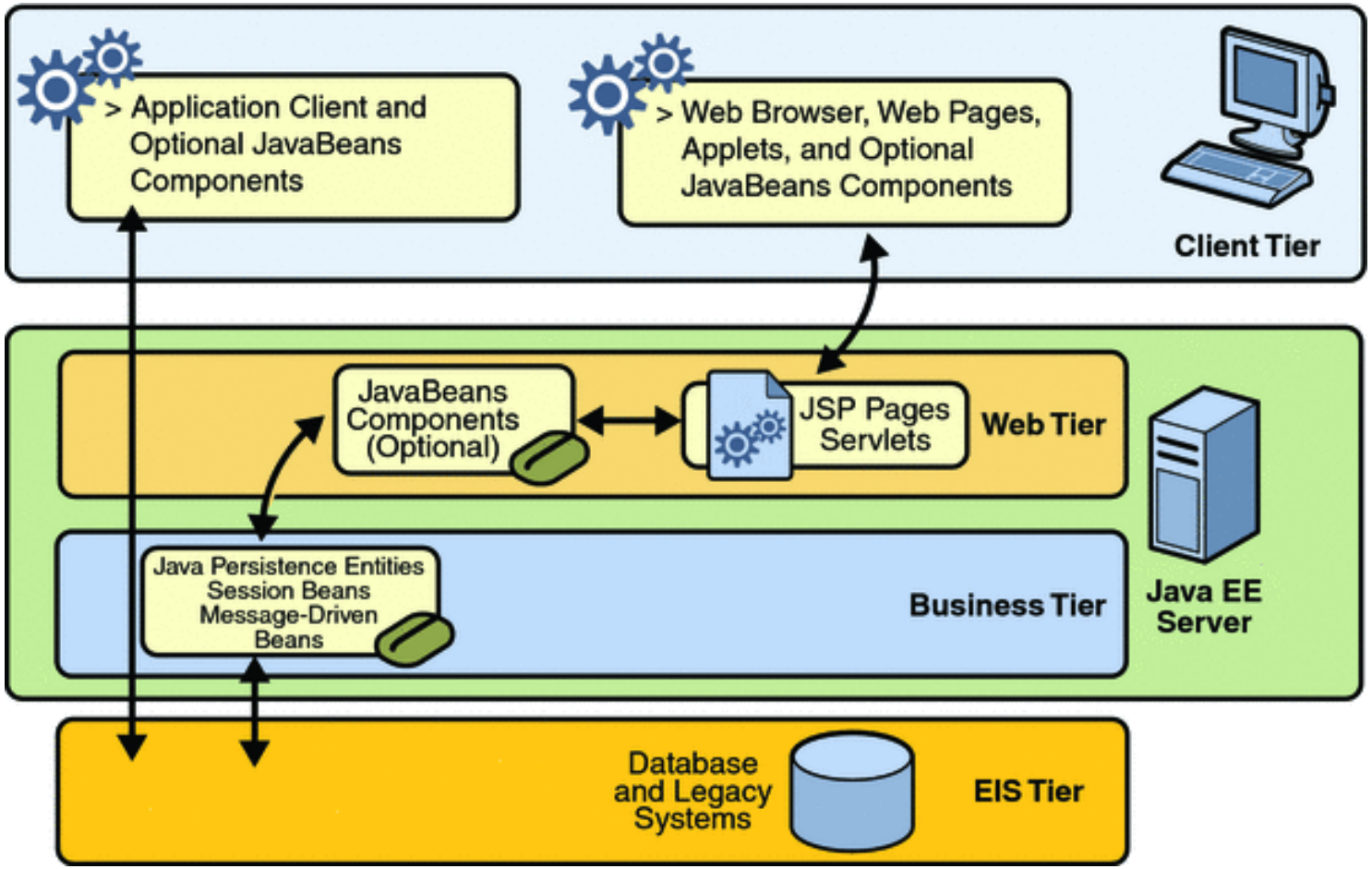
```
@javax.ejb.Local
public interface IChecker {
  public CheckResponse check(String uid);
}

public class CheckResponse implements Serializable {
  private String checkName;
  private String message;
  private String description;
  private String stackTrace;
  private String errorMessage;
  private CheckResult internalResult;
  private List<CheckResponse> subChecks;
}

public enum CheckResult {
  CHECK_OK, CHECK_FAILED;
}
```

ApplicationCheck – Restrictions

- Responses are binary (CHECK_OK, CHECK_FAILED)
- Raw data is often fuzzy
- Check does not necessarily fail if a sub-check fails

→ Apply a decision function to determine result

Java Enterprise Edition (JavaEE)



Source: docs.oracle.com

Java Management Extension (JMX)

- Provide JVM diagnostic information through JMX Beans
- Specifics are VM dependant
- Remote Monitoring
- Notification Listeners

However:

> *“This platform extension is only available to the garbage collector implementation that supports this extension.” – JavaDoc*

→ Always need to check if specific element actually supports JMX

JMX Bean Example: GarbageCollectorMXBean

java.lang.management.GarbageCollectorMXBean

- getCollectionCount() : long
- getCollectionTime() : long

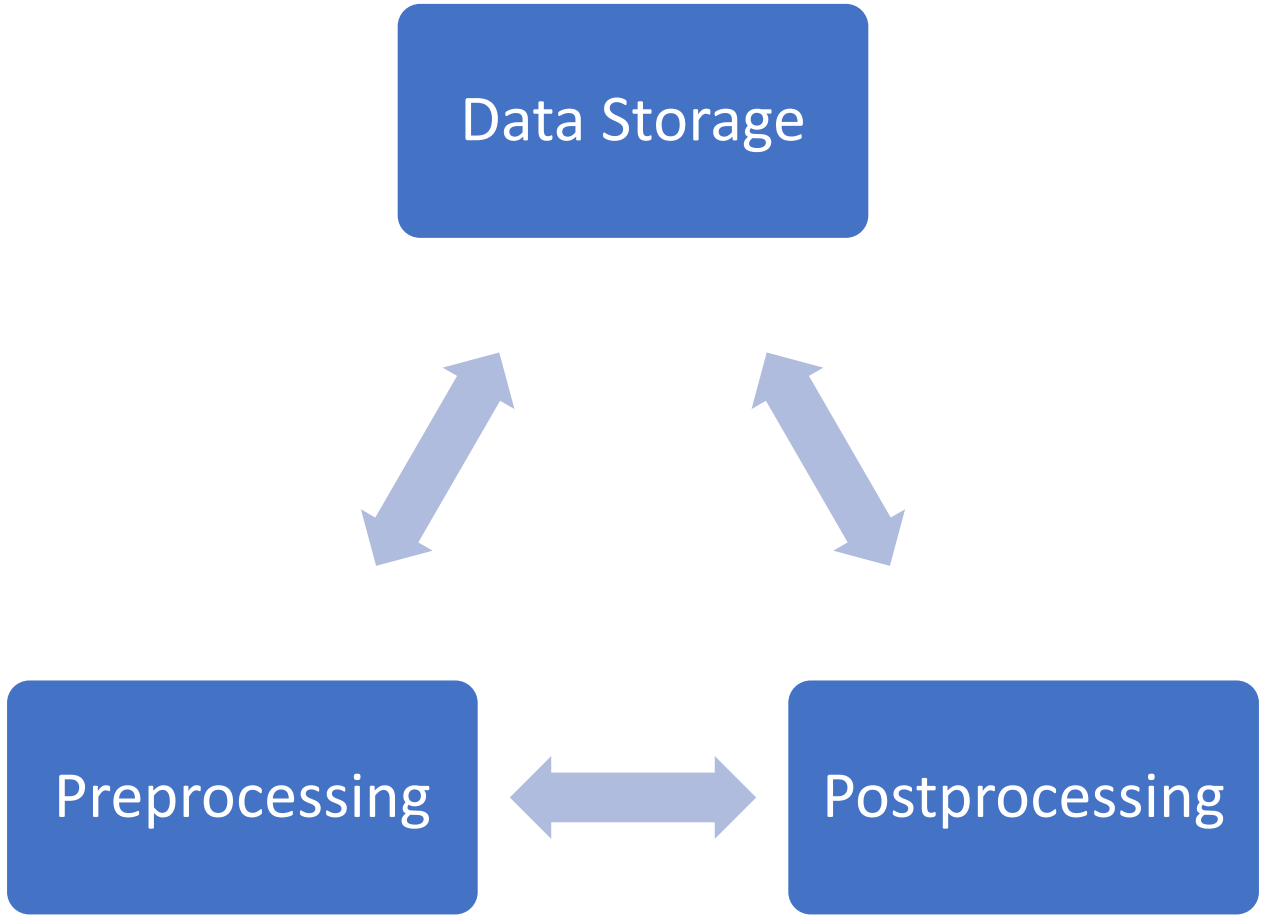
com.sun.management.GarbageCollectorMXBean

- getCollectionCount() : long
- getCollectionTime() : long
- getLastGcInfo() : GcInfo

GcInfo:

- Timestap + GC duration
- Detailed before/after data for each VM memory pool:
  EdenSpace, SurvivorSpace 1, SurvivorSpace 2, OldGen, PermGen, CodeGen

Project Constraints: Minimize Everything



GC Statistics Without Storing Data Points?

- 1 GcInfo instance per GC run
- Create statistics from that data

- Sliding average over fixed time period

Problem: Sliding average requires all data points in period

→ Discrete time steps

Discrete Time Steps

- Collect all data points in a short period into a single period object
- This period object holds min/avg/max/count
- Collect a small (known and fixed) number of period object
- Discard period object if too old

Discrete Time Steps – Pros/Cons

+ constant-time data point addition
+ Data points can be discarded
+ Number of period objects fixed and known
+ Small data sets for statistics generation
+ Old period objects can be “merged” to cover larger time periods
+ Allows potentially “infinite” time periods (> 3 Gyr)
– Statistics period varies

→ minimizes “everything”

TimerService

- Call methods on defined schedule

- Sometimes they don’t work
- TimerService only provides basic information
- No direct approach to monitor past invocations

→ Interceptors

Interceptor

- Intercept method calls:
  - Timer methods
  - EJB method calls
  - …
- Handle Cross-Cutting Concerns

- Configured through configuration, annotations or programatically

TimerService – Invocation Monitoring Strategy

- Intercept all timed method invocations
- Record the invocation
- Check for exceptions

→ Requires Interceptors to be configured in source or during startup