Rapid Delivery of Innovative Real-Time Applications with Oracle Coherence

CON7896

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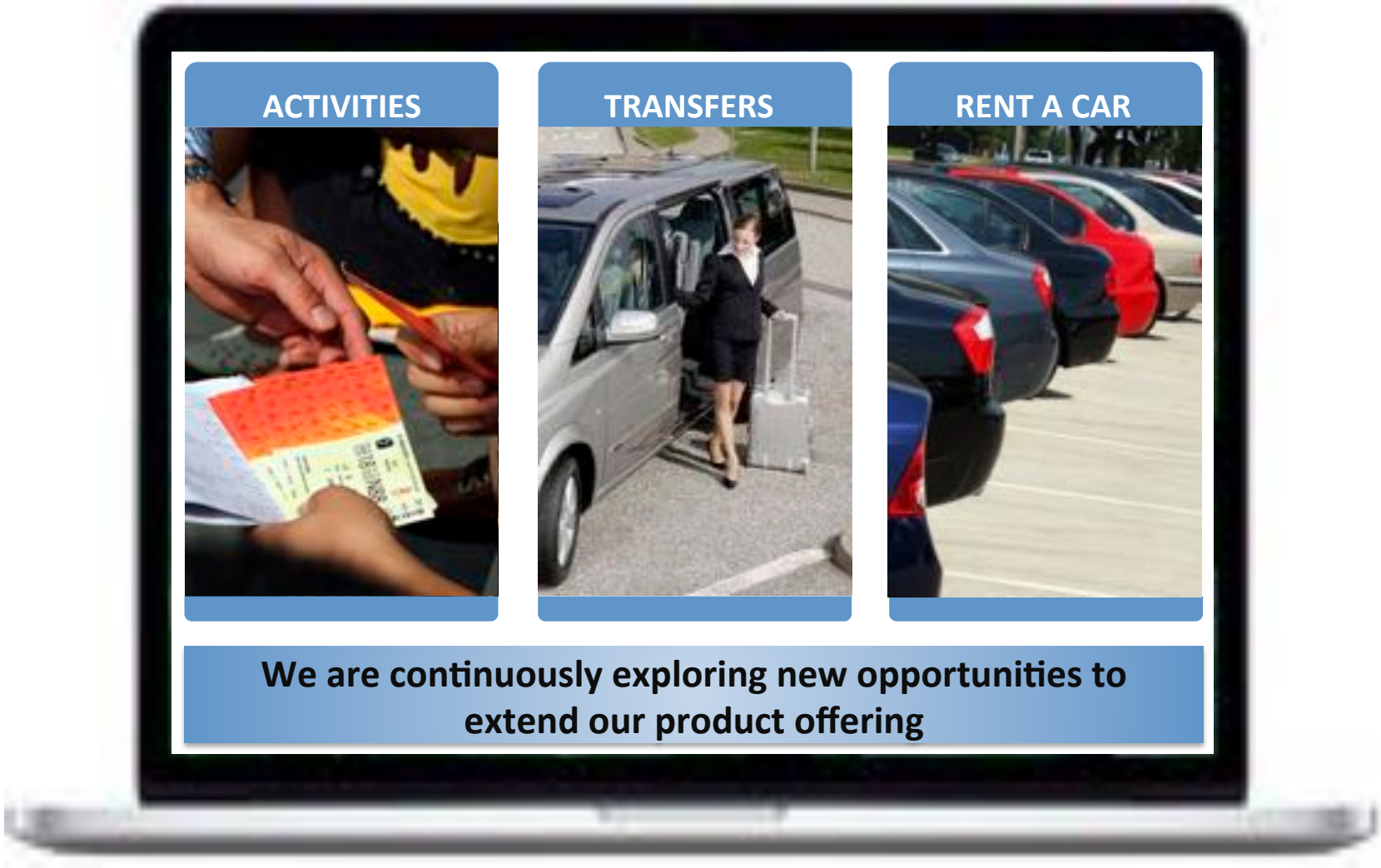
ORACLE OPEN WORLD

BUSINESS QUICK OVERVIEW

Better to understand who we are and what we do before going to details

Summary of Transfers & Activities Bank business – Link with Tui Travel PLC

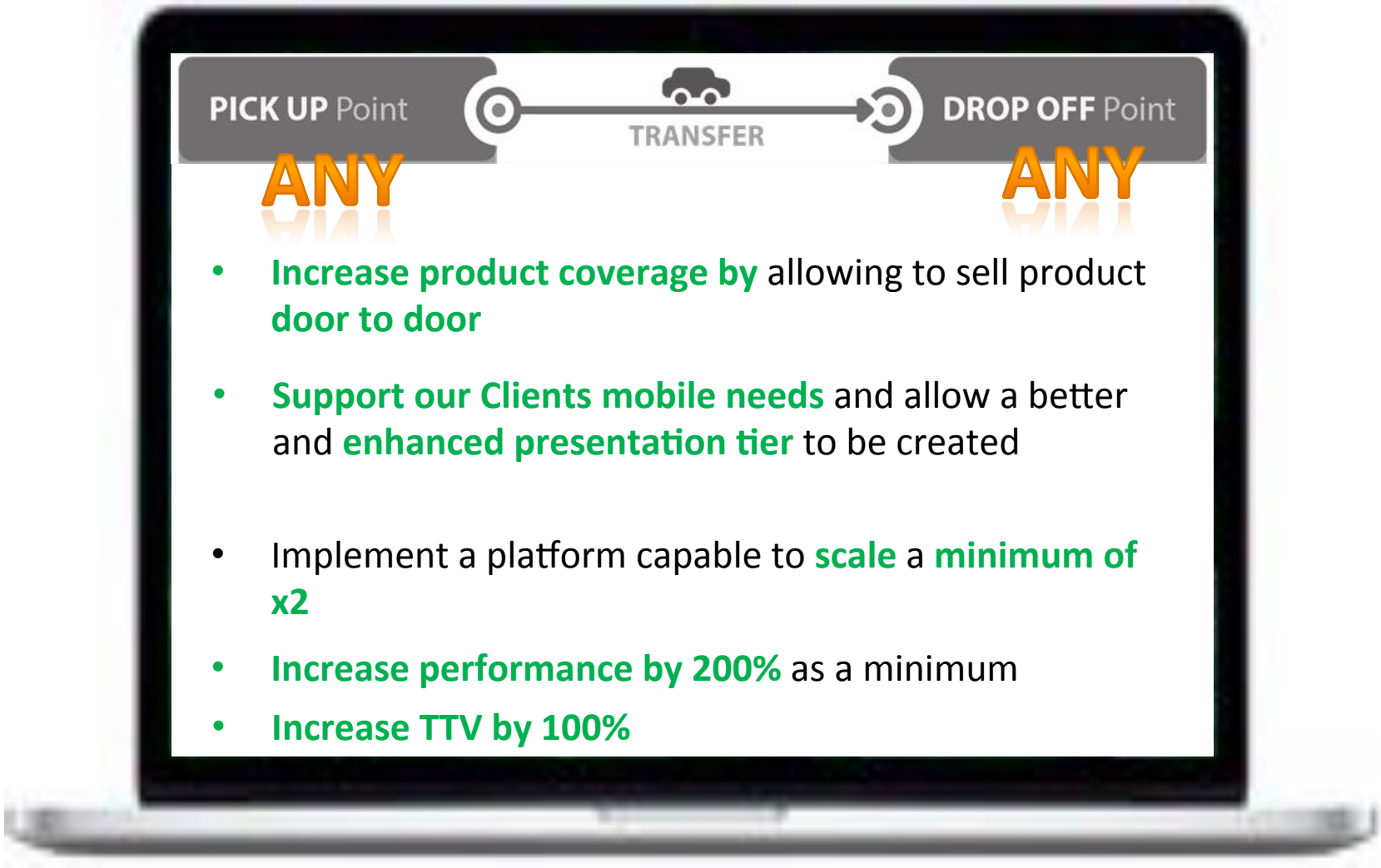
Summary of Transfers & Activities Bank business – What do we do & figures?



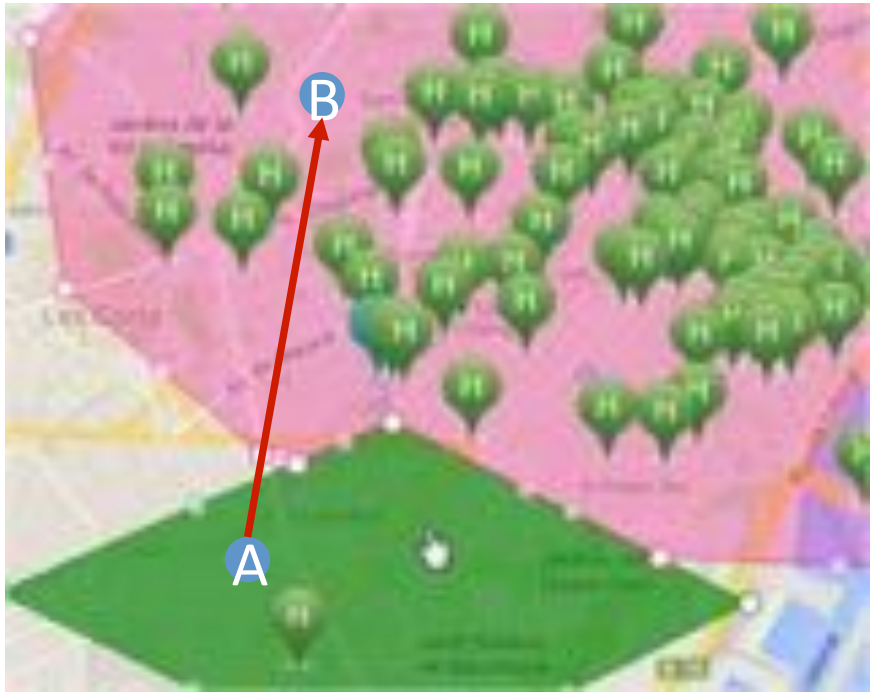
PROJECT CHALLENGES

Why the project was needed?

Business challenge or objectives

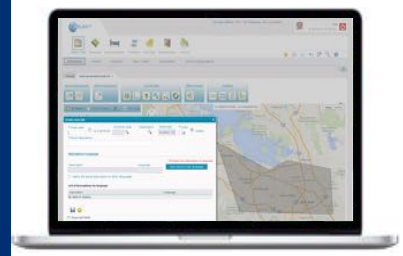


Business challenge or objectives



- Transfers are contracted and sold using one or more areas and defining a from-to route.
- Contracting was untouchable to avoid restructuring our price module.
- Implementation needed to be quick and fast
- Product needed to be standardise and distributed uniformly worldwide

The technical challenges…



How to create polygons in ADF?

How to store map areas and quotations in a database?

How to determine the area containing a pickup?

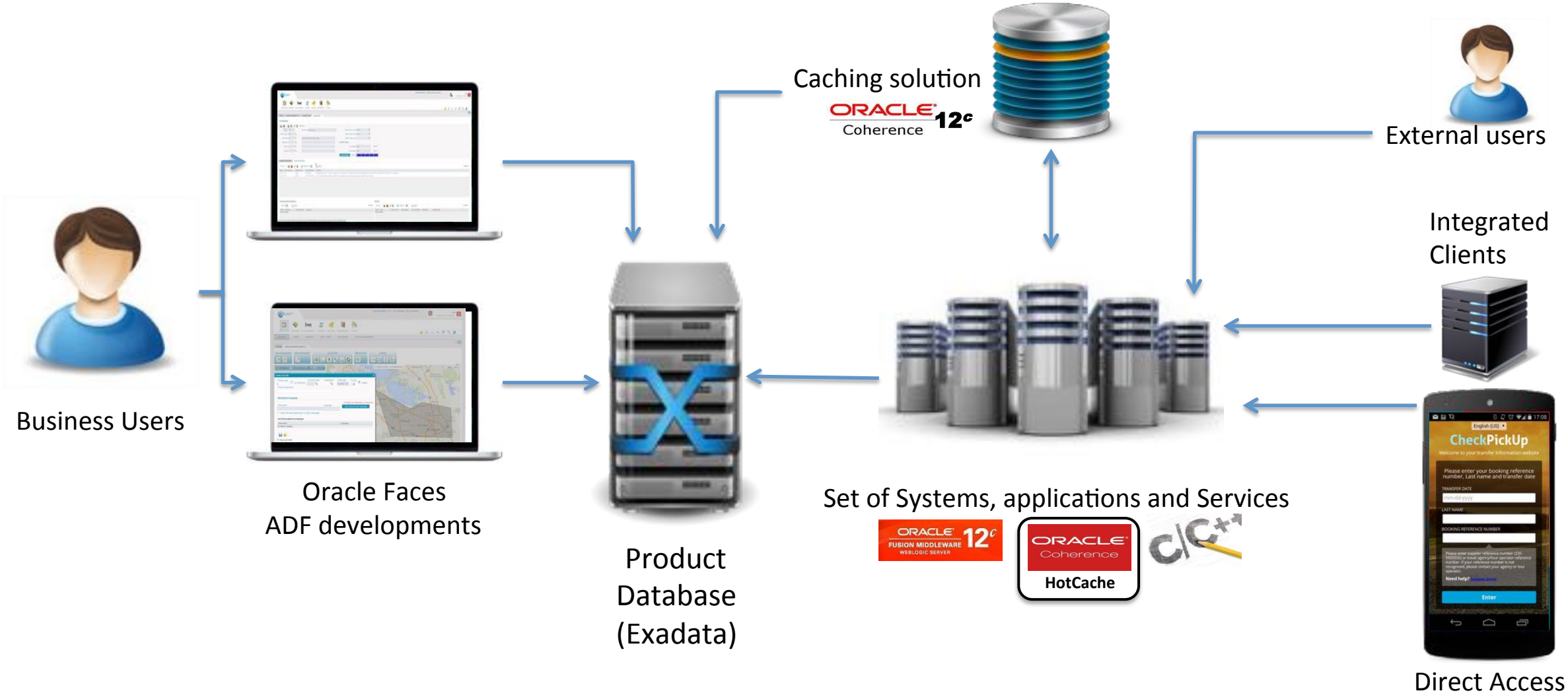
How to deliver the availability and integrate with the company's SOA platform?

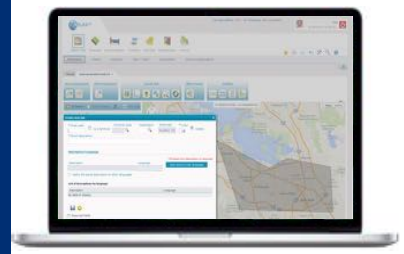
How to package and deploy the solution to get a standard process and efficient operations?

Capacity plan for both the launch and expected growth

Performance!!!

Walkthrough the solution

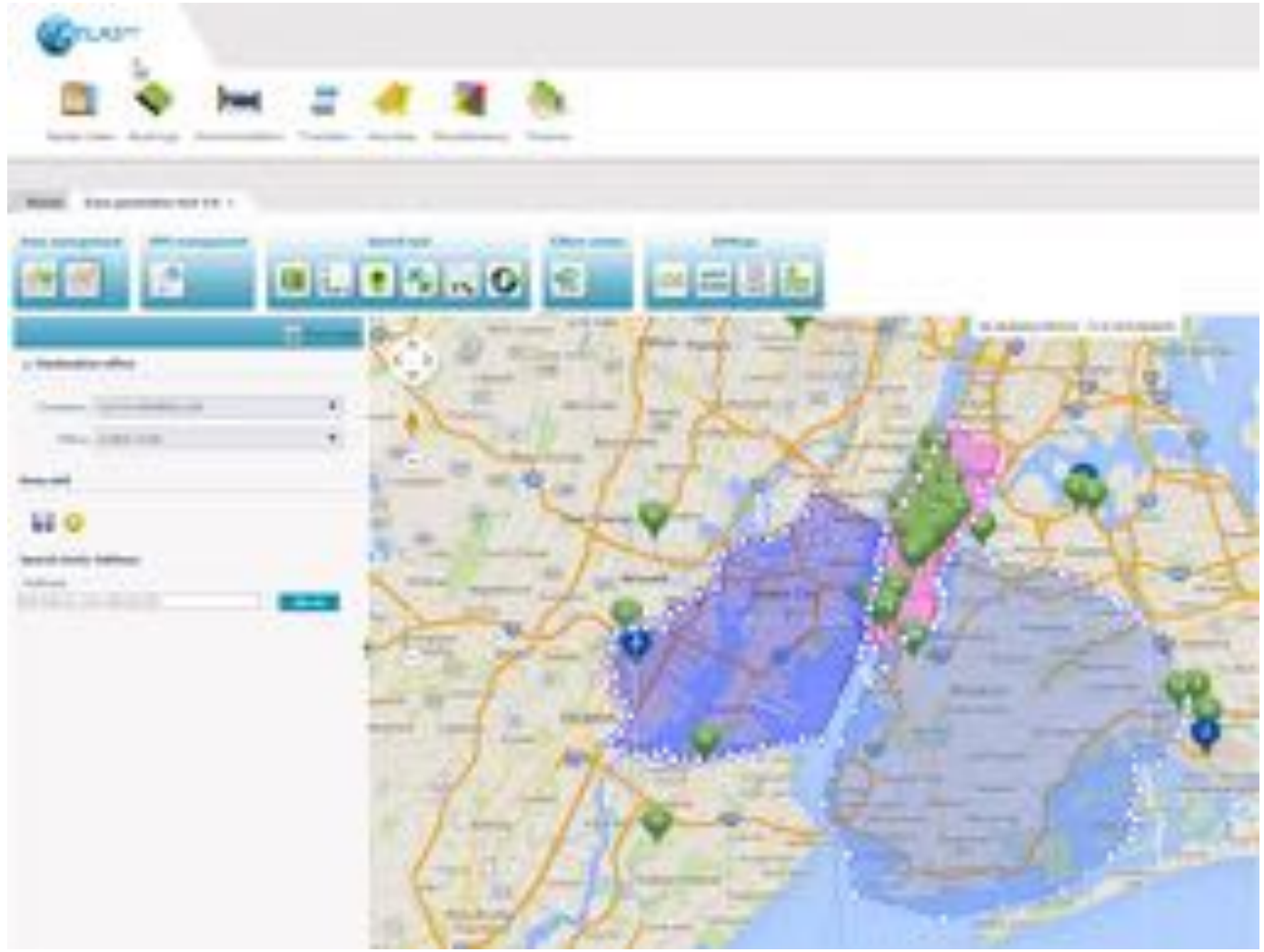




How to create polygons in ADF?

Google maps

to develop the Backoffice polygon generator tool



How to store map areas and quotations in a database?

How to determine in which polygon a GPS coordinate embedded?

- **Preliminary definitions**
  - Zones are defined geographically using polygons
  - Polygons are stored in an Oracle Database as SDO_GEOMETRY objects
  - A point is a set of geographic coordinates (latitude, longitude)
  - Zones can overlap, so a given point could lie in zero, one, or more zones

- **Use case:** find the zone(s) that contain a given point

- **Obvious solution**: this can be done in the Database by using the Spatial Operator SDO_CONTAINS and creating R-tree SPATIAL_INDEX indices.

- **Constraints:**
  - Response time is crucial while calculating availability
  - Do not bring any logic to the database.
  - Allow the system to scale horizontally

How to store map areas and quotations in a database?

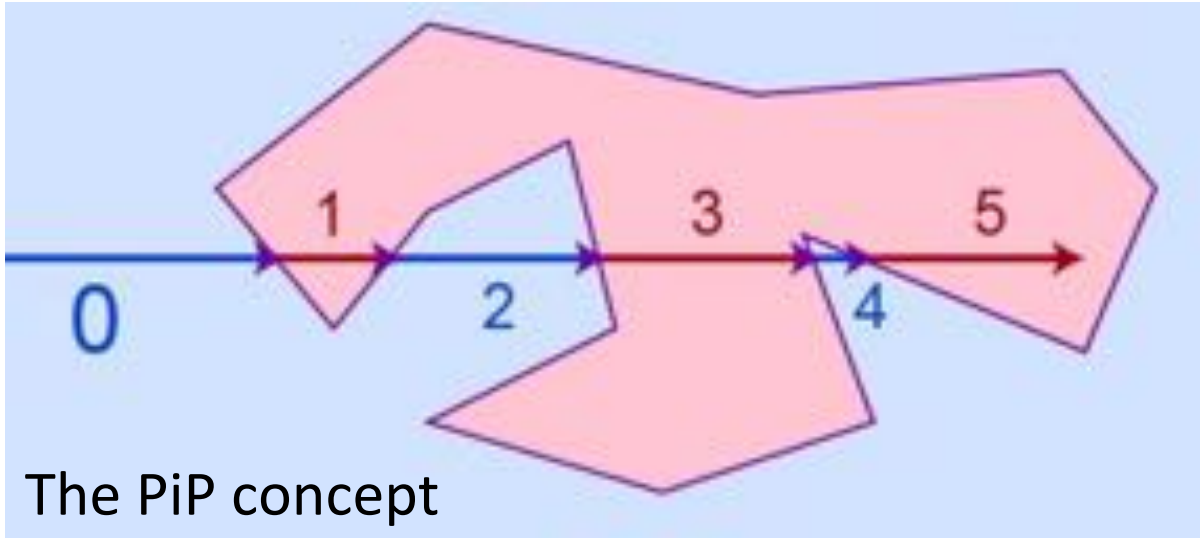
How to determine in which polygon a GPS coordinate embedded?

- **Chosen solution** ORACLE Coherence 12c
  - All the polygons are pre-loaded in a Coherence 12c cluster
    - They are pre-loaded when Coherence starts
    - They can be refreshed by a scheduled job or by HotCache.
    - A bounding box is calculated for each polygon on load
    - Standard JEE application running on WL12c manages the business logic. Coherence cache is injected into the EJBs.

  - **The search algorithm is run in grid**
    - For a given point, each node runs the PiP algorithm as a filter on all its polygons.
    - Only the polygons containing the given point are returned.
    - Optimization: the bounding box is checked first. This safely discards many polygons without actually running the PiP algorithm on them.

How to determine in which polygon a GPS coordinate embedded?

ORACLE Coherence 12c

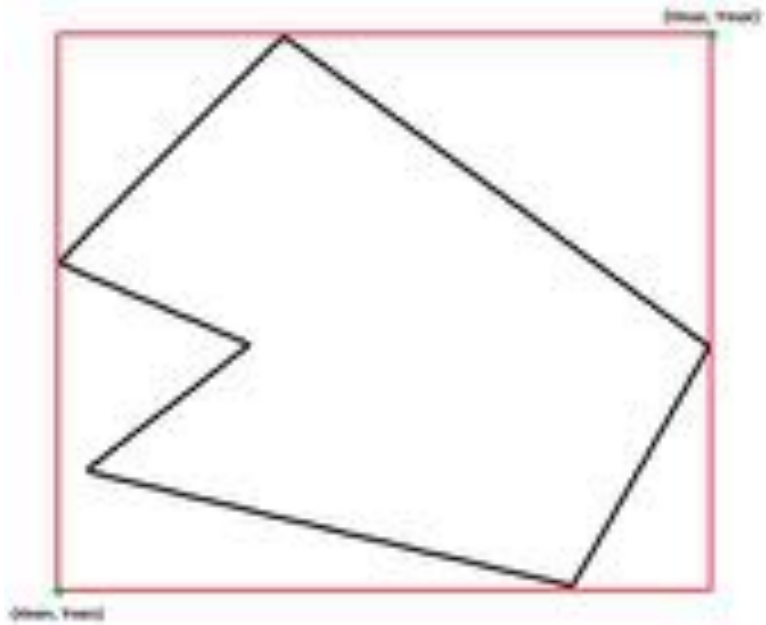


The PiP concept

Image Source: Wikipedia, Point in Polygon. License: CC BY-SA 3.0

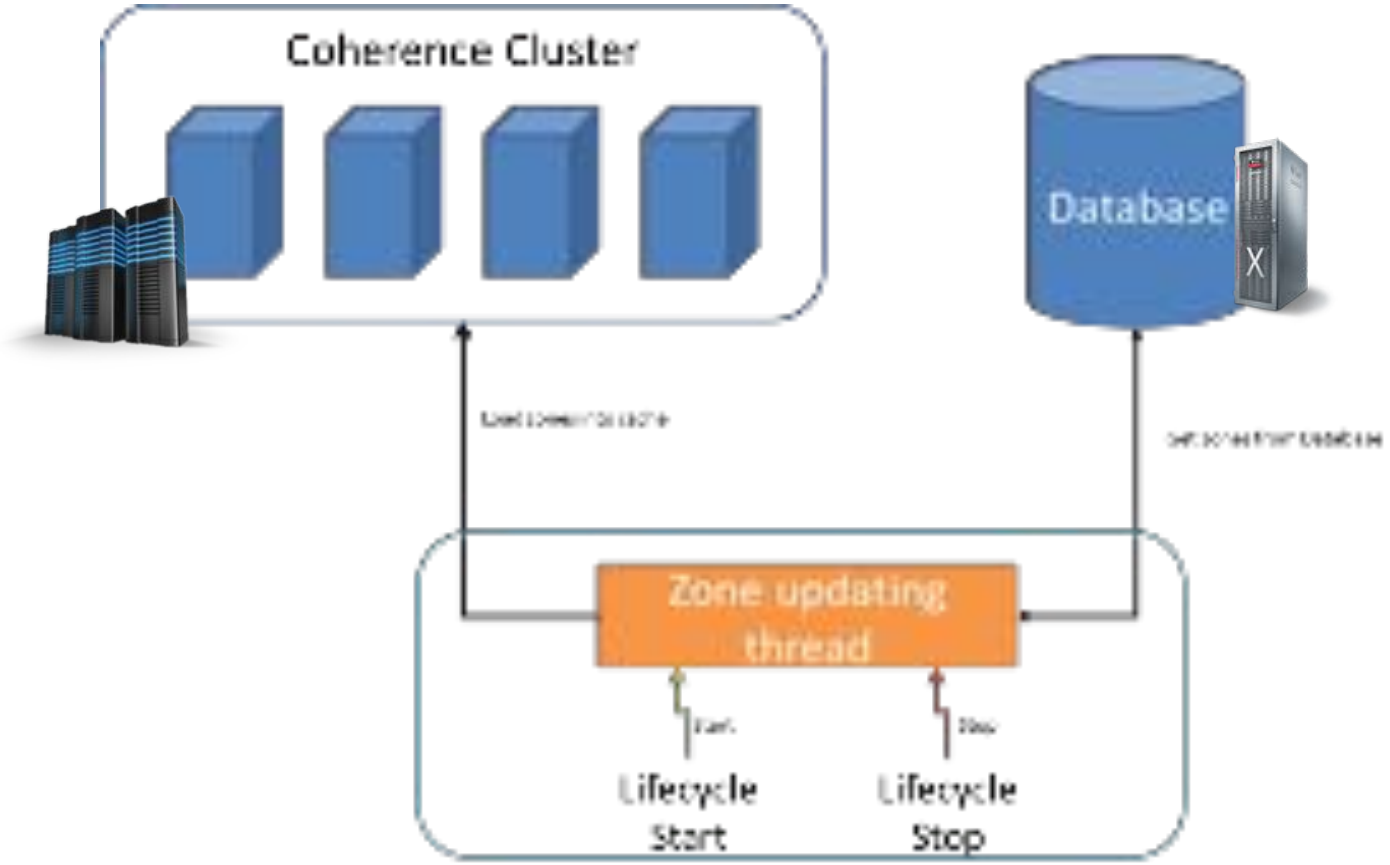
- Is a given point inside or outside a given polygon?
  - **Cast a ray** starting from the point and going any fixed direction
  - Test **how many times the ray intersects the edges** of the polygon
    - If it's odd the point is **inside** the polygon.
    - If it's even the point is **outside** the polygon.
- This can be implemented by calculating and **counting the intersections** between the ray and the edges.
- Computational cost: **O(N)** for N-sided polygons (floating point products).

How to determine in which polygon a GPS coordinate is embedded?

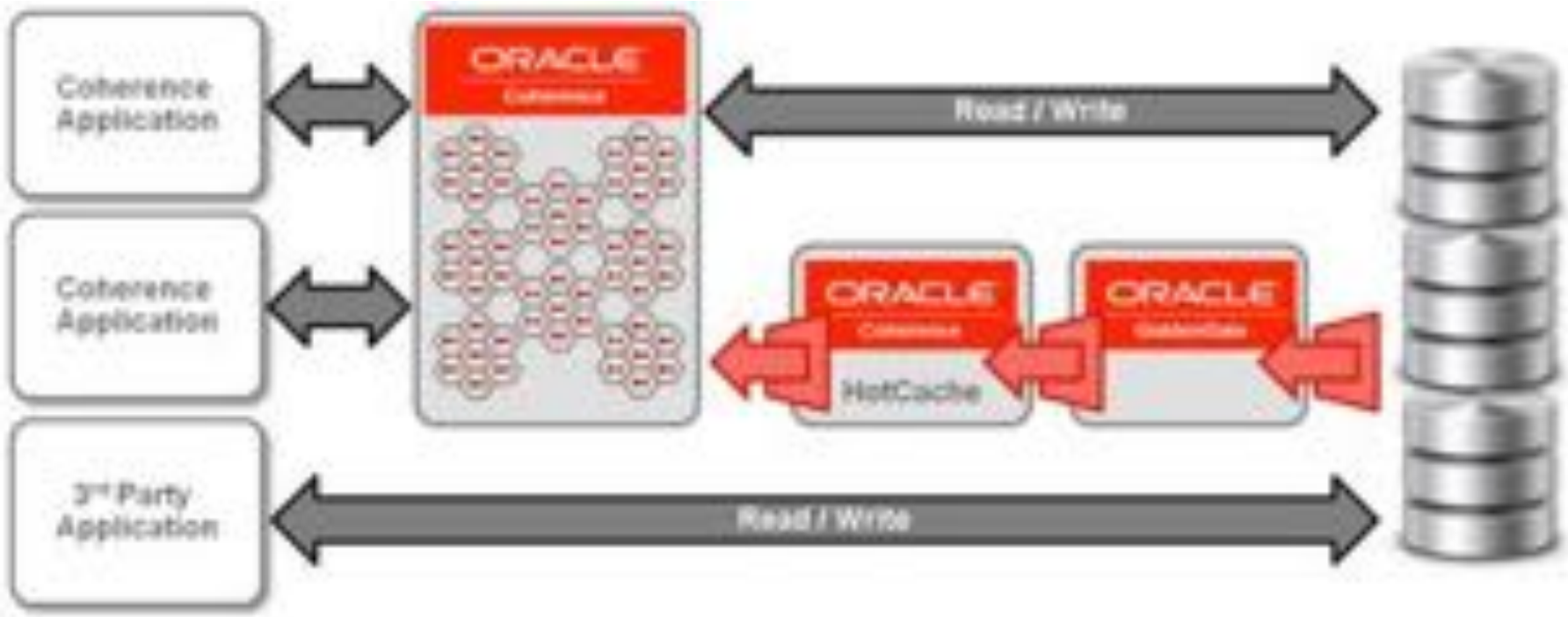


The bounding box

Coherence is refreshed periodically and at the server startup



Improvement using HotCache



ORACLE
FUSION MIDDLEWARE
WEBLOGIC SERVER

How to deliver the results and integrate with the company's SOA platform? How to package and deploy the solution for efficient operation?

- Classical **JEE** approach:
  - User Interface (Web or REST interface)
  - Business layer (EJB 3.1)
  - Data Layer (JPA + MyBatis)

- Database in the **Exadata** with **Multi-Datasources**

- **Coherence** support for:
  - Cache (Data)
  - Grid (Heavy calculation)

- Software Packaging with **EAR** (application) **+ GAR** (coherence)
  - More efficient operations support

Which hardware to set-up and which sizing was right one?

- **2** datacenters connected at 10Gbs
- **4 + 4** Weblogic 12c Servers. 24 CPU Cores per server = 288 CPU cores.
- **1 + 1** Coherence 12c Servers. 64 GB per server = 128GB. To be upgraded to **2 + 2** servers in next months.
- **2** Exadatas
- F5 Big IP Load balancers

Servers Configuration

Name	Type	Cluster	Machine	Listen Address	State	Health	Listen Port
ACTDIS01	Configured	ACTDISCluster	sa1dmp01.ods	fesa1dmp01.ods/10.162.239.21	RUNNING	OK	23002
ACTDIS02	Configured	ACTDISCluster	sa2dmp02.ods	fesa2dmp02.ods/10.162.239.22	RUNNING	OK	23002
ACTDIS03	Configured	ACTDISCluster	sa1dmp03.ods	fesa1dmp03.ods/10.162.239.23	RUNNING	OK	23002
ACTDIS04	Configured	ACTDISCluster	sa2dmp04.ods	fesa2dmp04.ods/10.162.239.24	RUNNING	OK	23002
ACTDISCoherence01	Configured	ACTDISCoherence	sa1dcp01.ods	fesa1dcp01.ods/10.162.239.108	RUNNING	OK	23012
ACTDISCoherence02	Configured	ACTDISCoherence	sa2dcp02.ods	fesa2dcp02.ods/10.162.239.109	RUNNING	OK	23012

- EAR files deployed in weblogic cluster (GAR included inside).
- GAR files deployed in weblogic cluster with coherence storage enabled.
- All the servers are included in the coherence cluster.
- Binaries are separated from the configuration files by using Deployment Plan.

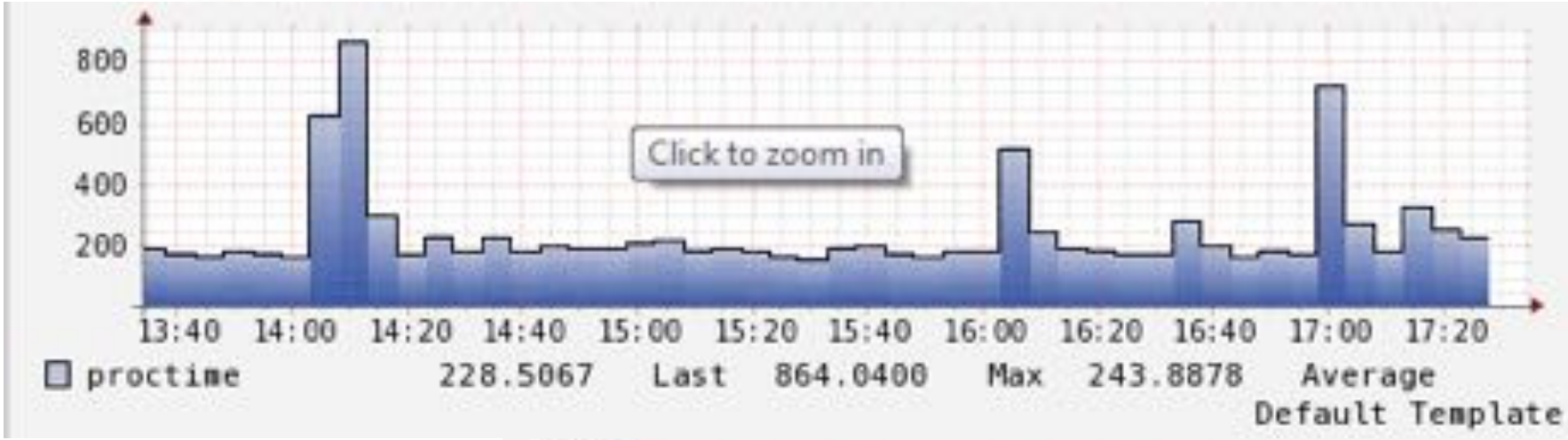
Performance!!!

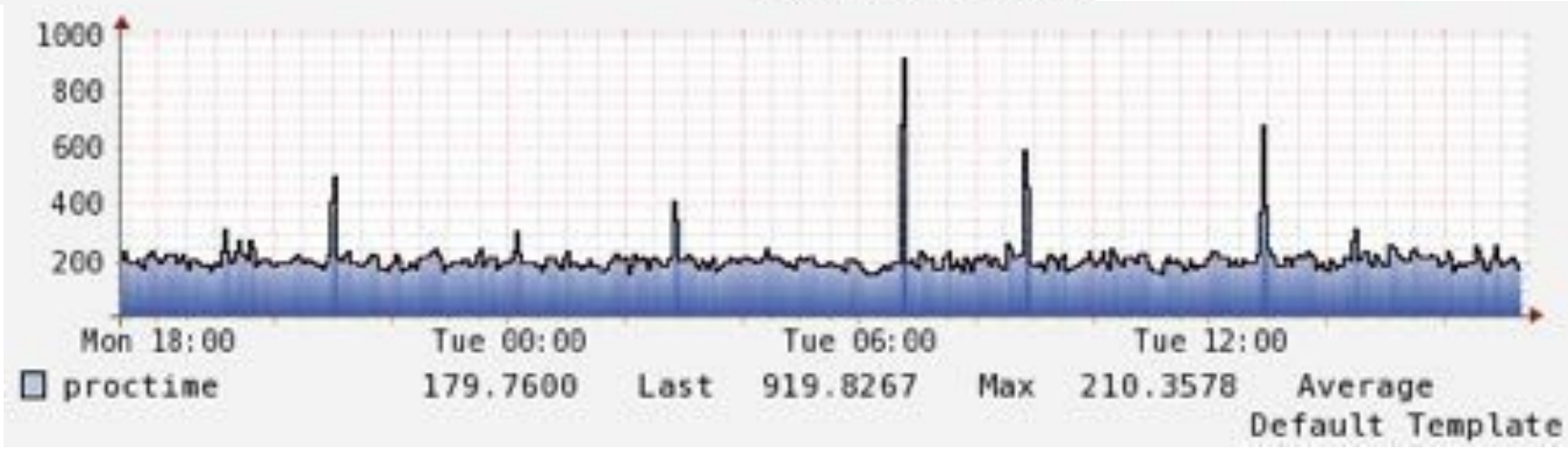
- 150 miliseconds average to return the transfers availability (end to end)

- Less than 1 milisecond (average) to execute point in polygon for 500.000 polygons around the world (excluding network latency).

- 200 miliseconds (average) to deliver the activities availability. Activities have a bigger contents sheet including photos and descriptions.

Performance!!!





1000%

Better response time comparing RQ to DB vs RQ to new Cached infrastructure

&

More requests per second. We can support more than 2000+ requests per second or what is the same 172,8M requests per day

500%

Capacity to scale 500% more. Using Coherence Grid and having the infrastructure purchased.

Days to complete all project and put it live including infrastructure

Contact us if you need any! THANKS!

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