Resilience in S/4HANA Extension

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Distributed system

Distributed System

"A distributed system is a system whose components are located on different networked computers, which then communicate and coordinate their actions by passing messages to each other."

(G. Coulouris et. al, 2012)

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CAP theorem

Consistency

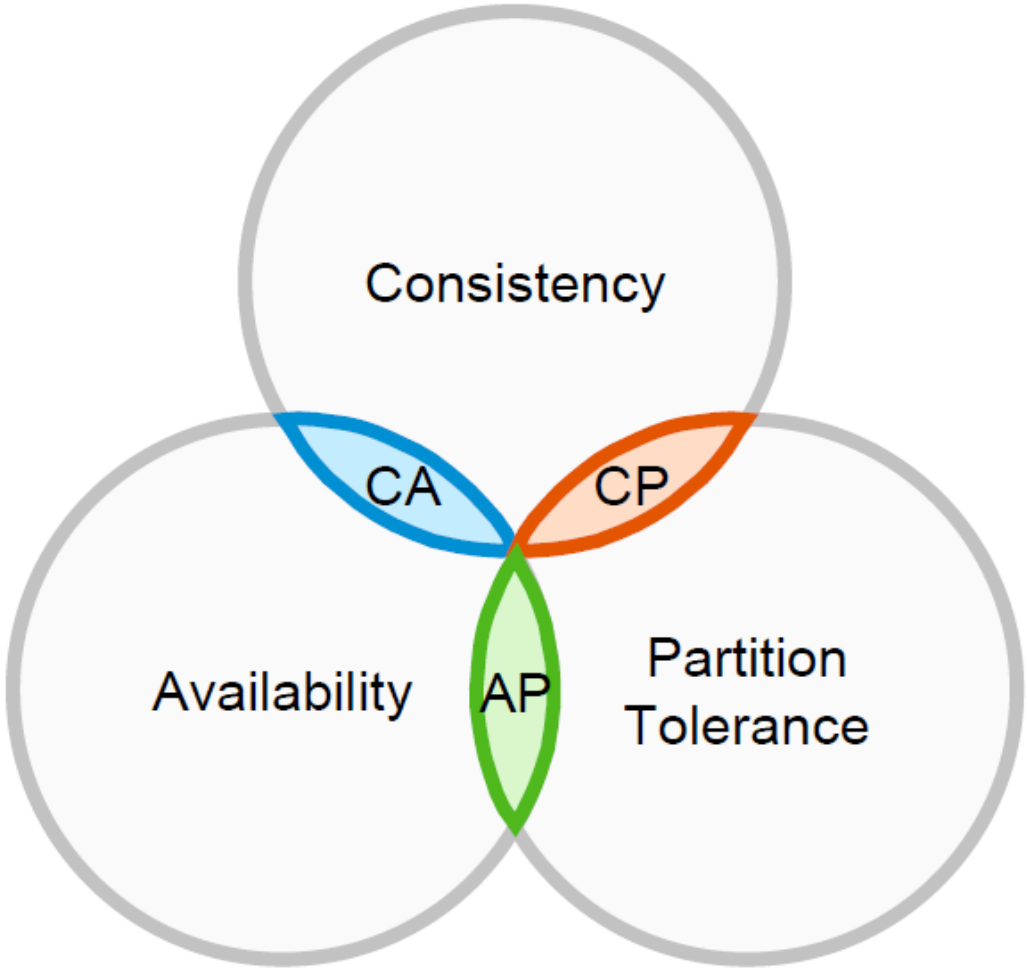
Any read operation that begins after a write operation completes must return that value or the result of a later write operation.

Availability

Every request received by a non-failing node in the system must result in a response.

Partition Tolerance

The network between our distributed components can arbitrarily lose many messages sent from one node to another.



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Possible implementations based on the CAP theorem

Consistency + partition tolerance (CP)

- Ensure consistency by making the system unavailable

Availability + partition tolerance (AP)

- Show partial data and inform the user about this on UI Level (degradations)
- Return alternative data or temporarily limit functionality
- Keep the system available, store locally and compensate later (eventual consistency)

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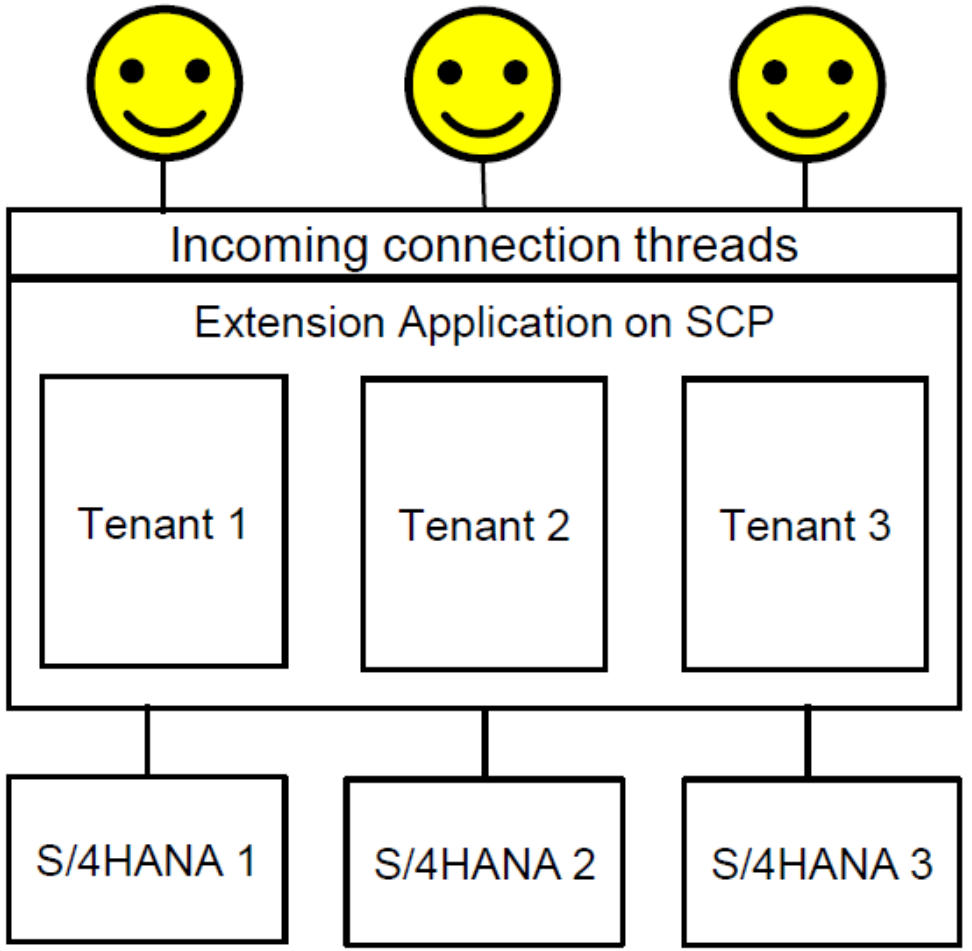
Cascading failures

```
class BusinessPartnerServlet extends HttpServlet {
  …
  @Override
  void doGet(…) {
    businessPartnerService
      .getAllBusinessPartner()
      .select(
        BusinessPartner.FIRST_NAME,
        BusinessPartner.LAST_NAME)
      .execute();
    …
  }
}
```



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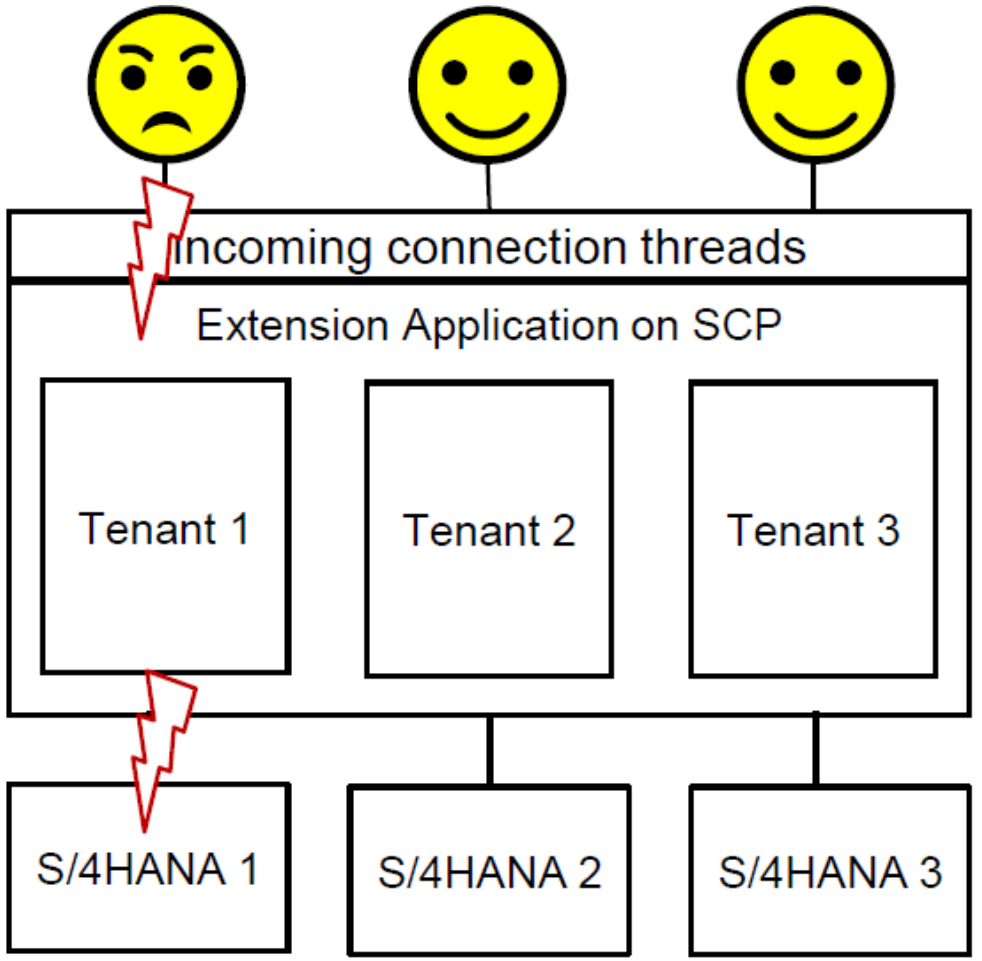

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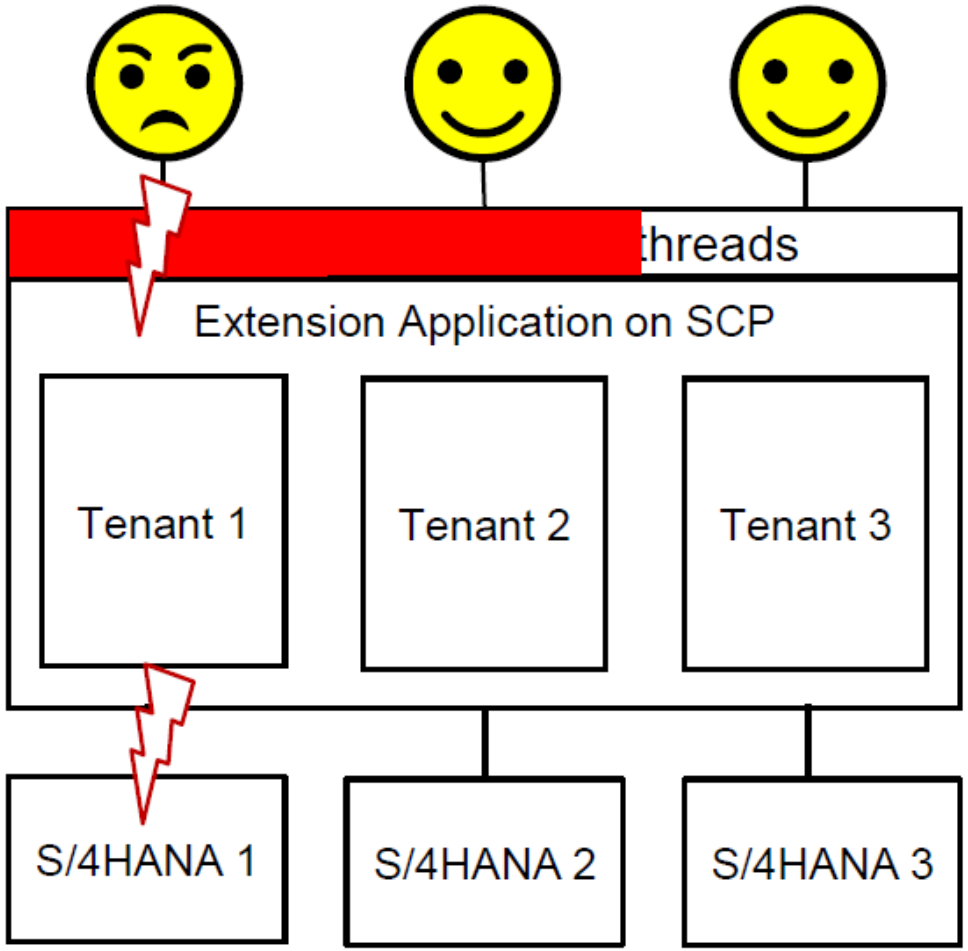

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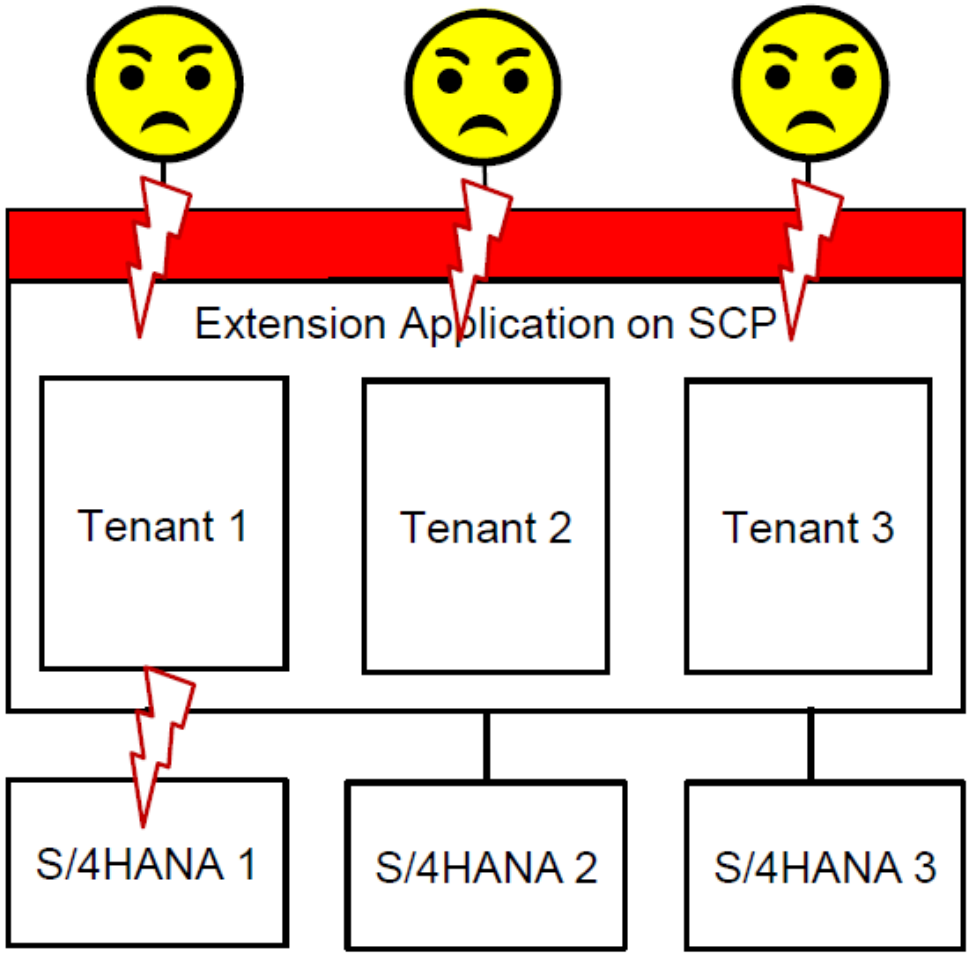

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Resilience – What is

- **Resilience** is the ability of someone or something to bounce back after difficulties.
- Kids are often described as resilient because of their ability to recover quickly
- A resilient flower may bloom even in a drought.
- A resilient flexible material is able to recover after a lot of deformation
- In our specific case, resilience means the ability for our application to maintain an high availability during its execution

Failure is inevitable!

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Resilience – Hystrix

Hystrix is a **latency and fault tolerance library** designed to isolate points of access to remote systems, services and 3rd party libraries, **stop cascading failure** and **enable resilience** in complex distributed systems where failure is inevitable.

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Resilience – How it is implemented

The SAP Cloud SDK is build upon the Hystrix library to provide resilience for your cloud applications.

Hystrix comes with many interlocking mechanisms to protect your application from failures, like

Timeouts: Hystrix allows setting custom timeout durations for every remote service.

Bulk-Head: By default, every command has a separate thread-pool from which it can requests threads to execute the remote service call

Circuit breaker: Hystrix uses the circuit breaker pattern to determine whether a remote service is currently available. Breakers are closed by default. If a remote service call fails too many times, Hystrix will open/trip the breaker.

Fallback: Hystrix enables you to simply provide a fallback solution. So if a call fails, Hystrix will check whether a fallback is implemented and call it automatically.

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Caching– What is

- Sometimes service calls from your application to external servers turn out to be quite expensive in terms of performance and latency
- **To improve responsiveness** to the users, the data requested internally by your application can often be stored for subsequent calls
- This general behavior is called a cache. A cache stores copies of information passing through it, so that, the amount of information, that needs to be transmitted across networks, can be reduced.
- By default, the cache is local to a single run of your application. It does not store data in files, or on outside servers.

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Caching– What is

Enables responsiveness and great user experience

Avoids redundant retrieval of the same data

Reduces load on systems like SAP S/4HANA

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Demo

Questions & answers

Thank you.

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