Real-World Uses of Transactional Web Services

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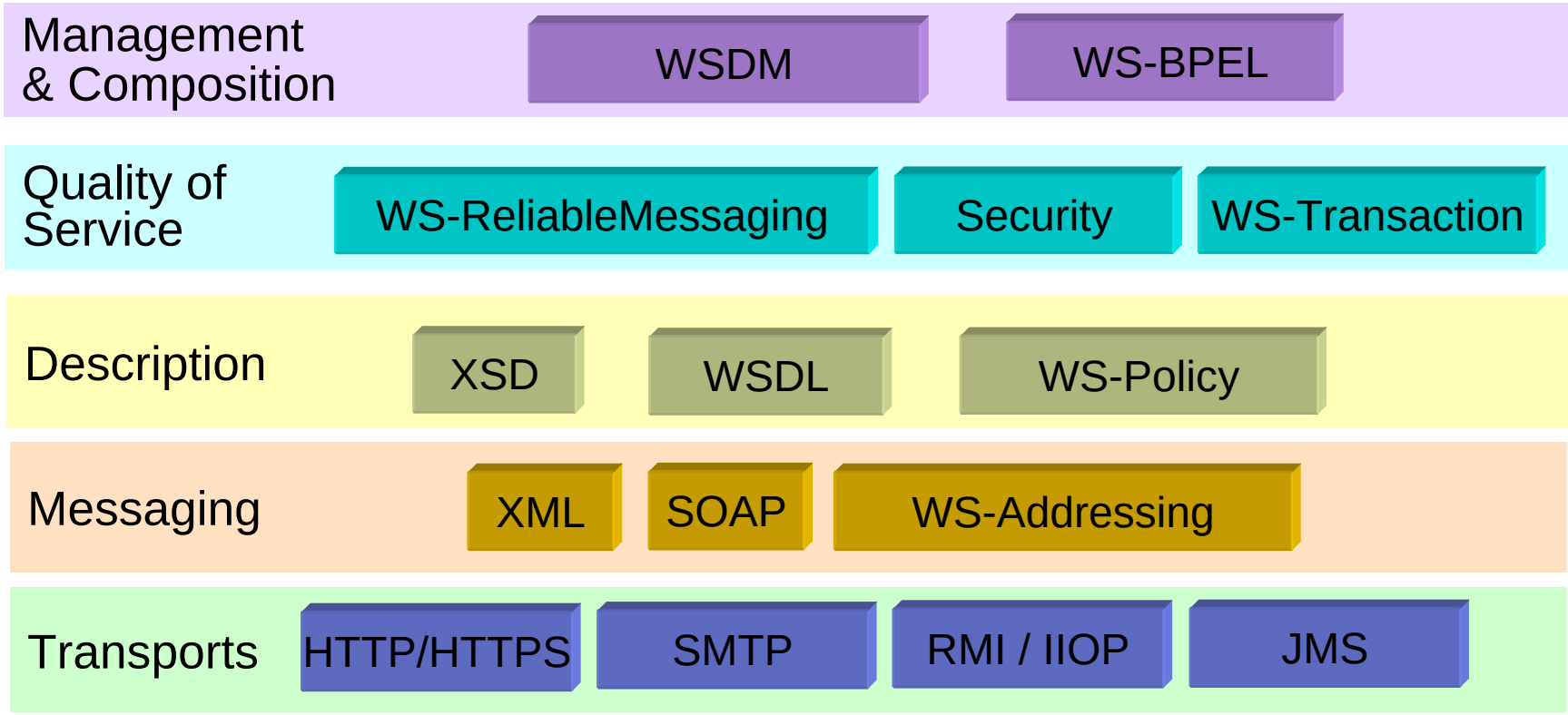
IBM WebSphere Transaction Architect

Web services composeable architecture



Brief history of WS-Tx standard

- WS-Tx = **WS-Coordination** +…
  - **WS-AtomicTransaction**
    - Atomic commit or rollback; 2PC
  - **WS-BusinessActivity**
    - Overall outcome atomic; business compensation
- Version 1.0 specs (IBM, MS, BEA) published Aug 2005
  - Input for OASIS WS-Tx Technical Committee
- OASIS WS-Tx TC V1.1 standard published April 2007

WS-Transaction: federating transactions across disparate systems

- WS-Tx defines the following concepts:
  - **An XML CoordinationContext** that identifies a transaction and which is passed implicitly in Web service messages without this context having to be declared as an explicit message parameter.
    - in the SOAP header for a SOAP binding
  - A generic **Coordination message set**
  - Protocol-specific messages sets that define the **AT and BA protocols**
- This XML context and XML messages are designed for simple transformation within different runtimes to map down to underlying transaction processing technologies.
  - For example, the J2EE WebSphere platform transforms WS-AT ← (JTA-based impl) → XA

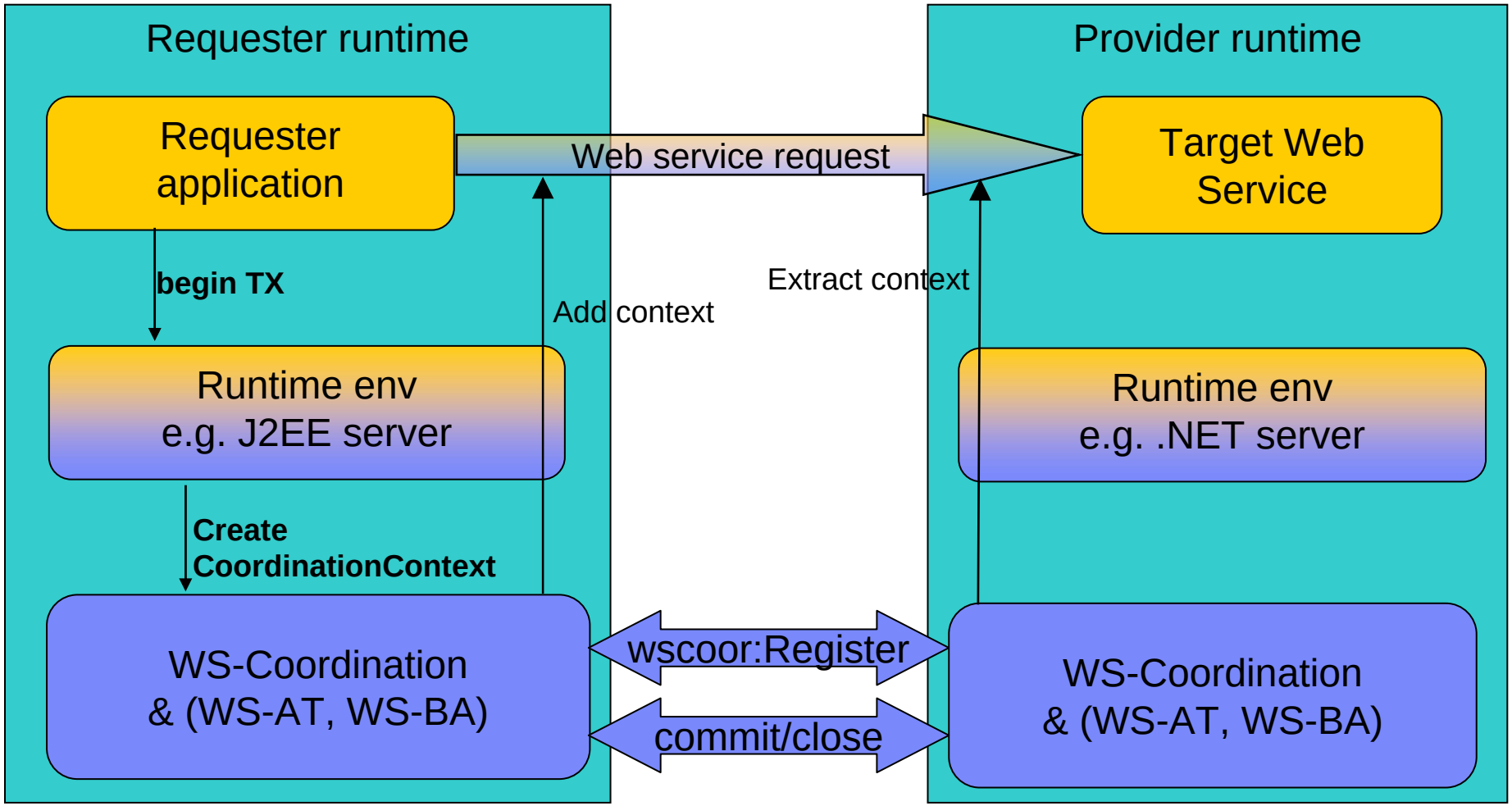
When is WS-AT useful?

- WS-AT enables the scope of ACID behaviour to be distributed between Web service components.
- BUT…
  - Resource locks are held throughout the transaction
  - Services that share an ACID transaction are not loosely coupled
- Primary uses:
  - transactions between services within a single organization domain
  - sometimes the *only* way to distribute an ACID transaction across different software stacks.

When is WS-BA useful?

- WS-BA provides a different form of atomicity from WS-AT. Participant are still brought to an atomic outcome but:
  - there is no isolation of resources
  - application-level compensation is required instead of resource manager rollback
- Also appropriate for longer-running and more loosely-coupled interactions.
  - but don't equate compensation with "looser coupling".
- A non-process-oriented approach *c.f.* WS-BPEL
- Primary uses:
  - business transactions that span organizational boundaries
  - distributed processes that use non-transactional resources

WS-Transaction architecture



What about the "NFRs"?

The TX specs define interoperable Web service transaction protocols. They don't define "non-functional requirements" such as:

- High availability and failover of TX endpoints
- Transaction-based workload management affinity
- Proxies and firewalls

These are outside the scope of the specification. But any enterprise-level SOA runtime needs to accommodate these.

Where are these considerations factored and do they affect interoperability?

WS-Addressing EndpointReferences

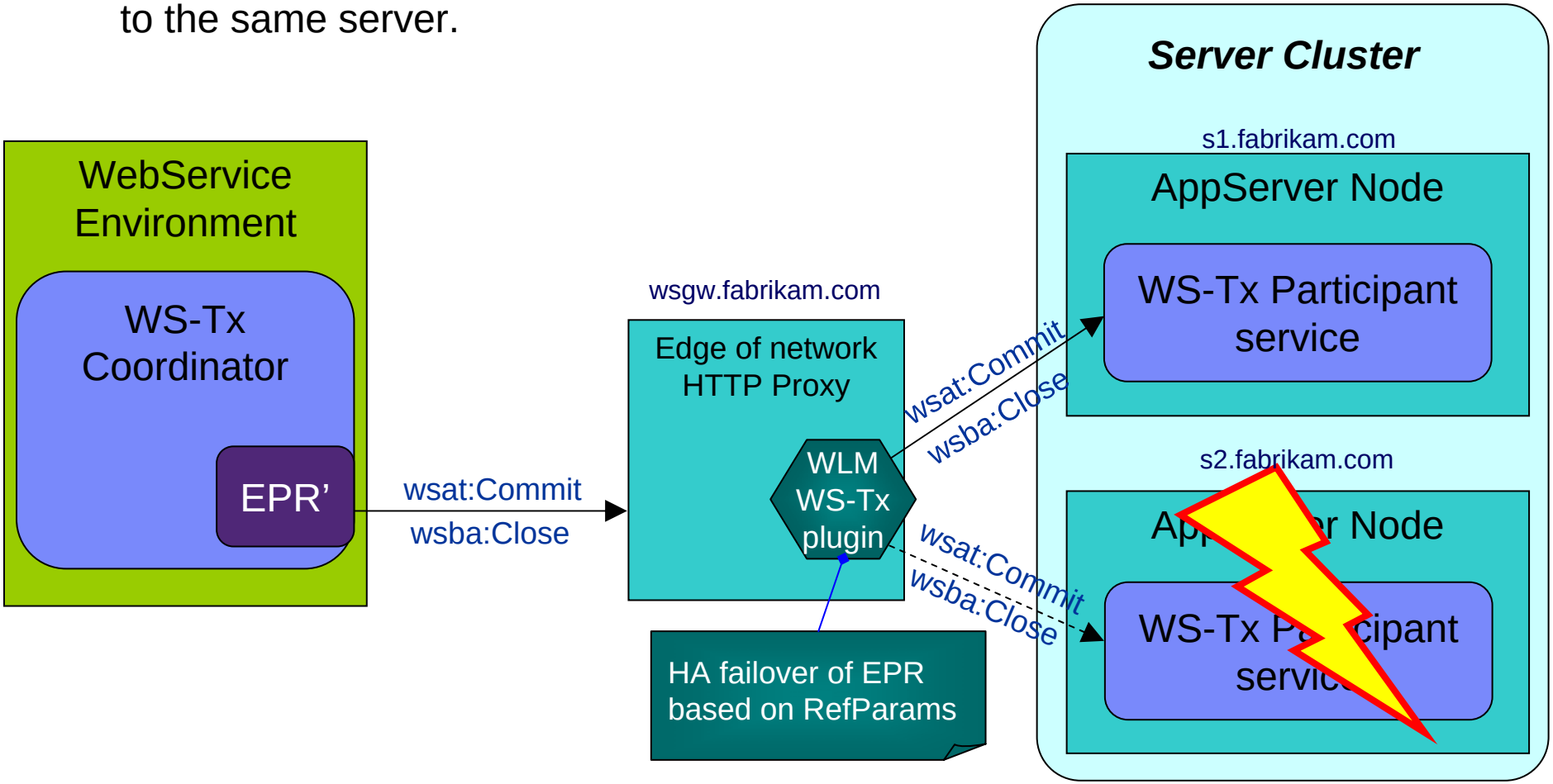
- The TX endpoints exchanged are WS-Addressing EndpointReferences:
  - A “++” XML pointer.
  - Contains an address URI for the endpoint service
  - Contains a set of ***opaque*** “ReferenceParameter” tokens that augment the address with anything required by the target service or its runtime environment.

```
<wsa:EndpointReference>
    <wsa:Address>http://wsgw.fabrikam.com/_IBMSYSAPP/wsat/services/Participant</wsa:Address>
    <wsa:ReferenceParameters>
        <someNS:txID>111-222-333</someNS:txID>
        <was:HAclusterId>47563940008426597832759 3</was:HAclusterId>
     </wsa:ReferenceParameters>
</wsa:EndpointReference>
```

High availability failover of protocol endpoints

WLM transaction affinity constraints.

All requests to WLM-able EPRs within the same WS-Tx context targeted to the same server.



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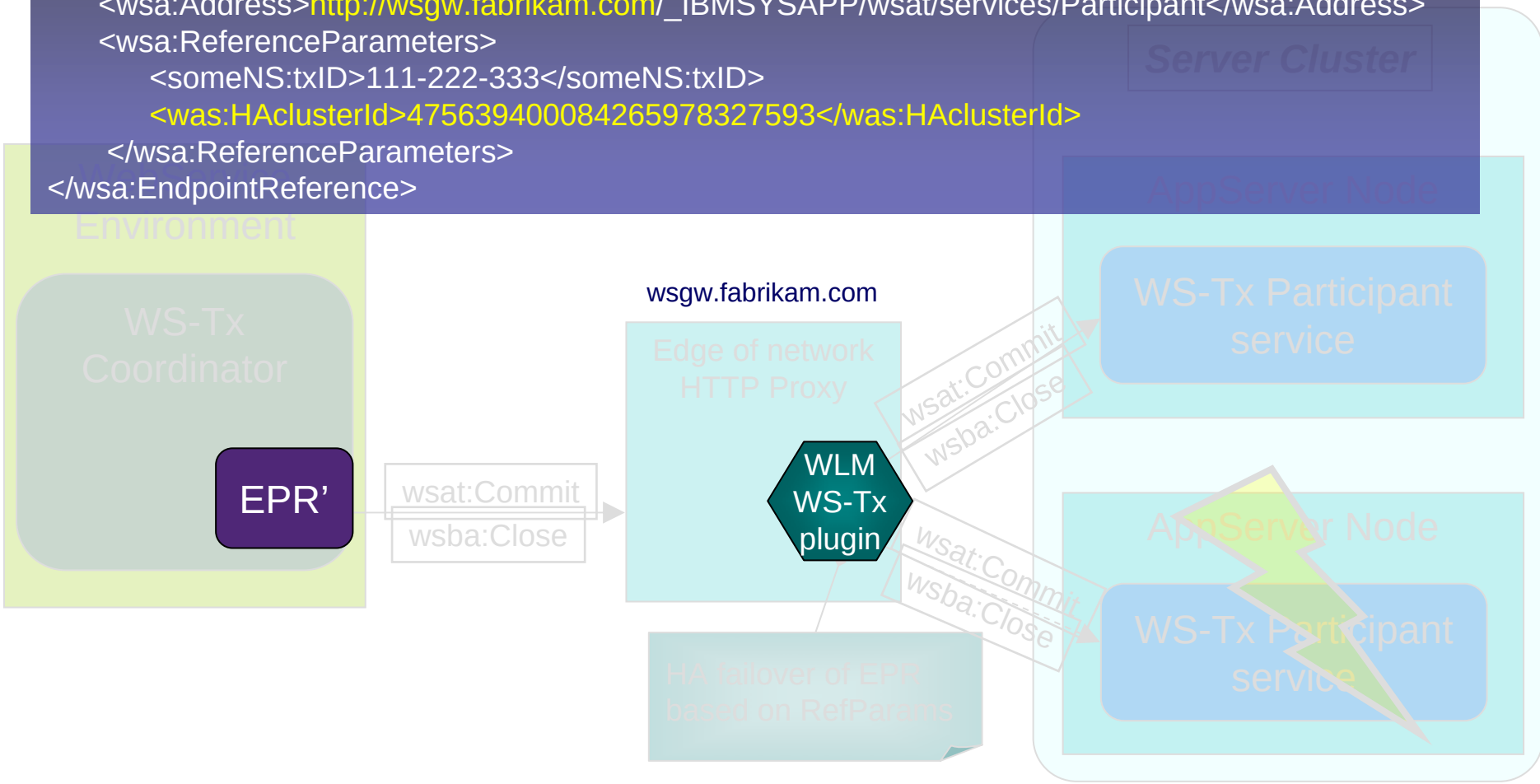

Transaction-based affinity routing

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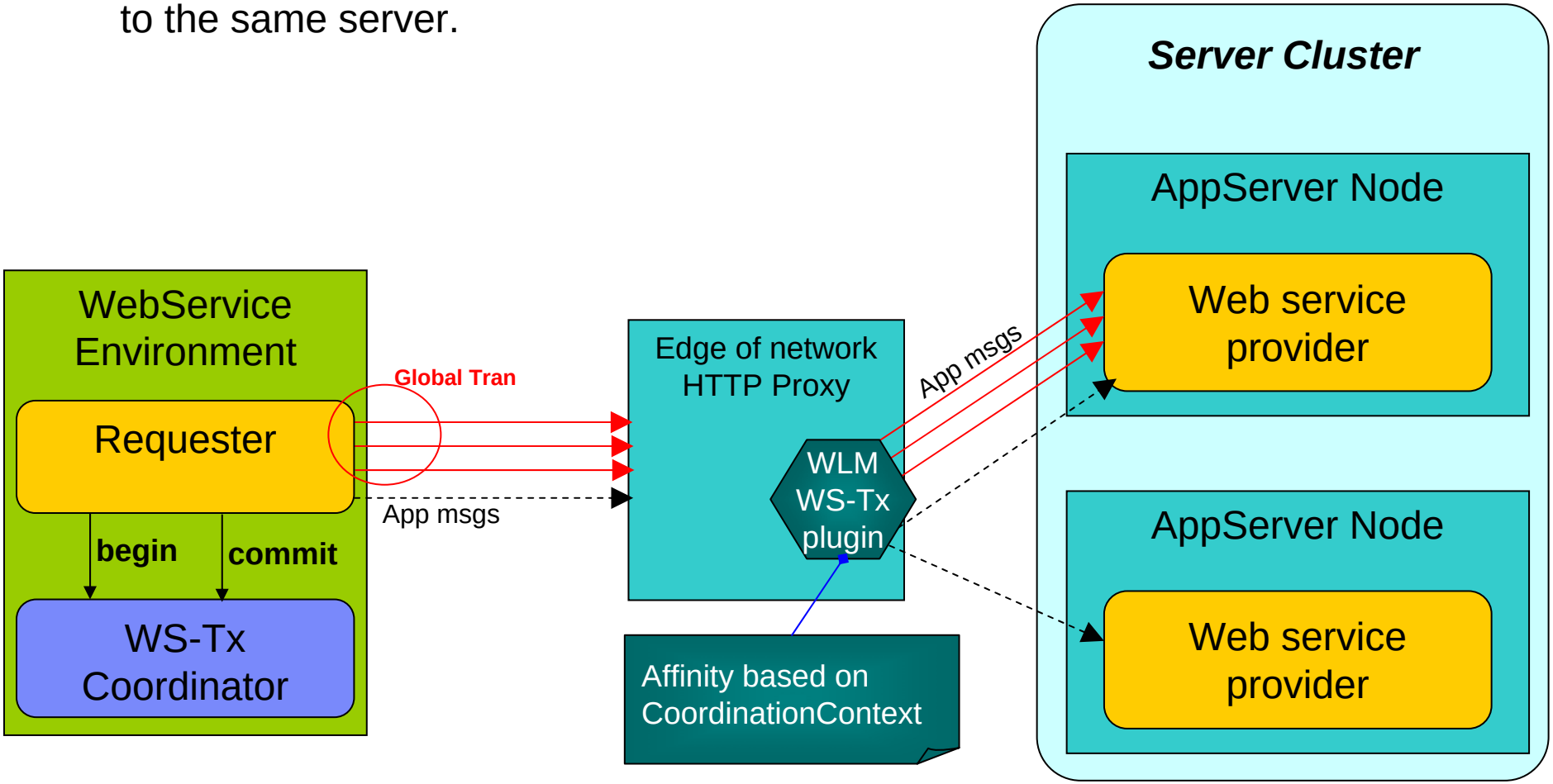
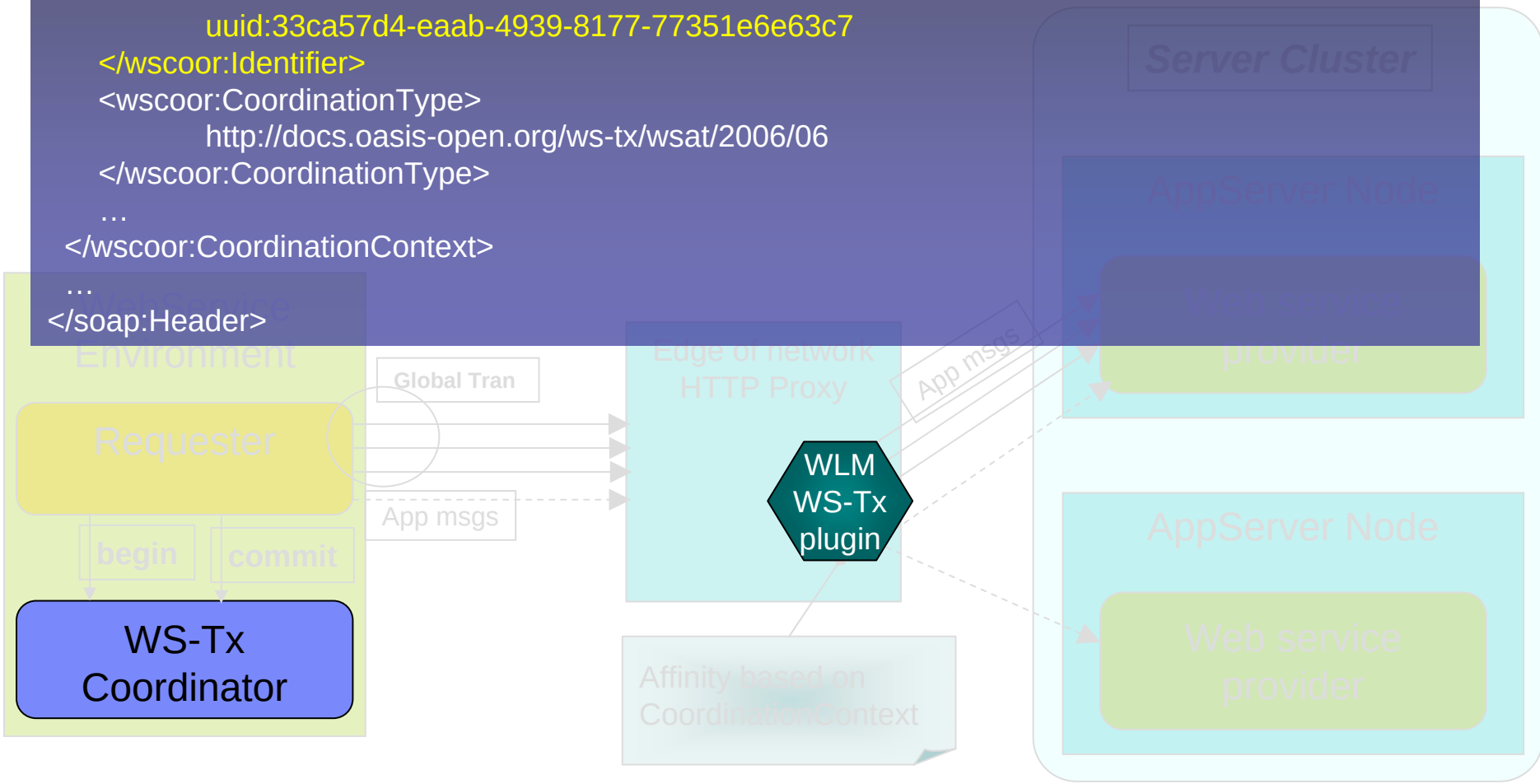
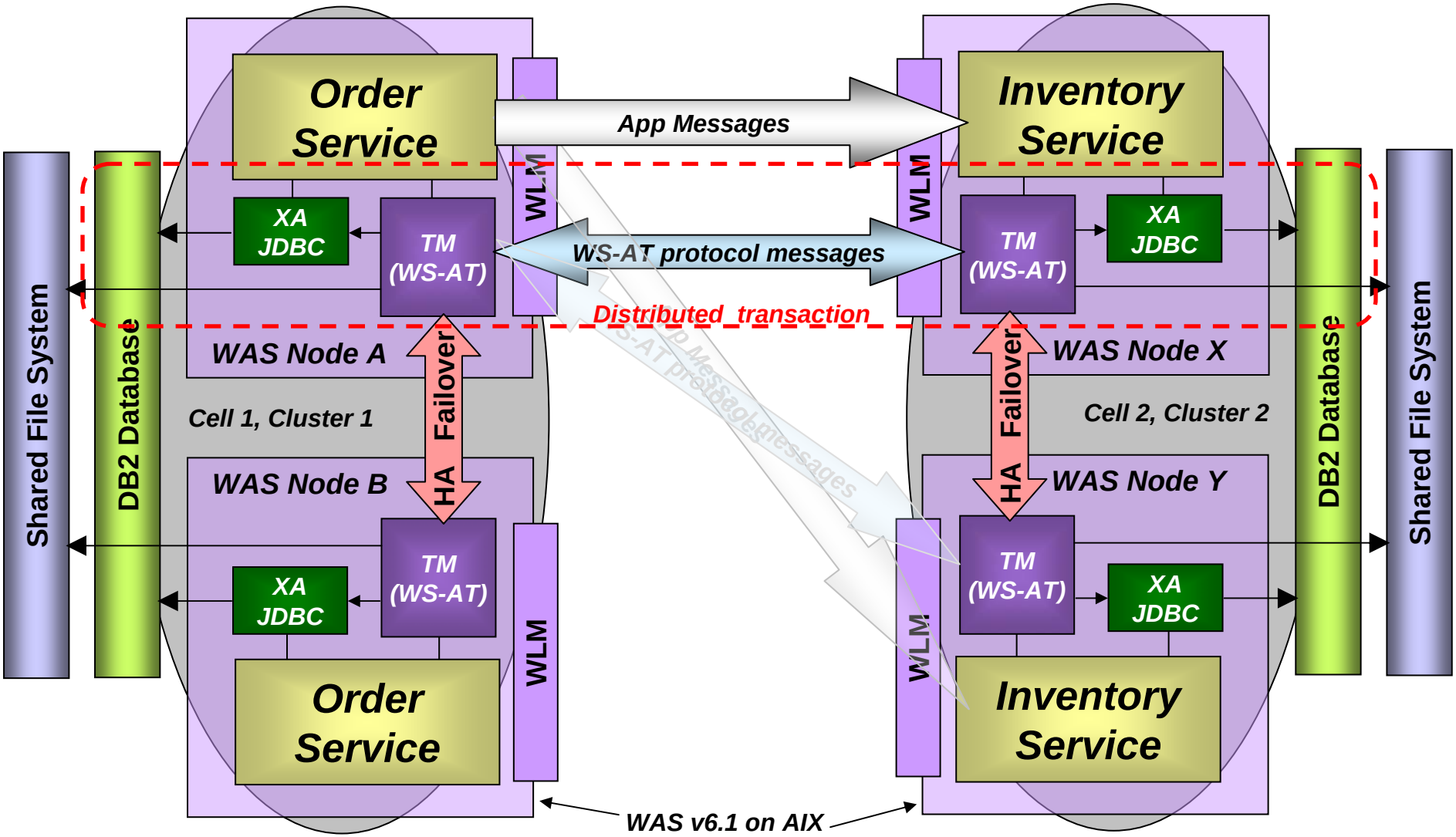


Transaction-based affinity routing

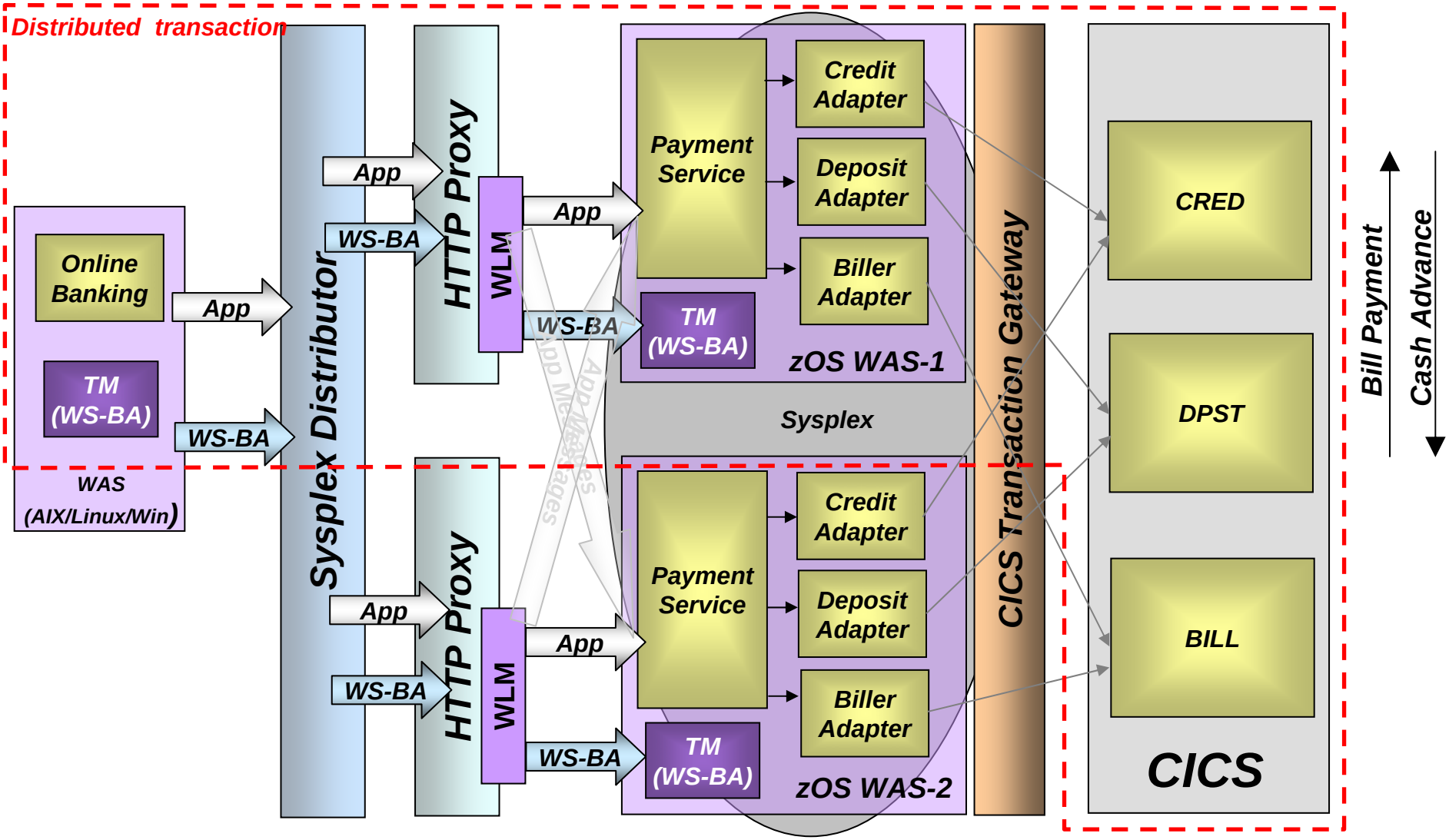
```
<soap:Header>
  <wscoor:CoordinationContext>
     <wscoor:Identifier>
              uuid:33ca57d4-eaab-4939-8177-77351e6e63c7
     </wscoor:Identifier>
     <wscoor:CoordinationType>
              http://docs.oasis-open.org/ws-tx/wsat/2006/06
     </wscoor:CoordinationType>
     ...
  </wscoor:CoordinationContext>
  ...
</soap:Header>
```



Order Management Application: HA WS-AT deployment



Online Banking: Proxied/WLM'd WS-BA deployment




Thank
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