OASIS Business Transactions Technical Committee
Draft specification: Abstract message set

Status

This text is intended to be incorporated directly into the draft protocol specification, with appropriate clause renumbering. It reflects agreements reached at the Mt Laurel face-to-face and in subsequent email. The clause number is arbitrary and just set to make it obvious this will not be the first part of specification.

Points where the editor has consciously chosen among undecided options are indicated with boxed notes.

This document is part of the on-going work of the OASIS Business Transaction Protocol Technical Committee.

> This section currently defines most of the messages in terms of their use between Coordinator and Participant. However, the messages used between the Coordinator and its superior (i.e. the Initiator and/or the Cohesion Conductor) are very similar. It was agreed at Mt Laurel that the latter interfaces and relationships will be standardised in the document, but the details are still under discussion. It is not yet clear whether it will be better to specify the Coordinator : Superior messages by modifying this description to cover both Coordinator : Superior and Participant : Coordinator relationships, or to have a separate (though similar) message set description for the Coordinator : Superior.

4 Abstract Message Set

The messages are defined in this section in terms of the abstract information that has to be communicated to the relevant actor. These abstract messages will be mapped to concrete messages communicated by a particular carrier protocol (there can be several such mappings defined).

The abstract message set and the associated state table assume the carrier protocol:

- will deliver messages completely and correctly, or not at all (corrupted messages will not be delivered);
- will report some communication failures, but will not necessarily report all (i.e. not all message deliveries are positively acknowledged within the carrier);
- will sometimes deliver successive messages in a different order than they were sent;
- does not have built-in mechanisms to link a request and a response

Note – these assumptions would be met by a mapping to SMTP and more than met by mappings to SOAP.

However, when the abstract message set is mapped to a carrier protocol that provides a richer service (e.g. reports all delivery failures, guarantees ordered delivery or offers a request/response mechanism), the mapping can take advantage of these features. Typically in such cases, some of the parameters of an abstract message will be implicit in the carrier mechanisms, while the values of other parameters will be directly represented in transmitted bits.

4.1 Addresses

All of the messages have a "target address" parameter and many also have other address parameters. These latter identify the desired target of other messages in the set. In all cases, the exact value will invariably have been determined by the implementation that is the target or desired future target. The format of the address will depend on the particular carrier protocol, but at this abstract level is considered to have two parts. The first part is meaningful for the carrier protocol itself, which will use it for the communication (i.e. it will permit a message to be delivered to a receiver). The second part is a suffix, which might be bound to a refined address, or to an appendix of a URL, or to a header for a particular carrier protocol. This may be used to route a message from a (carrier protocol) listener to the final, intended receiver. The suffix is opaque to parties other than the recipient. How the two parts are distinguished in a particular carrier mapping is specific to that mapping (and in some cases, such as a URL, the division point may be indeterminate).

All messages that concern a particular business transaction or participant (most of them) have an identifier parameter as well as the compound target address. This allows full flexibility for implementation choices – an implementation can:

a) Use the same carrier address and suffix for multiple business transactions, using the identifier parameter to locate the relevant state information;
b) Use the same carrier address for multiple business transactions and use the suffix to locate the information; or
c) Use a different carrier address for each business transaction.

Which of these choices is used is opaque to the entity sending the message – both parts of the address and the identifier originated at the recipient of this message (and were transmitted as parameters of earlier messages in the opposite direction). In cases b) and c), the identifier is to some extent redundant, although interoperation requires that it always be present.

There is a constraint on the implementation options, particularly in the case of c). In some recovery scenarios, the local element of a business transaction will have ceased to exist, while other elements still exist and are attempting to communicate with it. In such cases, the element(s) that do exist can draw conclusions and complete appropriately if they can determine that their would-be respondent has gone away; if they merely fail to get

through they are stuck in attempting recovery. Consequently, even when the local element of a transaction has completed it is required that a recovery message (i.e. any of the status-requesting messages) with the appropriate compound target address and identifier must be able to get through to something that can either definitively report the status or use the redirection mechanisms to give the compound target address of something that can give the status.. It is recognised that after a crash it may not be possible to immediately get through to anything that understands BTP; the requirement is that, eventually, there will be something that responds usefully to the query.

> Editor's note -- Discussion at one point suggested that the address parameters themselves contain a list of alternatives, with the onus on the sender to try these in turn (with the same identifier id, probably) – one of these would be loosely equivalent to an email postmaster. The text above assumes that the postmaster function is automatically available from the regular address, putting the responsibility on the receiver to use the addressing constructs appropriately.

4.2 Request/response pairs

Many of the messages combine in pairs as a request and its response. However, in some cases the response message is sent without a triggering request, or as a possible response to more than one type of request. To allow for this, the abstract message set treats each message as standalone; but where a request does expect a reply, a "reply-address" parameter will be present. For any message with a reply address parameter, in the case of certain errors, a FAULT message will be sent to the reply address instead of the expected reply.

4.3 Qualifiers

All messages have a "Qualifiers" parameter which contains zero or more Qualifer values. A Qualifier has sub-parameters:

Sub-parameter	type
Qualifier type	URI
Must-be-understood	Yes/no
To-be-propagated	Yes/no
Content	Arbitary – depends on type

Qualifier type: this identifies the meaning and use of the Qualifier. Qualifier types may be defined in this or other standard specifications, in specifications of a particular community of users or implementations or by bilateral agreement.

Must-be-understood: if this has the value "yes" and the receiving entity does not recognise the Qualifier type (or does not implement the necessary functionality), a FAULT "unknown qualifier" shall be returned and the message shall not be processed. (Default is "no").

to-be-propagated: if this has the value "yes" and the receiving entity passes the BTP message (which may be a CONTEXT, but can be other messages) onwards to other entities, the same Qualifier value shall be included. If the value is "no", the Qualifier shall not be included if the BTP message is passed onwards

Content: the type (which may be structured) and meaning of the content is defined by the specification of the Qualifier.

A Qualifier may be defined for use with all, several or only one message. The effect of the qualifier, or the information carried in it should be concerned with modification to the operation or meaning of the protocol message.

4.4 Messages

4.4.1 CONTEXT

A CONTEXT is supplied by (or on behalf of) the atomic business transaction Coordinator. Application messages which communicate operations of an atom from the initiator to a service are "augmented" with the CONTEXT.

Parameter	type
Target address	BTP address
Coordinator address	BTP address
Atom identifier	Identifier
Timelimit	Time
Qualifiers	List of qualifiers

Target address: the address to which the CONTEXT is sent. When the context is returned as the reply to an earlier message, this will be taken from the reply address of that message. When the CONTEXT is an augmentation to an application message, the target address is the effective target address of the application message.

Coordinator address: the address to which ENROLL, VOTE and INFERIOR_STATUS messages for this atom are to be sent.

Atom identifier: identifies the atom at the Coordinator

Timelimit: a Participant that has not sent an ok VOTE or received PREPARE by this time may initiate cancellation.

Meaning of augmentation:
If there are changes from operations induced by the receipt of this message. these changes are to be subject to the decision of the atom. This will If this atom is unknown to the service receiving an augmented message, the ENROLL message shall be sent to the coordinator.

Comment on augmentation:

> "Augmenting" a message with a CONTEXT can be achieved in several ways – among other mechanisms, it may be in a header/envelope, in a separate message on the same connection or as a field of the application operation itself.

> It is possible for a responder to pass on the context in a further message to some other entity – this can occur whether or not the first responder is itself registered (c.f. transactional server in OTS).

An entity receiving multiple messages augmented with CONTEXT with identical Coordinator address and atom identifier can assume that the same decision (confirm or cancel) will be applied to all the associated operations.

4.4.2 BEGIN

A request to some entity (a business transaction "manager" or factory or to an entity responsible for an identified cohesive business transaction will cause the creation of a new atomic business transaction.

This message is not fully specified in the abstract message set, but provides an identified event in the lifecycle of an atomic business transaction and provides a conceptual origin for the target address for BEGUN and for the timelimit.

Parameter	type
Target address	BTP address
Reply address	BTP address
Timelimit	Time
Qualifiers	List of qualifiers

Target address: the address of the entity to which the BEGIN is sent. How this address is acquired and the nature of the entity are outside the scope of this specification.

Reply address: the address to which the replying BEGUN message should be sent.

Timelimit: indicates the expected duration of the active phase of the atomic business transaction. If the Coordinator has not received PREPARE by this time, it should initiate cancellation. This timelimit is copied to any CONTEXT returned for this atomic business transaction (adjusted to refer to the same fixed point in time).

Types of FAULT possible (sent to Reply address)
General

4.4.3 BEGUN

BEGUN is a reply to BEGIN.

Parameter	type
Target address	BTP address
Coordinator-access address	BTP address
Coordinator address	BTP address
Atom identifier	Identifier
Timelimit	Time
Qualifiers	List of qualifiers

Target address: the address to which the BEGUN is sent. This will be the reply address from the BEGIN.

Coordinator-access address: the address to which GET_CONTEXT, PREPARE, CONFIRM, CANCEL and SUPERIOR_STATUS messages for the atom are to be sent.

Coordinator address: the address to which ENROLL, VOTE and PARTICIPANT_STATUS messages for this atom are to be sent.

Atom identifier: identifies the atom at the Coordinator

Timelimit: an Inferior that has not sent already VOTE or received PREPARE by this time should initiate cancellation without waiting for further messages.

The Coordinator address, Atom identifier and Timelimit parameters are identical to those in CONTEXT and a CONTEXT message can be constructed from them without further reference to the Coordinator.

At implementation option, the Coordinator-access address (generally used by the initiator or by a cohesive business transaction conductor) and the Coordinator address (used to enrol and by Participants) may be the same or may be different. There is no general requirement that they even use the same carrier protocol. Either or both may also be the same as the Target address of the BEGIN message.

No FAULT messages are issued on receiving BEGUN.

4.4.4 GET_CONTEXT

A request to a Coordinator to return a CONTEXT for the atomic business transaction.

Parameter	type
Target address	BTP address
Reply address	BTP address
Atom identifier	identifier
Qualifiers	List of qualifiers

Target address: the Coordinator-access address of the Coordinator.

Reply address: the address to which the replying CONTEXT message should be sent.

Atom identifier: identifies the atom at the Coordinator

Types of FAULT possible (sent to Reply address)
General
InvalidId – if Atom identifier is unknown

4.4.5   ENROLL

A request to a Coordinator to enroll a Participant in an atomic business transaction. This is issued after receipt of a CONTEXT message that propagated the atomic business transaction, usually augmenting an application message.

The entity issuing ENROLL is not explicitly defined – depending on the implementation of the Service/Participant side, the issuer of ENROLL may be considered to be the Service, the Participant, an interceptor on the path between the Initiator and the Service or an entity that does not otherwise appear in the model.

Parameter	
Target address	BTP address
Atom identifier	identifier
Reply address	BTP address
Participant address	BTP address
Participant identifier	identifier
Qualifiers	List of qualifiers

Target address: the address to which the ENROLL is sent. This will be the Coordinator address from the CONTEXT message.

Atom identifier. The atom identifier as on the CONTEXT message

Reply address: the address to which a replying ENROLLED is to be sent. If this field is empty, no ENROLLED reply is required by the entity issuing this ENROLL.

Participant address: the address to which PREPARE, CONFIRM, CANCEL and SUPERIOR_STATUS messages for this branch of this atomic business transaction are to be sent.

Participant identifier: the identifier for the participant for this branch of this atomic
business transaction.

In general, an ENROLLED response will be required from the Coordinator before the
Coordinator is ordered to confirm (by the Initiator). This is required to avoid Participants
attempting to be ENROLLED after the atomic business transaction has been confirmed,
which can break the atomicity guarantee. This can ensured if a successful response to the
application message that was augmented with the CONTEXT is not delivered to the
Initiator until after an ENROLLED response has been received by some entity. However,
for certain mappings to a carrier protocol the original issuer of the ENROLL does not
require the ENROLLED response, which can be delivered to some other entity that can
ensure the Participant is safely enrolled.

Types of FAULT possible (sent to Reply address)
    General
        InvalidId – if Atom identifier is unknown
        WrongState – if Coordinator has already reported a ready vote to its superior

4.4.6 ENROLLED

Sent from Coordinator in reply to an ENROLL message, to indicate the Participant has
been successfully enrolled (and will therefore be included in the termination exchanges)

Parameter	
Target address	BTP address
Participant identifier	identifier
Qualifiers	List of qualifiers

Target address: the address to which the ENROLLED is sent. This will be the Reply
address from the ENROLL message.

Participant identifier. The Participant identifier as on the ENROLL message

For some carrier mappings, either or both of the identifiers may be unnecessary.

Is there a need for a Branch identifier – unambiguously identifying this
participant with an identifier chosen by the coordinator ? This could be used
on subsequent participant->coordinator messages, instead of the (participant
address +) participant identifier to determine which who this was. However, it
can only be used if the branch id is communicated to the Participant. Compare
OTS recovery coordinator references, which can be different for each
resource.

No FAULT messages are issued on receiving BEGUN

4.4.7 RESIGN

Sent from an enrolled Participant to the Coordinator to remove the Participant from the enrolment. This can only be if the operations of the atomic business transaction have had no effect as perceived by the Participant.

RESIGN may be sent in response to a PREPARE message (instead of a VOTE), or at any point prior to the sending of a VOTE message.

Parameter	
Target address	BTP address
Atom identifier	identifier
Participant address	BTP address
Participant identifier	identifier
Response requested	Yes/no
Qualifiers	List of qualifiers

Target address: the address to which the RESIGN is sent. This will be the Coordinator address from the original CONTEXT message.

Atom identifier. The atom identifier as on the CONTEXT message

Participant address. The Participant address as on the earlier ENROLL message (with the Participant identifier, this determines who the message is from)

Participant identifier. The Participant identifier as on the earlier ENROLL message

Response_requested is set to "yes" if a RESIGNED response is required.

> Note -- RESIGN is equivalent to readonly vote in some other protocols, but can be issued early. The RESIGNED response will be needed if no PREPARE has been received, to ensure the Coordinator does not get a FAULT in reply to a later PREPARE because the Participant no longer knows of the atomic business transaction.

> Some of the phrasing is little complicated by the indecision of whether a Participant is a per-transaction/per-branch entity (with a limited lifetime) or an entity that deals with many transactions and it is only the Participant's knowledge of the transaction that has a limited lifetime.

Types of FAULT possible (sent to Participant address)
 General
 InvalidId – if Atom identifier is unknown
 UnknownSubordinate – if no ENROLL had been received for this Participant
 address and identifier
 WrongState – if a VOTE has already been for this branch

4.4.8 RESIGNED

Sent in reply to a RESIGN message with a Response_requested value "yes".

Parameter	
Target address	BTP address
Participant identifier	identifier
Qualifiers	List of qualifiers

Target address: the address to which the RESIGNED is sent. This will be the Participant address from the ENROLL message.

Participant identifier. The Participant identifier as on the earlier ENROLL message, identifying the branch of the atomic business transaction.

After receiving this message the Participant will not receive any more messages with this Participant address and identifier.

> All the following messages need their entries modified to cope with initiator:coordinator

No FAULT messages are issued on receiving BEGUN.

4.4.9 PREPARE

Sent from Coordinator to Participants from whom ENROLL but neither VOTE or RESIGN have been received, requesting a VOTE reply.

Parameter	
Target address	BTP address
Participant identifier	identifier
Qualifiers	List of qualifiers

Target address: the address to which the PREPARE message is sent. This will be the Participant address from the ENROLL message.

Participant identifier. The Participant identifier as on the earlier ENROLL message, identifying the branch of the atomic business transaction.

On receiving PREPARE, the Participant should reply with a VOTE (or RESIGN) in a timely manner. It should reply even if it has already sent an earlier VOTE.

> Note – No reply address is needed, as the reply will invariably be sent to the Coordinator.

1 Types of FAULT possible (sent to Coordinator address)
2   General
3   InvalidId – if Participant identifier is unknown
4   WrongState – if a CONFIRM or CANCEL has already been received for this
5   branch
6

7 *4.4.10 VOTE*

8
9 Sent from participant to coordinator, either unsolicited or in response to PREPARE.
10

Parameter	
Target address	BTP address
Atom identifier	identifier
Participant address	BTP address
Participant identifier	identifier
Vote	See below
Qualifiers	List of qualifiers

11
12 Target address: the address to which the RESIGN is sent. This will be the Coordinator
13   address from the original CONTEXT message.

14
15 Atom identifier. The atom identifier as on the CONTEXT message

16
17 Participant address. The Participant address as on the earlier ENROLL message (with the
18   Participant identifier, this determines who the message is from)

19
20 Participant identifier. The Participant identifier as on the earlier ENROLL message

21
22 Vote: the Participant's vote for the completion of the atomic business transaction,
23   dependent on its ability to apply or undo the operations of the atomic business
24   transaction, as they affect the Participant. Possible values are given in the table:
25

Vote	Meaning
cancel	the operations cannot be performed and the effects have been undone; the atom is no longer known to this participant
ready	the operations can be confirmed and can be cancelled, as may be instructed by the coordinator. The level of isolation is a local matter (i.e. is the participants choice, as constrained by the contract) – other access may be blocked, may see applied results of operation or may see original state (or cancelled)

26
27 On sending a VOTE(ready) (i.e. a VOTE message with Vote = "ready"), the Participant
28 undertakes to maintain its ability to confirm or cancel the local effects of the operations

until it receives a CONFIRM or CANCEL message. The reliability of this "promise", and time limits on it may be modified by some Qualifiers on the message.

> The time limits have been moved the standardised qualifier (not yet written up), as were the application data/reason information that were in the previous draft.

Types of FAULT possible (sent to Participant address)
> General
> InvalidId – if Atom identifier is unknown
> UnknownSubordinate – if no ENROLL has been received for this Participant address and identifier, or if RESIGN has been received for the branch

> Note – Due to unsolicited voting and the use of VOTE in recovery, it is possible for VOTE to be received when the Coordinator is in more or less any state.

4.4.11 CONFIRM

Sent by the Coordinator to a Participant from whom VOTE(ready) has been received

Parameter	
Target address	BTP address
Participant identifier	identifier
Qualifiers	List of qualifiers

Target address: the address to which the CONFIRM message is sent. This will be the Participant address from the ENROLL message.

Participant identifier. The Participant identifier as on the earlier ENROLL message, identifying the branch of the atomic business transaction.

On receiving CONFIRM, the Participant is released from its promise to be able to undo the operations of the atom. The effects of the operation can be made available to everyone (if they weren't already)

No further messages for the atom will be sent, apart from resending the confirm in recovery

Types of FAULT possible (sent to Coordinator address)
> General
> InvalidId – if Participant identifier is unknown
> WrongState – if no VOTE(ready) has been sent, or if CANCEL has been received

4.4.12 CONFIRMED

Sent in reply to CONFIRM after the Participant has applied the confirmation.

Parameter	
Target address	BTP address
Atom identifier	identifier
Participant address	BTP address
Participant identifier	identifier
Qualifiers	List of qualifiers

Target address: the address to which the CONFIRMED is sent. This will be the Coordinator address from the original CONTEXT message.

Atom identifier. The atom identifier as on the CONTEXT message

Participant address. The Participant address as on the earlier ENROLL message (with the Participant identifier, this determines who the message is from)

Participant identifier. The Participant identifier as on the earlier ENROLL message

Types of FAULT possible (sent to Participant address)
General
InvalidId – if Atom identifier is unknown
UnknownSubordinate – if no ENROLL has been received for this Participant address and identifier, or if RESIGN has been received for the branch
WrongState – if no VOTE(ready) has been received

NOTE – A CONFIRMED message arriving before a CONFIRM message is sent, or after a CANCEL has been sent will occur when the Participant has taken an autonomous decision and is not regarded as occurring in the wrong state. (The latter will cause a CONTRADICTION message to be sent.)

4.4.13 CANCEL

Sent by the Coordinator to a Participant at any time before (and unless) CONFIRM has been sent for the atomic business transaction.

Parameter	
Target address	BTP address
Participant identifier	Identifier
Qualifiers	List of qualifiers

Target address: the address to which the CANCEL message is sent. This will be the Participant address from the ENROLL message.

Participant identifier. The Participant identifier as on the earlier ENROLL message, identifying the branch of the atomic business transaction.

The atom is cancelled. The effects of any operations of the atomic business transaction should be undone. The participant is released from its promise to be able to confirm the operations.

No further messages for the atom will be sent, apart from any resending in recovery.

Types of FAULT possible (sent to Coordinator address)
    General
    InvalidId – if Participant identifier is unknown
    WrongState – if CONFIRM has been received

4.4.14 CANCELLED

Sent in reply to CANCEL after the Participant has applied the cancellation.

Parameter	
Target address	BTP address
Atom identifier	Identifier
Participant address	BTP address
Participant identifier	Identifier
Qualifiers	List of qualifiers

Target address: the address to which the CANCELLED is sent. This will be the Coordinator address from the original CONTEXT message.

Atom identifier. The atom identifier as on the CONTEXT message

Participant address. The Participant address as on the earlier ENROLL message (with the Participant identifier, this determines who the message is from)

Participant identifier. The Participant identifier as on the earlier ENROLL message

Types of FAULT possible (sent to Participant address)
    General
    InvalidId – if Atom identifier is unknown
    UnknownSubordinate – if no ENROLL has been received for this Participant address and identifier, or if RESIGN has been received for the branch
    WrongState – if CONFIRM has been sent

    NOTE – A CANCELLED message arriving before a CANCELLED message is sent, or after a CONFIRM has been sent will occur when the Participant has taken an autonomous decision and is not regarded as occurring in the wrong state. (The latter will cause a CONTRADICTION message to be sent.)

4.4.15 CONTRADICTION

> This is used in sorting out what happens when a participant timeout goes off; it also can be used (rarely one hopes) when "normal" heuristic mix occurs.

Sent by the Coordinator to a Participant that has taken an autonomous decision contrary to the decision for the atom. This is detected by coordinator when the 'wrong' one of CONFIRMED or CANCELLED is received.

Parameter	
Target address	BTP address
Participant identifier	Identifier
Qualifiers	List of qualifiers

Target address: the address to which the CONTRADICTION message is sent. This will be the Participant address from the ENROLL message.

Participant identifier. The Participant identifier as on the earlier ENROLL message, identifying the branch of the atomic business transaction.

> Do there need to be rules about the coordinator recording the contrary decision before sending this, and for the participant to retain information on the decision until receiving CONTRADICTION ? Such rules belong in the logging and state table section.

4.4.16 SUPERIOR_STATUS

Sent by a Coordinator to a Participant at any time, when (for whatever reason) there is uncertainty what state the Participant has reached, including when the Participant did not, or might have not received the last message (equivalently, the Coordinator did not receive the expected reply). Also sent in reply to a received INFERIOR_STATUS, in particular state

Parameter	
Target address	BTP address
Participant identifier	Identifier
Status	See below
Reply	Yes/no
Qualifiers	List of qualifiers

Target address: the address to which the SUPERIOR_STATUS message is sent. This will be the Participant address from the ENROLL message.

Participant identifier. The Participant identifier as on the earlier ENROLL message, identifying the branch of the atomic business transaction.

Status: states the current state of the sender for the atomic business transaction, which corresponds to the last message sent directly to the Participant (regardless of the addresses used, for the purposes of this table it is considered that neither CONTEXT or ENROLLED are sent to the Participant)

Status	Meaning / Previous message sent
Active	No message sent to Participant
Preparing	PREPARE sent
Confirming	CONFIRM sent
Cancelling	CANCEL sent
Inaccessible	the atomic business transaction may or may not be known, but the status cannot be determined at the moment
Unknown	the atom is not known: this implies the atomic business transaction is cancelled.

Reply: this is "yes" if the SUPERIOR_STATUS is sent in reply to a received INFERIOR_STATUS and "no" otherwise.

Informs the participant of the current status of the Coordinator, and if Reply = "no" requests an appropriate response from the Participant.

For status Preparing, Confirming and Cancelling, the SUPERIOR_STATUS message this effectively repeats the last message sent and the participant is expected to reply appropriately (possibly repeating a lost message from the participant) if Reply is "no". Status values Inaccessible and Unknown are only sent in response to a received INFERIOR_STATUS message with Reply of "no". In these cases, therefore Reply will always be "yes".

A participant should reply without undue delay to a received SUPERIOR_STATUS with Reply of "no", replying with INFERIOR_STATUS only if none of the other messages are appropriate. (In particular, if the participant is ready, it should resend the VOTE)

Status of "unknown" shall only be sent if it has been determined for certain that the Coordinator has no knowledge of the atomic business transaction. If there could be persistent information corresponding to the coordinator, but it is not accessible from the entity receiving the INFERIOR_STATUS message or the entity cannot determine whether any such persistent information exists, the response shall be Inaccessible

4.4.17 INFERIOR_STATUS

1 Sent by the Participant to the Coordinator at any time, when (for whatever reason) there
2 is uncertainty of the state of the atom as known to the Coordinator including when the
3 Coordinator did not, or might have not received the last message from the Participant
4 (equivalently, the Participant did not receive the expected reply) Also sent in response to
5 a received SUPERIOR_STATUS, in particular states.
6

Parameter	
Target address	BTP address
Atom identifier	identifier
Participant address	BTP address
Participant identifier	identifier
Status	See below
Reply	Yes/no
Qualifiers	List of qualifiers

7
8 Target address: the address to which the CANCELLED is sent. This will be the
9   Coordinator address from the original CONTEXT message.
10
11 Atom identifier. The atom identifier as on the CONTEXT message
12
13 Participant address. The Participant address as on the ENROLL message (with the
14   Participant identifier, this determines who the message is from)
15
16 Participant identifier. The Participant identifier as on the ENROLL message
17
18 Status: states the current state of the Participant for the atomic business transaction,
19   which corresponds to the last message sent to the Coordinator by (or in the case of
20   ENROLL for) the Participant
21

Status	Meaning / Previous message sent
Active	ENROLL sent
Ready	VOTE sent
Inaccessible	the atom may or may not be known, but the status cannot be determined at the moment
Unknown	the atom is not known; this implies the previous termination message (CANCEL or CONFIRM) did get through and was replied to

22
23 Reply: this is "yes" if the INFERIOR_STATUS is sent in reply to a received
24 SUPERIOR_STATUS and "no" otherwise.
25
26 Informs the coordinator of the current status of the participant, and if Reply is "no",
27 requests an appropriate response from the Coordinator.
28

For status Ready, this effectively repeats the VOTE message. The status values Inaccessible and Unknown are only sent in response to a received SUPERIOR_STATUS message with Reply of "no". In these cases, therefore Reply will always be "yes".

A Coordinator should reply without undue delay to a received INFERIOR_STATUS with Reply of "no", replying with SUPERIOR_STATUS only if none of the other messages are appropriate.

Status of "Unknown" shall only be sent if it has been determined for certain that the Participant has no knowledge of the atomic business transaction. If there could be persistent information corresponding to the participant, but it is not accessible from the entity receiving the COORDINATOR_STATUS message or the entity cannot determine whether any such persistent information exists, the response shall be Inaccessible.

A SUPERIOR_STATUS/INFERIOR_STATUS exchange that determines that one or both sides are in the active state does not require that the atom be cancelled (unlike some other two-phase commit protocols). the atom may be continued, with new application messages carrying the same CONTEXT. Similarly, if the Participant is ready but the Coordinator is active, there is no required impact on the progression of the atom.

4.4.18 REDIRECT

Sent when the address previously given for a superior or subordinate is no longer valid and the state information for the atomic business transaction is now accessible with a different address (but the same atom or participant identifier).

Parameter	
Target address	BTP address
Atom identifier	Identifier
Participant identifier	Identifier
Old address	The previous address
New address	The new address
Qualifiers	List of qualifiers

Target address: the address to which the REDIRECT is sent. This may be the Reply address from a received message or the address of the opposite side (superior/inferior) as given in a CONTEXT or ENROLL message

Atom identifier. The atom identifier as on the CONTEXT message. (present only if the REDIRECT is sent from the inferior).

Participant identifier. The Participant identifier as on the ENROLL message

Old address: The previous address of the sender of REDIRECT.

New address: The new address to be used for messages sent to this entity.

1
2 If the entity whose address is changed is a Participant, the New address value replaces the
3 Participant address as present in the ENROLL. If the entity whose address is changed is a
4 Coordinator, the New address value replaces the Coordinator address as present in the
5 CONTEXT message.

6 ### *4.4.19 FAULT*

7 Sent in reply to various messages to report an error condition

8

Parameter	
Target address	BTP address
Atom identifier	Identifier
Participant identifier	Identifier
Fault type	See below
Fault data	See below
Qualifiers	List of qualifiers

9
10 Target address: the address to which the FAULT is sent. This may be the Reply address
11 from a received message or the address of the opposite side (superior/inferior) as
12 given in a CONTEXT or ENROLL message
13
14 Atom identifier: The atom identifier as on the CONTEXT message (present only if the
15 FAULT is sent to the superior).
16
17 Participant identifier: The Participant identifier as on the ENROLL message (present only
18 if the FAULT is sent to the inferior)
19
20 Fault type: identifies the nature of the error, as specified for each of the main messages.
21
22 Fault data: Information relevant to the particular error. Each fault type defines the content
23 of the fault data.
24

Fault type	Meaning	Fault data
General	Any otherwise unspecified problem	Free text explanation
InvalidId	The received Atom identifier or Participant Identifier does not identify a known atomic business transaction (or branch)	The identiifier
WrongState	The message has arrived when the recipient is in an invalid state.	
UnknownSubordinate	The atomic business transaction is known but	

	the branch identified by the Participant address and identifier are not enrolled in it	

1
2