INTERNATIONAL STANDARD

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Information technology — Open Systems Interconnection — Service definition for the Commitment, Concurrency and Recovery service element

Technologies de l'information — Interconnexion de systèmes ouverts (OSI) — Définition du service pour l'élément d'engagement, de concomitance et de rétablissement

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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

International Standard ISO/IEC 9804 was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 33, *Distributed application services*, in collaboration with ITU-T. The identical text is published as ITU-T Recommendation X.851.

This third edition cancels and replaces the second edition (ISO/IEC 9804:1994), which has been technically revised.

Annexes A and B form an integral part of this International Standard. Annex C is for information only.

Introduction

This Recommendation | International Standard is one of a set of Recommendations | International Standards produced to facilitate the interconnection of information processing systems. It relates to other ITU-T Recommendations | International Standards in the set defined by the Reference Model for Open Systems Interconnection (see ITU-T Rec. X.200 | ISO/IEC 7498). The reference model subdivides the area of standardization for interconnection into a series of layers of specification, each of manageable size.

The goal of Open Systems Interconnection is to allow, with a minimum of technical agreement outside the interconnection Recommendations and International Standards, the interconnection of information processing systems:

– from different manufacturers;

– under different managements;

– of different levels of complexity; and

– of different technologies.

This Recommendation | International Standard recognizes that application-processes may wish to communicate with each other for a wide variety of reasons. However, any communication requires certain services independent of the reasons for communication. The application-service-element defined in this Recommendation | International Standard provides such services.

This Recommendation | International Standard defines the facilities of the application-service-element for Commitment, Concurrency and Recovery (CCR). CCR provides services for a single association. A referencing specification uses these services for starting and ending a specific sequence of distributed application operations despite application or communication failure.

This Recommendation | International Standard is referenced by a specification to apply CCR to its operation. CCR services may be used with presentation services (see ITU-T Rec. X.216 | ISO/IEC 8822), or with other Application Layer services. However, the use of CCR services is subject to the restrictions specified in clause 9. The use of CCR services allows a referencing specification to define its activity as an atomic action. An atomic action may use many associations, possibly with different protocols on each association.

Annex A describes the rules that shall be followed by a specification that references this Recommendation | International Standard.

Annex B presents the relationship of the CCR model and concepts to the Application Layer Structure (see ITU-T Rec. X.207 | ISO/IEC 9545).

Annex C is a tutorial to aid the understanding of the concepts and facilities of CCR.

INTERNATIONAL STANDARD

ITU-T RECOMMENDATION

INFORMATION TECHNOLOGY – OPEN SYSTEMS INTERCONNECTION – SERVICE DEFINITION FOR THE COMMITMENT, CONCURRENCY AND RECOVERY SERVICE ELEMENT

1 Scope

This Recommendation | International Standard is intended for reference by other specifications when the functionality of commitment, concurrency and recovery is required. It can be referenced whenever the processing of two or more application-entity invocations in a distributed application needs to be organized into an atomic action.

This Recommendation | International Standard defines services that are used on a single association to coordinate two application-entity invocations involved in an atomic action. The determination of which application-entity invocations are involved in an atomic action is not within the scope of this Recommendation | International Standard.

This Recommendation | International Standard establishes the general principles for the coordinated use of the CCR services when more than two application-entity invocations are involved in a single atomic action, or when recovery is required after failure. The coordination of multiple associations and the related application-entity invocations that constitute an atomic action is achieved by a referencing specification in conjunction with this Recommendation | International Standard.

This Recommendation | International Standard is only applicable to a distributed application whose specification references this Recommendation | International Standard.

This Recommendation | International Standard does not specify individual implementations or products. It does not constrain the implementation of entities and interfaces within a computer system.

No requirement is made for conformance to this Recommendation | International Standard.

This Recommendation | International Standard includes requirements for compliance that apply to a referencing specification.

The CCR service defined in this Recommendation | International Standard requires that CCR Protocol Version 2 (or a later version) is being used.

2 Normative references

The following Recommendations and International Standards contain provisions which, through reference in this text, constitute provisions of this Recommendation | International Standard. At the time of publication, the editions indicated were valid. All Recommendation and Standards are subject to revision, and parties to agreements based on this Recommendation | International Standard are encouraged to investigate the possibility of applying the most recent edition of the Recommendations and Standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards. The Telecommunication Standardization Bureau of the ITU maintains a list of the currently valid ITU-T Recommendations.

2.1 Identical Recommendations | International Standards

- ITU-T Recommendation X.200 (1994) | ISO/IEC 7498-1:1994, *Information technology – Open Systems Interconnection – Basic Reference Model: The Basic Model.*
- ITU-T Recommendation X.207 (1993) | ISO/IEC 9545:1994, *Information technology – Open Systems Interconnection – Application layer structure*.
- ITU-T Recommendation X.210 (1993) | ISO/IEC 10731:1994, *Information technology – Open Systems Interconnection – Basic Reference Model : Conventions for the definition of OSI services*.
- ITU-T Recommendation X.215 (1995) | ISO/IEC 8326:1996, *Information technology – Open Systems Interconnection – Session service definition*.

- ITU-T Recommendation X.216 (1994) | ISO/IEC 8822:1994, *Information technology – Open Systems Interconnection – Presentation service definition*.
- ITU-T Recommendation X.217 (1995) | ISO/IEC 8649:1996, *Information technology – Open Systems Interconnection – Service definition for the association control service element*.
- ITU-T Recommendation X.227 (1995) | ISO/IEC 8650-1:1996, *Information technology – Open Systems Interconnection – Connection-oriented protocol for the association control service element: Protocol specification*.
- ITU-T Recommendation X.650 (1996) | ISO/IEC 7498-3:1997, *Information technology – Open Systems Interconnection – Basic Reference Model: Naming and addressing*.
- ITU-T Recommendation X.852 (1997) | ISO/IEC 9805-1:1998, *Information technology – Open Systems Interconnection – Protocol for the commitment, concurrency and recovery service element: Protocol specification*.

2.2 Paired Recommendations | International Standards equivalent in technical content

- ITU-T Recommendation X.860 (1997), *Open Systems Interconnection – Distributed transaction processing: Model*.

  ISO/IEC 10026-1[1)], *Information technology – Open Systems Interconnection – Distributed Transaction Processing – Part 1: OSI TP Model*.
- ITU-T Recommendation X.862 (1997), *Open Systems Interconnection – Distributed transaction processing: Protocol Specification*.

  ISO/IEC 10026-3[1)], *Information technology – Open Systems Interconnection – Distributed Transaction Processing – Part 3: Protocol specification*.

3 Definitions

3.1 Reference Model definitions

3.1.1 Basic Reference Model definitions

This Recommendation | International Standard is based on the concepts developed in ITU-T Rec. X.200 | ISO/IEC 7498-1. It makes use of the following terms defined in them:

a) application-association; association;

b) application-entity;

c) Application Layer;

d) application-process;

e) application-service-element;

f) presentation-connection;

g) presentation-service;

h) session-connection;

i) session-service.

3.1.2 Naming and addressing definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.650 | ISO/IEC 7498-3:

- application-entity title[2)].

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1) To be published.

2) As defined in ITU-T Rec. X.650 | ISO 7498-3, an application-entity title is composed of an application-process title and an application-entity qualifier.

3.2 Service conventions definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.210 | ISO/IEC 10731:

a) service-provider;

b) service-user;

c) confirmed service;

d) non-confirmed service;

e) provider-initiated service;

f) primitive;

g) request (primitive);

h) indication (primitive);

i) response (primitive); and

j) confirm (primitive).

3.3 Presentation service definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.216 | ISO/IEC 8822:

a) abstract syntax;

b) abstract syntax name;

c) defined context set;

d) functional unit [presentation];

e) presentation context; and

f) presentation data value.

3.4 ACSE service definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.217 | ISO/IEC 8649:

a) association-initiator;

b) association-responder; and

c) disrupt.

3.5 Application Layer Structure definitions

This Recommendation | International Standard makes use of the following terms defined in ITU-T Rec. X.207 | ISO/IEC 9545:

a) application-context;

b) application-entity invocation;

c) application-service-object;

d) control function;

e) multiple association control function;

f) single association control function;

g) single association object.

3.6 CCR service definitions

3.6.1 acceptor: The CCR service-user that receives the indication primitive for a particular CCR service. For a confirmed service, it also issues the response primitive.

3.6.2 application failure: The failure of an application-entity invocation to meet its normal specification.

3.6.3 atomic action: A specific set of operations of a distributed application that may be characterized by the properties of atomicity, consistency, isolation, and durability.

3.6.4 atomic action branch; branch: A relationship between two CCR service-users representing an integral part of an atomic action. The relationship may survive both communication or application failure. It is begun by the use of CCR services and later completed by either the use of CCR services or by an application or communication failure.

3.6.5 atomic action branch identifier; branch identifier: A value assigned by the atomic action branch-initiator that uniquely identifies a branch within the scope of the atomic action.

3.6.6 atomic action data: State and control information about an atomic action and its branches. Atomic action data required for recovery persists if an application or communication failure occurs.

3.6.7 atomic action graph: A connected graph consisting of CCR service-users as nodes and atomic action branches as arcs that represents the structure of an atomic action.

3.6.8 atomic action identifier: A value assigned by the atomic action owner that uniquely identifies an atomic action within the OSI environment. (The value is first used in a CCR service by the atomic action initiator. However, the initiator may have received the value from another source via a mechanism that is not visible in CCR services).

3.6.9 atomic action initiator: The begin-tree root.

3.6.10 atomic action owner: The CCR service-user that established the atomic action identifier.

3.6.11 atomicity: A property of a set of related operations such that the operations are either all performed, or none of them are performed.

3.6.12 begin-tree; atomic action begin-tree: An atomic action graph that has been formed into a rooted tree where the direction of an arc is from the CCR service-user that initiates the atomic action branch.

3.6.13 bound data: Data that are accessed and manipulated by a CCR service-user as part of an atomic action. Their state is bound by the rules of CCR. Bound data survive application and communication failures and exist beyond the atomic action branch.

3.6.14 branch-initiator; atomic action branch-initiator: The CCR service-user that begins a specific branch.

3.6.15 branch-responder; atomic action branch-responder: On a specific branch, the CCR service-user that did not initiate the branch.

3.6.16 commit-tree; atomic action commit-tree: An atomic action graph that has been formed into a rooted tree in which the direction of an arc is from the CCR service-user (the commit-superior) that may order commitment to the peer (the commit-subordinate).

3.6.17 CCR service-provider: Two peer CCR application-service-elements involved in the same atomic action branch.

3.6.18 CCR service-user: That part of an application-entity invocation that makes use of CCR services to coordinate one or more branches of an atomic action graph.

3.6.19 commit coordinator: A CCR service-user that receives ready signals from all of its neighbours.

3.6.20 commit-decider: A CCR service-user that orders commitment to (usually, all of) its neighbours, without having received an order of commitment. It is the root of the commit-tree (In certain cases, one of two roots).

3.6.21 commitment of an atomic action branch; commitment: Completion of an atomic action branch with the release of bound data in the final state.

3.6.22 commit-subordinate: (With reference to a branch.) The CCR service-user that sends a ready signal to its neighbour; (with reference to a particular CCR service-user) another CCR service-user from whom a ready signal has been received on any branch (there may be several commit-subordinates for one CCR service-user).

3.6.23 commit-superior: (With reference to a branch.) The CCR service-user that receives a ready signal from its neighbour; (with reference to a particular CCR service-user) another CCR service-user to whom a ready signal has been sent (CCR ensures there can be at most one).

3.6.24 communication failure: The unexpected release of the supporting association.

3.6.25 compensating action: Operations used to re-establish either the initial or the final state from a mixed situation that was brought about by a conflict between heuristic decision(s) and the decision of the commit coordinator.

3.6.26 concurrency control: A real open system mechanism that coordinates modifications to bound data used by concurrent atomic actions so the isolation property of the atomic action is guaranteed.

3.6.27 confirmation of commitment: A statement from a commit-subordinate to the commit-superior that the commit-subordinate has completed local commitment procedures.

3.6.28 continuing two-phase branch; continuing two-phase neighbour: A branch/neighbour in an atomic action except any

i) which have been rolled back (by C-ROLLBACK request or indication); or

ii) which the CCR service-user has determined will be rolled-back, but has not done so; or

iii) on which C-NOCHANGE indication has been received.

NOTE – ii) includes branches where the supporting association has failed prior to a ready signal, as well as branches to which C-ROLLBACK request is about to be issued.

3.6.29 connected graph: A graph that consists of a set of nodes and a set of arcs. Two nodes may be connected by an arc. Each arc connects two nodes. The terms "node" and "arc" are used here in the normal mathematical sense.

3.6.30 consistency: A property of a set of related operations such that the effects of the operations are performed accurately, correctly, and with validity, with respect to application semantics.

3.6.31 distributed application: An information processing endeavour that is accomplished using two or more application-entity invocations interconnected within the OSI environment.

NOTE – This term will be removed from this subclause when its definition becomes available in another referenced Recommendation | International Standard.

3.6.32 doubt period: For a CCR service-user, the period during an atomic action that begins when it decides to send a ready signal to its superior and ends when it receives either the order to commit or to rollback. A CCR service-user that does not send a ready signal does not have a doubt period.

3.6.33 durability: A property of a completed set of related operations such that all the effects of the operations are not altered by any sort of failure.

3.6.34 final state: The state of bound data produced as a result of the completed application operations of the atomic action.

3.6.35 graph: An object that consists of a set of nodes and a set of arcs. Two nodes may be connected by an arc. Each arc connects two nodes.

NOTE – As used in this Recommendation | International Standard, "graphs" are always acyclic and connected, although this is not a general property of graphs. See also the definition of "tree" below.

3.6.36 heuristic decision: A decision of a CCR service-user that has sent a ready signal to the commit-superior and then releases all or part of its bound data before it is ordered to commit or to roll back by the commit-superior.

3.6.37 initial state: The state of bound data at the time of first use by an atomic action.

3.6.38 intermediate: A node in a rooted tree that is neither a leaf nor the root. An intermediate always has precisely one incoming arc.

3.6.39 intermediate state: One of the states of bound data produced during the manipulation of bound data that is neither the initial nor the final state.

3.6.40 interrupted branch: An atomic action branch whose supporting association was normally or abnormally released because of an application or communication failure.

3.6.41 isolation: A property of a set of related operations such that partial results of the set of operations are not accessible, except by operations of the set. This definition implies that different sets of related operations that have this property and that share bound data are serializable.

3.6.42 leaf: A node in a graph that only has one arc. In a rooted tree, the term is restricted to nodes with only one incoming arc. Thus, in a rooted tree, the root is never considered to be a leaf.

3.6.43 local commitment procedures: Establishing the final state of all bound data, removal of concurrency controls, and release of all resources used in performing the atomic action.

3.6.44 local rollback procedures: Re-establishing the initial state of all bound data, removal of concurrency controls, and release of all resources used in performing the atomic action.

3.6.45 mixed heuristic situation; mixed situation: The state of bound data produced as the result of heuristic decision(s) when a CCR service-user releases bound data in a state different from the commit coordinator.

3.6.46 neighbour (of a node in a graph): A node within a connected graph that has an arc in common with this node. For CCR, the logically adjacent CCR service-user directly connected by an atomic action branch.

3.6.47 neighbourhood (of a node): The connected part of a tree that consists of a neighbour of the node and all the nodes in the tree that are disconnected from this node (i.e. they do not have a path to the node) when the neighbour is removed from the tree.

3.6.48 node; CCR node: A CCR service-user for a particular atomic action.

3.6.49 non-reference mapping: Any mapping of CCR services to the ACSE and Presentation service other than that specified in the body of ITU-T Rec. X.852 | ISO/IEC 9805-1. Annex B of ITU-T Rec. X.852 | ISO/IEC 9805-1 specifies constraints on such mappings.

3.6.50 order of commitment of an atomic action branch; order of commitment: A statement by a CCR service-user to a neighbour that has given a ready signal that the atomic action branch is committed.

3.6.51 phase I: For a CCR service-user that sends a ready signal, the period during an atomic action that ends when it decides to send a ready signal to its superior. For a CCR service-user that does not send a ready, phase I ends when, and if, it decides to commit the atomic action (i.e. when a commit coordinator becomes commit-decider). This Recommendation | International Standard does not specify when phase I starts.

3.6.52 phase II: For a CCR service-user that is not the commit-decider, the period during an atomic action that begins when it is ordered to commit by its commit-superior. For the commit-decider CCR service-user, phase II begins when it decides to commit the atomic action. Phase II ends for any CCR service-user when it completes all of its branches and its involvement with the atomic action ends.

3.6.53 presumed rollback: The recovery mechanism used by CCR. It conditionally allows a CCR service-user to treat an application or communication failure as a rollback. This occurs if it has not recorded atomic action data for the branch. In addition, a CCR service-user acting as a commit-subordinate may presume rollback under the following condition. It has recorded atomic action data for the branch but, during recovery, it discovers that the commit-superior does not.

3.6.54 ready-to-commit state: A state of bound data in which, until the atomic action has been terminated by commitment or rollback, the bound data can be released in either their initial or their final state.

3.6.55 reference mapping: The mapping of CCR services to the ACSE and Presentation service specified in the body of ITU-T Rec. X.852 | ISO/IEC 9805-1.

3.6.56 recovery of an atomic action branch; recovery: Procedures used by a CCR service-user to complete an interrupted atomic action branch for which it has recovery responsibility.

3.6.57 recovery responsibility for an atomic action branch; recovery responsibility: A property of a CCR service-user that determines whether it attempts recovery. The CCR service-user acquires this property as a result of using certain CCR services. It retains the property until the completion of the atomic action branch.

3.6.58 referencing specification: An Application Layer Recommendation | International Standard or other specification that specifies the use of CCR services. CCR services are always used in conjunction with a referencing specification.

3.6.59 requesting neighbourhood: With reference to some request primitive, the neighbourhood including the requesting CCR service-user and excluding the accepting CCR service-user.

3.6.60 requestor: The CCR service-user that issues the request primitive for a particular CCR service. For a confirmed service, it also receives the confirm primitive.

3.6.61 rollback of an atomic action branch; rollback: Completion of an atomic action branch with the release of bound data in the initial state.

3.6.62 ready signal: A statement from a CCR service-user to a neighbour that indicates the CCR service-user's readiness to commit

3.6.63 subordinate of an arc: The node at the incoming end of an arc.

3.6.64 subordinate of a node: The node at the other end of an outgoing arc. A node may have zero, one, or more subordinates.

3.6.65 subordinate subtree: The subtree of a subordinate node.

3.6.66 subtree (of a node): A tree (within another tree) with the node as the root. A leaf node is its own subtree.

3.6.67 superior of an arc (in a rooted tree): The node from which the arc is outgoing.

3.6.68 superior of a node (in a rooted tree): The node at the other end of the single incoming arc. The root of the tree has no superior. Otherwise, a node has exactly one superior.

3.6.69 root: The single node in a tree that has outgoing arcs only.

3.6.70 tree: An acyclic, connected graph whose arcs are oriented from a single node with outgoing arcs only. The nodes of a tree are arranged in a hierarchical structure according to the orientation of the arcs. The terms "node" and "arc" are used here in the normal mathematical sense.

NOTE – In at least some mathematical uses, a tree is any acyclic, connected graph without any necessary orientation of the arcs. In this Recommendation | International Standard, "tree" is distinguished from the more general "graph" by the presence of some orientation of the arcs.

3.6.71 user-ASE: An application-specific ASE.

4 Abbreviations

For the purposes of this Recommendation | International Standard the following abbreviations apply:

ACSE	Association Control Service Element
AE	Application-entity
AEI	Application-entity-invocation
Amd	Amendment to an ITU-T Recommendation | ISO/IEC International Standard
ASE	Application-service-element
ASO	application-service-object
CCR	Commitment, Concurrency, and Recovery application-service-element
CCR-sp	Commitment, Concurrency, and Recovery service-provider
cnf	Confirm primitive
ind	Indication primitive
MACF	Multiple Association Control Function
OSI	Open Systems Interconnection
OSIE	Open Systems Interconnection Environment
req	Request primitive
rsp	Response primitive
SACF	Single Association Control Function
SAO	Single Association Object
U-ASE	User application-service-element

5 Conventions

This Recommendation | International Standard defines services for CCR following the descriptive conventions defined in ITU-T Rec. X.210 | ISO/IEC 10731.

In clause 7, the definition of each CCR service includes a table that lists the parameters of its primitives. For a given primitive, the presence of each parameter is described by one of the following values:

Blank	Not applicable
C	Conditional
M	Mandatory
U	User option

In these tables, the notation (=) indicates that a parameter value is semantically equal to the value to its left in the table.

6 Concepts

6.1 Use of CCR in a distributed application environment

CCR services are defined for a single association. They are not concerned with and do not address the organization and topology of a distributed application. A referencing specification is always required to coordinate the use of CCR services. However, the use of CCR services requires an understanding of the distributed application environment.

6.1.1 Atomic action environment

6.1.1.1 Atomic action properties

An atomic action is a specific set of related distributed application operations that may be characterized by the following properties:

a) *Atomicity* – A property of a set of related operations such that the operations are either all performed or none of them are performed.

b) *Consistency* – A property of a related set of operations such that the effect of the operations are performed accurately, correctly and with validity, with respect to application semantics.

c) *Isolation* – A property of a set of related operations such that partial results are not accessible, except by operations of the set. This definition implies that different sets of related operations that have this property and that share bound data are serializable.

d) *Durability* – A property of a set of related operations such that all the effects of the operations are not altered by any sort of failure.

In the ideal case, all these atomic action properties are maintained by the CCR service-user. However, the degree of achievement of these properties depends on the level of compliance to the CCR service-user rules (see Annex A) and the local strategies of the CCR service-users.

Taking heuristic decisions is an example of a local strategy that might violate the atomic action properties (see 6.3). Heuristic decisions do not guarantee atomicity of the atomic action. Another example is the use of a concurrency mechanism that allows intermediate states of bound data to be visible outside the atomic action.

6.1.1.2 The atomic action graph and begin-tree

The CCR service-users that participate in an atomic action form a relationship that is a graph with no closed loops. This is called the **atomic action graph.** An example is shown in Figure 1. An atomic action graph consists of CCR service-users (as nodes) and atomic action branches (as arcs).

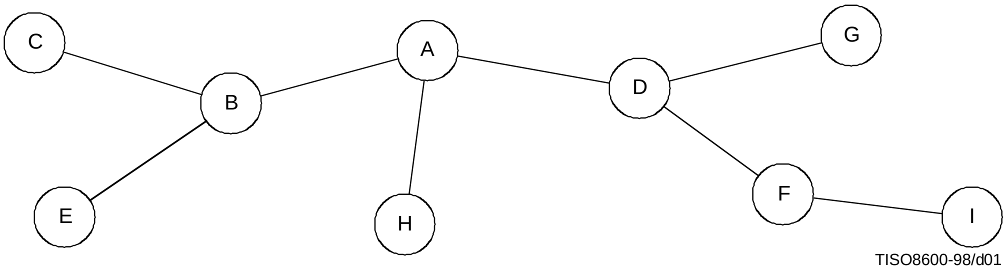

Figure 1 – Atomic action graph

A given AEI can represent one or more CCR service-users of the same or different atomic action graphs.

NOTE 1 – Atomic action branches between CCR service-users in the same AEI are outside the scope of this Recommendation | International Standard.

A **branch** of the atomic action is the relationship between two logically adjacent CCR service-users in the atomic action graph. These CCR service-users are called **neighbours**.

An atomic action graph is dynamically constructed by the formation of its branches. The atomic action graph and its branches only exist for the lifetime of the atomic action.

An atomic action graph starts when a CCR service-user begins the first branch. This CCR service-user is called the **atomic action initiator**. It makes use of an **atomic action identifier** to unambiguously identify the new atomic action within the OSIE. The atomic action identifier can be assigned by the atomic action initiator or some other entity can assign the value and communicate it to the atomic action initiator. This value is propagated throughout the atomic action. A CCR service-user uses it to maintain concurrency controls. Following an application or communication failure, it is used to correlate recovery for interrupted branches of the atomic action.

NOTE 2 – A referencing specification may specify mechanisms for passing the atomic action identifier to the initiator from some other entity that creates and assigns the identifier.

Figure 2 shows the atomic action graph of Figure 1, with the CCR service-users ordered and lettered in the sequence in which they joined the atomic action. CCR service-user A is the atomic action initiator.

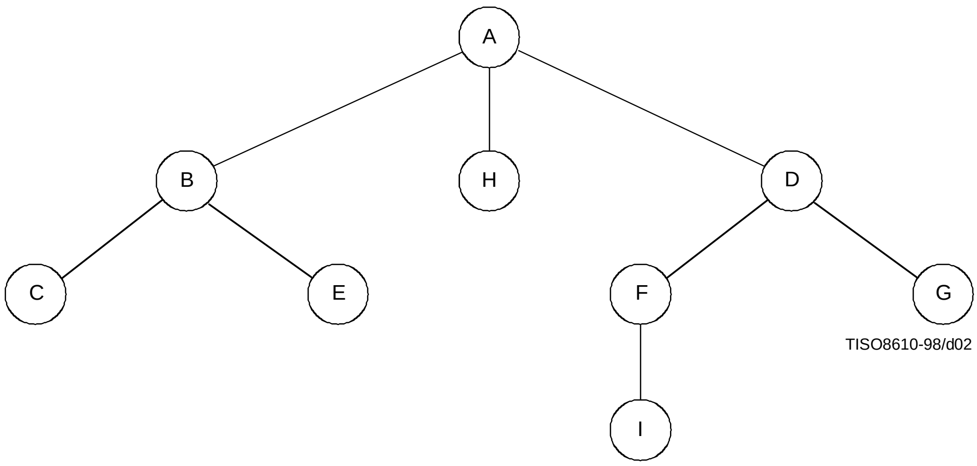

Figure 2 – Atomic action graph ordered according sequence of joining

Based on the requirements of the referencing specification, a CCR service-user can introduce another CCR service-user into the atomic action graph. This adds a new branch to the atomic action graph.