



Department of Defense MANUAL

NUMBER 8260.03, Volume 2
June 14, 2011

USD(P&R)

SUBJECT: Global Force Management Data Initiative (GFM DI) Implementation:
The Organizational and Force Structure Construct (OFSC)

References: See Enclosure 1

1. PURPOSE

a. Manual. Pursuant to DoD Instruction (DoDI) 8260.03 (Reference (a)), the authority in DoD Directive (DoDD) 5124.02 (Reference (b)), and in accordance with DoDD 8320.03 (Reference (c)), this Manual implements policy, assigns responsibilities, and provides procedures and rules for the electronic documentation of force structure data across the DoD.

b. Volume. This Volume sets forth responsibilities and procedures for implementation of the OFSC for authorized force structure in GFM DI Organization Servers (OSs) and for task organized force structure in systems that consume OS data.

2. APPLICABILITY. This Volume applies to OSD, the Military Departments, the Office of the Chairman of the Joint Chiefs of Staff and the Joint Staff, the Combatant Commands, the Office of the Inspector General of the DoD, the Defense Agencies, the DoD Field Activities, and all other organizational entities within the DoD (hereafter referred to collectively as the "DoD Components").

3. DEFINITIONS. See Glossary.

4. POLICY. In accordance with Reference (a), this Volume implements DoD policy to:

a. Electronically document and maintain currency of authorized force structure in a suite of authoritative data sources (ADSs), known as GFM DI OSs, hereafter referenced to as OSs, in a comprehensive and hierarchical format usable by systems across the DoD as a common reference for data integration, and to ensure that force structure data is visible, accessible, understandable, and trusted across the DoD, as required by DoDD 8320.02 (Reference (d)).

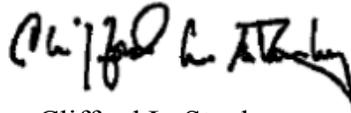
b. Implement the electronic documentation of DoD force structure elements and relationships in accordance with Reference (a).

5. RESPONSIBILITIES. See Enclosure 2.

6. PROCEDURES. See Enclosure 3.

7. RELEASABILITY. UNLIMITED. This Volume is approved for public release and is available on the Internet from the DoD Issuances Website at <http://www.dtic.mil/whs/directives>.

8. EFFECTIVE DATE. This Volume is effective immediately upon its publication to the DoD Issuances Website.



Clifford L. Stanley
Under Secretary of Defense for
Personnel and Readiness

Enclosures

1. References
2. Responsibilities
3. The Organizational and Force Structure Construct

Glossary

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ENCLOSURE 1

REFERENCES

- (a) DoD Instruction 8260.03, "Organizational and Force Structure Construct (OFSC) for Global Force Management (GFM)," August 23, 2006
- (b) DoD Directive 5124.02, "Under Secretary of Defense for Personnel and Readiness (USD(P&R))," June 23, 2008
- (c) DoD Directive 8320.03, "Unique Identification (UID) Standards for a Net-Centric Department of Defense," March 23, 2007
- (d) DoD Directive 8320.02, "Data Sharing in a Net-Centric Department of Defense," December 2, 2004
- (e) Joint Publication 1, "Doctrine for the Armed Forces of the United States," May 2, 2007
- (f) Title 10, United States Code
- (g) DoD Instruction 7730.64, "Automated Extracts of Manpower and Unit Organizational Element Files," December 11, 2004
- (h) Joint Publication 1-02, "Department of Defense Dictionary of Military and Associated Terms," current edition
- (i) Army Research Laboratory Technical Report ARL-TR-2172, "Default Operational Representations of Military Organizations," February 2000¹
- (j) Title 32, United States Code
- (k) Unified Command Plan (UCP), December 17, 2008, distributed by Chairman Joint Chiefs of Staff memo MCM 0044-08, December 23, 2008²
- (l) Global Force Management (GFM) Implementation Guidance FY 2010 – 2011, approved by Secretary of Defense Memorandum OSD 77941-09, January 7, 2010³
- (m) Air Force Manual 38-208, "Air Force Management Engineering Program (MEP) - Quantification Tools," Volume 2, November 19, 2003
- (n) DoD Instruction 1120.11, "Programming and Accounting for Active Military Manpower," April 9, 1981
- (o) DoD Directive 5101.1, "DoD Executive Agent," September 3, 2002
- (p) DoD Directive 5100.3, "Support of the Headquarters of Combatant and Subordinate Joint Commands," February 9, 2011
- (q) Army Regulation 10-87, "Organization and Functions: Army Commands, Army Service Component Commands, and Direct Reporting Units," September 4, 2007
- (r) United States Navy Regulations-1990, Department of the Navy, September 14, 1990⁴
- (s) Air Force Pamphlet 38-102, Headquarters United States Air Force Organization and Functions (Chartbook), January 1, 2004
- (t) Headquarters U.S. Marine Corps Programs and Resources Department, "U.S. Marine Corps Concepts and Programs," 2010

¹ Copies may be obtained from the Internet at http://www.dodccrp.org/files/Chamberlain_Default.pdf

² Copies may be obtained from the Internet at <http://www.dod.gov/pubs/foi/ojcs/>

³ Select unclassified definitions quoted from classified document not releasable to the public. On a need to know basis, a copy may be requested from Joint Staff/J-8 Forces Division, (703) 614-9770.

⁴ Copies may be obtained from the Internet at <http://doni.daps.dla.mil/navyregs.aspx>

- (u) Department of the Army General Order, No. 3, (DAGO 2002-03), "Assignment of Functions and Responsibilities Within Headquarters, Department of the Army," July 9, 2002⁵
- (v) Table of Distribution and Allowances (TDA) Immediate Office of the Secretary of the Army SAW00EAA CCNUM 0110 20091001
- (w) Department of the Army General Order, No. 1, (GO 2001-01), Assignment Of Functions, Responsibilities, And Duties Within The Army Secretariat, January 12, 2001⁶
- (x) Secretary of Defense Memorandum, "Forces for Unified Commands-FY 2006 (U)," February 15, 2006
- (y) Title 5, United States Code
- (z) Title 14, United States Code
- (aa) Title 50, United States Code
- (ab) Strategic Planning Guidance FY 2006-2011 (U), March 1, 2004

⁵ Copies may be obtained from the Internet at <http://www.army.mil/usapa/epubs/pdf/go0203.pdf>

⁶ Copies may be obtained from the Internet at http://www.army.mil/USAPA/epubs/pdf/go0101_obs.pdf

ENCLOSURE 2

RESPONSIBILITIES

1. UNDER SECRETARY OF DEFENSE FOR PERSONNEL AND READINESS (USD(P&R)). The USD(P&R) shall:

a. Require Global Force Management (GFM) Component OSs comply with the implementation of References (a), (c), (d), and this Volume, in coordination with the Heads of the DoD Components.

b. Within the OSD OSs, document and maintain, in accordance with the logical rules of the OFSC, all force structure data and relationships under OSD aegis, with the exception of force structure data under the purview of the Under Secretary of Defense for Intelligence (USD(I)).

c. Within the OSD OSs, implement, maintain, and track via FMIDs, all force structure data and relationships under OSD sponsorship, with the exception of force structure data under the purview of USD(I).

d. Ensure that only force structure data authorized pursuant to Reference (a) is used for any force structure representation in future human resource domain systems under OSD auspices as part of the certification process.

2. UNDER SECRETARY OF DEFENSE FOR ACQUISITION, TECHNOLOGY, AND LOGISTICS (USD(AT&L)). The USD(AT&L), in coordination with the USD(P&R) and the Under Secretary of Defense (Comptroller)/Chief Financial Officer, DoD, shall ensure that only force structure data authorized pursuant to Reference (a) and documented in accordance with the logical rules of the OFSC is used for any force structure representation in automated systems under USD(AT&L) aegis.

3. USD(I). The USD(I) shall:

a. Within the Defense Intelligence Enterprise OSs, document and maintain, in accordance with the logical rules of the OFSC, all force structure data and relationships under USD(I) aegis.

b. Ensure that only force structure data authorized pursuant to Reference (a), and documented in accordance with the logical rules of the OFSC, is used for any force structure representation in future Defense Intelligence Enterprise systems as part of the certification process.

c. Provide advice to assist the USD(P&R) in the implementation of this Volume.

4. ASSISTANT SECRETARY OF DEFENSE FOR NETWORKS AND INFORMATION INTEGRATION/DoD CHIEF INFORMATION OFFICER (ASD(NII)/DoD CIO). The ASD(NII)/DoD CIO shall:

a. Assist the USD(P&R), the USD(AT&L), and the USD(I) where necessary to ensure that the OFSC is adopted as the common semantics for the electronic documentation of hierarchical force structure across the DoD with minimal data mediation needs.

b. As required by Reference (d), provide assistance as needed to ensure use of federated enterprise capabilities to publish metadata and to locate, search, and retrieve metadata and data.

5. SECRETARIES OF THE MILITARY DEPARTMENTS. The Secretaries of the Military Departments shall:

a. Within the applicable Service OSs, document and maintain in accordance with the logical rules of the OFSC all force structure data and relationships under that Service's aegis.

b. Ensure that only force structure data authorized pursuant to Reference (a) and documented in accordance with the logical rules of the OFSC is used for any force structure representation in future Service systems as part of the certification process.

c. Provide advice to assist the USD(P&R) in the implementation of this Volume.

6. CHAIRMAN OF THE JOINT CHIEFS OF STAFF. The Chairman of the Joint Chiefs of Staff shall:

a. Within the Joint OSs, document and maintain in accordance with the logical rules of the OFSC all force structure data and relationships under Joint Staff aegis.

b. Ensure that only force structure data authorized pursuant to Reference (a), and documented in accordance with the logical rules of the OFSC, is used for any force structure representation in future joint systems as part of the certification process.

c. Provide advice to assist the USD(P&R) in the implementation of this Volume.

7. COMMANDERS OF THE COMBATANT COMMANDS. The Commanders of the Combatant Commands shall:

a. Ensure that only force structure data authorized pursuant to Reference (a) is used for any force structure representation in future joint systems as part of the certification process.

b. Through the Chairman of the Joint Chiefs of Staff, provide advice to assist the USD(P&R) in the implementation of this Volume.

ENCLOSURE 3

THE OFSC

1. INTRODUCTION

a. Purpose

(1) In accordance with Reference (a), it is DoD policy that force structure is central to integrating data within the DoD. It mandates that the electronic documentation of organizational and force structure data, military and civilian, be in a joint, hierarchical format usable by all systems across the DoD net centric environment. Such a format, non-prejudicial to the diverse structures utilized by the Military Services, the joint community, and OSD Components, has not previously been articulated. This requires careful extension of terminology to ensure applicability across DoD mission areas, while remaining sensitive to the permissible implications of doing so. Furthermore, some fundamental force management concepts are weighted with conventional meanings at odds with their official definitions, resulting in differing, subjective interpretations, even within the military context, that must also be resolved. To this end, the OFSC establishes a precise formalism, based upon graph theory, for the digitization of organizational and force structure hierarchical data.

(2) The OFSC describes architectural and behavioral aspects of organizational structures. Architectural aspects describe the construction of the different organizational elements. Behavioral aspects describe how leadership authority flows through the elements. In so doing, the OFSC replaces subjective interpretations of organizational structure based on informal definitions with a logically cumulative and mathematically rigorous set of rules that support automated information sharing, data aggregation, and analysis within and across DoD mission areas. This enclosure explains the requirements fulfilled by the rules and the formalism upon which they are based. It includes a necessary expansion of DoD taxonomy beyond a military operational context to incorporate digitization of administrative and operational structures and the sequence of leadership of any organization across the Department as a whole. The OFSC business rules govern the accurate composition and decomposition of force structure hierarchies (Rules 1-3), ensure that unity of command is maintained (Rules 4-5), and define and regulate the interpretation of overlapping leadership relations so that user defined parameters yield a coherent organizational structure (Rules 6-13). The characteristic properties of the different leadership relations are described in detail in sections 4 through 12 of this enclosure. Additionally, rigor is imposed onto the English semantics through a simplified form of First Order Logic (FOL). Appendix 1 to this enclosure includes an FOL tutorial and a summary of the entire OFSC rule set. Specific rules will be referenced as applicable throughout this Manual.

(3) The OFSC is a representational schema for use in data exchange between information systems. It does not alter electronic storage schemata or the physical business of operating and deploying forces by the Services, Combatant Commands (CCMDs), or OSD. When combined with the information exchange specification of the GFM extensible markup language (XML) schema definition (XSD), the OFSC provides the minimum requirements for the exchange of

force structure data so that it can be manipulated in a consistent manner by computer programs to the benefit of decision makers. Both the OFSC and the GFM XSD are required to accomplish this objective. Without the OFSC, the GFM XSD can be used and interpreted incorrectly.

(4) Pursuant to Reference (a), the OFSC is to be implemented in the GFM Component OSs and in all automated systems that utilize a force structure representation. The OSs are the ADSs for the default force structure authorized for procurement by Congress. The initial suites of OSs exist in unclassified and classified domains, under the management of OSD, the Joint Staff, Defense Intelligence Enterprise, and the Military Services. External applications integrate OS data with instance data and manipulate the default force structure to represent ad hoc organizations while maintaining linkages through unique identification back to the original authorizations. Appendix 2 to this enclosure provides implementation guidance for GFM DI OS.

b. Aggregation Based upon Leadership and Command

(1) The first OFSC rule is the fundamental military concept that every organization has a leader. This statement requires elaboration, however, and the challenge of defining principal terms with the necessary precision to support automated information exchange must be approached carefully. Conceptually, an OFSC organization is an aggregation point with a leader, to which arbitrary entities can be associated, and that may be used to unite other organizations. The OFSC delineates these aggregation points using the criteria of leadership, defined as the authority (both military and civilian) exercised over subordinates by virtue of grade or assignment within the DoD.

(2) A primary subtype of leadership is command. Command is the core theme of military leadership and drives many related concepts and terms, to include command relationships and command authority. The objective of GFM DI is to provide the basis, and to satisfy force structure requirements, for all DoD users at any DoD echelon or function where leadership is involved. The OFSC must not limit aggregation based only on military command. Any recognized level of leadership in either the military or civilian hierarchies, and through operational and administrative relationships, must be available to justify the creation of an OFSC organization. This requires that the OFSC formalism for some (but not all) military command relationships be expanded to allow the electronic documentation of OSD civilian organizational structures. To this end, the term command relationship will be expanded to refer to the exercise of authority in either civilian or military hierarchies. In the OFSC, command relationships are synonymous with leadership relationships.

(3) The OFSC distinguishes between the exercise of command relationships through a sequence of individuals, routinely referred to as a chain of command, and the full organizational hierarchy through which leadership and command is exercised, coined a command structure. This distinction is explained in section 3 of this enclosure. As with command relationships, these terms are expanded to include any leadership authority, military or civilian, and the resulting operational and administrative hierarchies. Therefore, chain of command is synonymous with chain of leadership and command structure is synonymous with leadership structure.

(4) The logical expressions for these various leadership concepts and structures are defined in sections 4 through 12 of this enclosure. Special cases requiring greater explanation on how the formulism is to be deployed are described in sections 13 through 16 of this enclosure. Enclosure 3 concludes with an explanation of the challenges presented by digitizing the upper echelon of the DoD hierarchy, where the command structures of the Services' Active and Reserve Components, the joint community, and OSD agencies are united into a bridge that spans across the Department to facilitate data integration.

c. Enhancing the DoD Levels of Authority

(1) A command structure and its corresponding chain of command must demonstrate equivalence (see Rule 2 and section 3.e). In accordance with Joint Publication (JP) 1 (Reference (e)), the military establishment recognizes two basic branches of the chain of command. Although not named by Reference (e), they have been traditionally referred to as the operational chain of command and the administrative chain of command. The OFSC incorporates these notions as fundamental concepts and characterizes relationships in both branches to harmonize the interactions between them.

(2) To further define various command relationships and resulting aggregations based upon them, the OFSC incorporates the terms and concepts defined in Reference (e) as the DoD levels of authority. A basic taxonomy of these authorities or relationships derived from Reference (e) is shown in Figure 1.

Figure 1. The DoD Levels of Authority Taxonomy

- | |
|--|
| <ul style="list-style-type: none">I. Command Relationships (or Command Authority)<ul style="list-style-type: none">A. Combatant Command (Command Authority) (COCOM)B. Operational Control (OPCON)C. Tactical Control (TACON)D. Support<ul style="list-style-type: none">1. General2. Mutual3. Direct4. CloseII. Administrative Control (ADCON)III. Coordinating AuthorityIV. Direct Liaison Authorized (DIRLAUTH) |
|--|

(3) To consistently represent the interactions between diverse command and leadership relationships, the OFSC employs a taxonomy of leadership relationship, shown in Figure 2. This taxonomy expands the scope of the command relationships to include the administrative and operational branches of the chain of command and their interaction with the DoD levels of authority. This allows all leadership and command relationships to be consistently represented and integrated across the joint community and recognizes that commanders exercising authority in an administrative chain of command share authority comparable to their operational

counterparts. Using leadership relationships as an umbrella category, a new category of relationship, called administrative relationships, is introduced to complement the Reference (e) category called Command Relationships. Since the Command Relationships category is operational in nature, it has been renamed Operational Relationships in the OFSC. This differs from Figure 1, which does not consider administrative control (ADCON) to be a command relationship. The OFSC does not differentiate between command relationships exercised in an administrative versus operational capacity.

(4) As shown in Figure 2, under the Administrative Relationships category, a new relationship is introduced called default administrative leadership (ADMIN). ADMIN is a relationship to build structures based upon the administrative chain of command and represents default administrative leadership in both the military and civilian hierarchies. The ADMIN relationship implements, in part, the organizing function identified in sections 3013, 5013, and 8013 (b) of title 10, United States Code (U.S.C.) ((Reference (f)), and initiates a correlation with the administrative chain of command. The use of “default” in the relationship title indicates a preset option designated by a Service or DoD Component to serve as an initial condition. The OFSC treatment and implementation of the interactions between the concepts of the administrative chain of command, the Title 10 function of organizing, the GFM ADMIN default relationship, and ADCON are covered in section 5 of this enclosure.

Figure 2. OFSC Leadership Relationship Taxonomy

- I. Command (Leadership) Relationships
 - A. Operational Relationships
 - 1. COCOM
 - 2. OPCON
 - 3. TACON
 - 4. Support
 - a. General
 - b. Mutual
 - c. Direct
 - d. Close
 - B. Administrative Relationships
 - 1. Default Administrative Leadership (ADMIN)
 - 2. ADCON
- II. Coordinating Authority
- III. DIRLAUTH

(5) The OFSC categorizes ADCON as an administrative relationship to acknowledge that any of the inherent Service functions outlined in Reference (f) may involve command of an administrative nature. This does not imply that an ADCON function will require command relationships, but only that it may, and therefore, it is placed under the leadership relationships umbrella. The set of ADCON functions and associated responsibilities is complex and the subclasses of ADCON may not be defined, distributed, or interpreted consistently across Service and joint boundaries. For these reasons, ADCON is defined separately from the ADMIN default

relationship that is defined consistently across the Services via Title 10 and is manifested in the OFSC via the administrative chain of command.

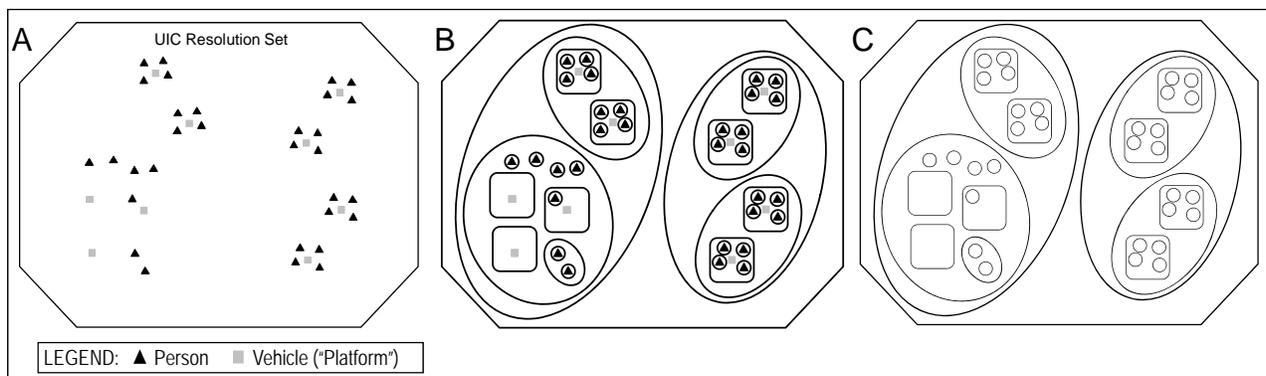
d. Authorization Data as a Fundamental Building Block

(1) Authorization data and force structure data are closely associated. In the GFM DI, authorization data refers to the permission to procure personnel or equipment. It is not the actual personnel or equipment, but the congressional permission to obtain it, as described in DoDI 7730.64 (Reference (g)). Manpower is reported in terms of what has been determined necessary (manpower requirement) and what is authorized for employment (manpower authorization). Manpower documents describe the qualifications and types of jobs required to operate an organization. Section 13 of this enclosure describes how manpower and selected equipment authorizations are tightly intertwined with force structure because they contain the primary assets that constitute an organization's resources.

(2) Authorization data is used as the basis for the OFSC because it is relatively stable. While the actual people and equipment are transient, the authorization persists and typically evolves slowly over time at predefined intervals. This allows the authorization data to be treated as if it were static, for example, to be maintained in a shared reference library, analogous to a phone book.

(3) The principle of using authorization data as building blocks is illustrated in Figure 3. Diagram A illustrates people (triangles) and platforms (squares) geographically located within a set delineated by the Unit Identification Code (UIC), denoted by an octagon, to which they belong. Generally, UIC resolution is standard for current systems (e.g., command and control, readiness, logistics). Diagram B illustrates the same UIC set subdivided or decomposed into smaller and smaller groups denoted by the ellipses, circles, and squares. These groupings can be based upon any of a number of criteria, but often are based on tactics, training, and doctrine of employment. Each group can be further decomposed into smaller groups until a group is comprised of a single person or piece of equipment (platform).

Figure 3. Real Objects versus Authorizations



(4) In Figure 3, Diagram C is the same as Diagram B except the actual people and platforms have been removed, leaving only authorization placeholders. Thus, Diagram C can be considered a template for the organization to which people and platforms, like those in Diagram A, can be matched to produce Diagram B. The important characteristic is that the authorizations remain relatively stable, while the real people and platforms associated with them constantly revolve or change due to rotation of people and the introduction or retirement of equipment.

2. FORMALISM TO REPRESENT FORCE STRUCTURE

a. Graph Theory

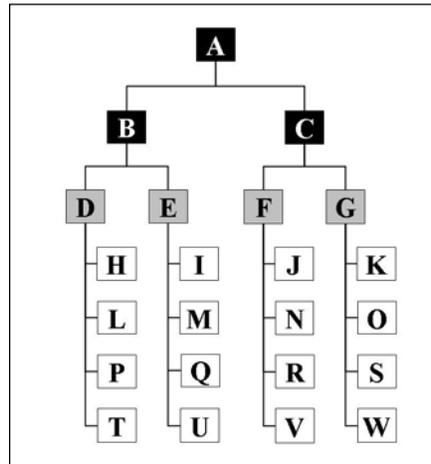
(1) To produce a formal representation, a formalism representing force structure must be selected. Since aggregation, or composition, is the principle function being utilized by the OFSC, several different formalisms were considered: set theory (denoted in Figure 3), graph theory, and predicate logic. Graph theory was the chosen instrument due to the familiarity of using tree graphs to represent the hierarchical nature of military leadership (e.g., org charts).

(2) In Figure 4, the basic formalism of the OFSC is shown using a tree graph. Tree graphs are valid structures for the representation of leadership-based organizations because there is always someone in charge at any position in the structure. Whether this leadership is a consequence of the authority of command or the informal permissible leadership applied at echelons below those of a commander, there is an explicit command lineage for everyone in the DoD that can be represented via a path through a tree graph (e.g., a chain of command or command channel).

(3) A graph is composed of nodes and links. A tree graph is special in that it is fully connected (i.e., every node is linked to at least one other node) and only one path may exist between any two nodes. This requires that every node must have a link to it and that a node can only have one parent. These characteristics are what will be referred to as the tree property and must be maintained in the OFSC in accordance with Rules 1, 4, and 5.

(4) Figure 4 illustrates a simple tree graph composed of 23 nodes (A-W) and 22 links. A link identifies a node as a parent or child of another node. Node B is the parent of node E, and node E is the child of node B. A node without a child is called a leaf node; there are 16 leaf nodes in the Figure (e.g., nodes H, L, P, and T). Conversely, a node with children is called an internal node. There are seven internal nodes in the Figure (e.g., nodes A, C, and F). A tree graph is defined by a root node that defines the top of the tree (e.g., node A). In the ultimate case, a root node is a node without a parent; however, one can refer to subtrees via a node that serves as the local root of that tree (e.g., there are subtrees rooted by nodes B and E). Tree graphs are often referred to by the name of their root node. It is important to understand this distinction. Node A is a single node, while tree graph A (or the tree rooted at node A) consists of 23 nodes and 22 links. Finally, the set of all the children of a root node is called its descendants (e.g., Nodes B-W are descendants of node A). Conversely, an ancestor is a node on the path from a descendant to the root (node B is an ancestor of node U).

Figure 4. A Tree Graph



(5) In the OFSC, DoD organizations are mapped to the terms used for a graph. The nodes are called organizational elements (OEs). There is no intrinsic interpretation for an OE beyond the fact that it is an aggregation point that, per Rule 1, has a designated leader. Nodes are only a portion of a graph; the other component is represented by the links. In the OFSC, links are called associations, and they directly connect together two OEs (a parent and a child). For a given set of nodes, there are many alternative ways to link them together. In mathematical terms, many different graphs can be produced for a set of nodes by connecting them together in different configurations using different links. Therefore, the links are as important as the nodes. In OFSC terms, the associations are as important as the OEs.

(6) In the OFSC, an organizational tree graph (org tree) that results from connecting together a set of OEs with a set of associations is called a unit. Many different units can be created from a single set of OEs simply by re-linking them using different associations. Unit A and OE A are thus different concepts. OE A is a single node, while Unit A is the org tree rooted by OE A. This important distinction has not been a part of previous force structure definitions, but serves as the core for many of the OFSC principles. The OFSC provides the guidelines for the representation of units by adding rigor to the process and procedures of building and interpreting organizational structures composed of OEs and associations.

(7) The final term used with tree graphs is a path. A path is a sequence of nodes whereby each node has a link to the next node in the sequence. A cycle is a path where the start and end node is the same, which is forbidden by the tree property. In the OFSC, a path of any length is called a relation, and the distinction between a link and a path in a graph must be understood to grasp the distinction between an OFSC association and an OFSC relation. In Figure 4, a path exists between nodes A and U via nodes B and E using links (A,B), (B,E), and (E,U). Therefore, one can reach node U from node A through a set of links. In this example, the path is of length three because three links are traversed. Technically, a path may be of any length one or greater; since a path is composed of one or more links. There is a technical distinction between a path of length one and the single link that defines the path. Normally, paths are derived from links, and in the OFSC relations are derived from associations (section 4.c further clarifies the properties of

OFSC relations and associations). By definition and using Figure 4 as an example, an association exists between nodes A and B, B and E, and E and U, while a relation exists between any two of these nodes. The importance of these distinctions will become clear when one maps common military terms, like the DoD levels of authority, to these formalisms.

(8) Mathematically, a relation is a subset of the product of two sets, written “ $R: A \times B$.” If (a, b) is an element of R then one writes “ $a R b$,” meaning a is related to b by R . A relation may be: reflexive, symmetric, transitive, anti-symmetric, or total. Both reflexive and transitive relations exist in the OFSC. As mathematics defines links and paths as two different notions that are differentiated by qualifiers, consequently an OFSC association and the relation it characterizes are two different notions that are defined with different data attributes. The process of moving from node to node along the links of a graph is called tree traversal. Although multiple associations may co-exist between two OEs, user selected parameters will produce different views of that org tree by deriving relations via tree traversal algorithms that exploit data attributes as discriminators. The discriminators currently used by the OFSC pertain to the DoD Levels of Authority (Reference (e)), time, and classification level. Beginning in section 4, rules will be presented and discriminators introduced that define the relation between two OEs when a variety of associations compose the path between them. The present discussion of mathematical formalism will conclude by describing how time enables filtering during the tree traversal process.

b. The Tree Property and Time-Based Trees

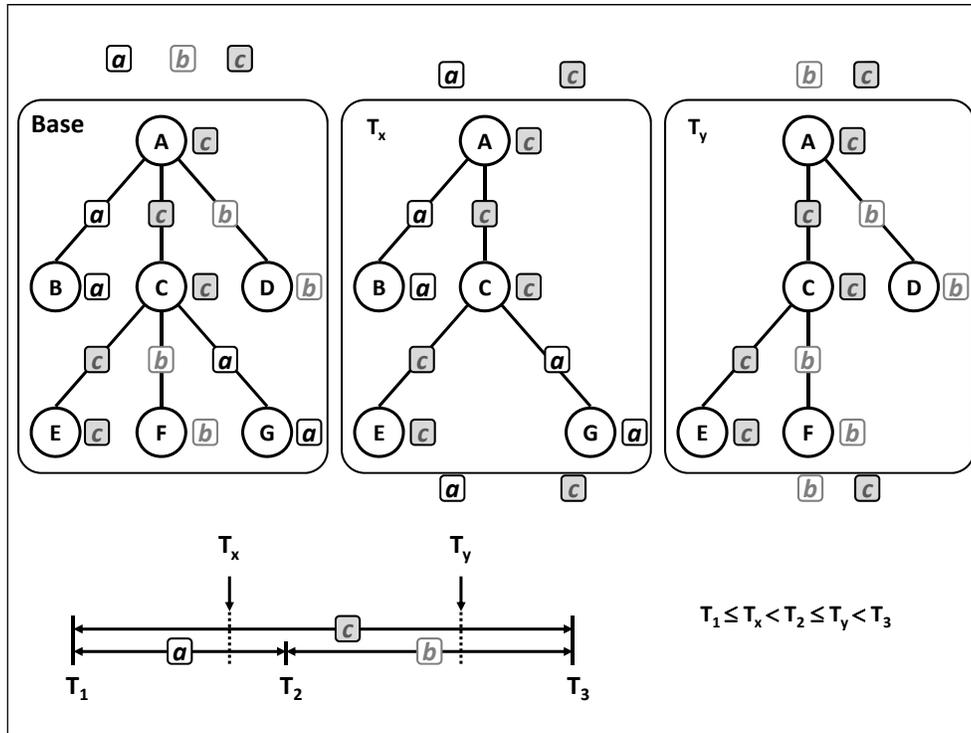
(1) The links and nodes of a graph may include additional qualifiers that allow them to be filtered (i.e., selected or deselected) during the tree traversal process. This allows different paths to be followed by applying parameter constraints during the traversal process. The tree property requires an OE to always have an association to another OE, and that it has only a single parent OE. However, this does not restrict the existence of multiple parent associations provided the associations are mutually exclusive. There must be some way to distinguish between multiple associations to reduce or filter the set down to a single association to a parent, thus maintaining the tree property (and unity of command, see section 4.b). When criteria are applied to resolve multiple associations to a single association, the resulting association is called the active association. There can only be one active association to a child OE at a time (Rule 4). There is no limit to the number of attributes that can be used as discriminators in the OFSC, provided they are rigorously defined so as to produce a coherent tree when multiple possibilities exist.

(2) A fundamental discriminator for all OFSC entities is time. Every element of an OFSC graph includes a time interval that defines the time period for which the entity is valid. This is one of the primary attributes used to differentiate between multiple associations to maintain the tree property by reducing multiple parent-child associations to a single one. For a given time, only a subset of all the possible entities (nodes and links) is valid, and this set can be used to resolve a particular tree graph. Figure 5 illustrates where three variations of the same graph are depicted by filtering different nodes and links.

(3) In Figure 5, the graph on left, marked Base, shows all the possible nodes and links. The attributes a , b , or c have been added to partition the nodes and links into three sets. To

traverse this tree, a set of permissible attributes must be provided to be used during the traversal process. The middle graph illustrates the case in which only nodes and links with the attributes of a and c are included. The right graph illustrates the case in which only nodes and links with the attributes of b and c are included. One can include as many different attributes as necessary to describe the different path combinations. There could also be multiple links between nodes provided that a mutually exclusive discriminator is applicable.

Figure 5. Time-Tagged Nodes and Links



(4) To simplify the annotation and selection process, a sequence of always increasing (or decreasing) numbers may be used. In mathematics this is called a monotonic function. In this case, it is a monotonic increasing function. A convenient set of numbers that meets this criterion is time. Consider that the attributes in the tree graphs of Figure 5 represent a time interval, defined using a start time and an end time, to indicate the time period for which each node or link is valid. Furthermore, the lower part of Figure 5 includes a timeline that denotes three time intervals using the three times: T_1 , T_2 , and T_3 . The time period from T_1 to T_2 is represented by attribute a, the period from T_2 to T_3 by attribute b, and the period from T_1 to T_3 (the concatenation of periods A and B) by attribute c. Any value on the timeline can now be used as a discriminator or selector for the nodes and links of the graphs. Any node or link whose time interval includes the time selected from the timeline is included in the tree traversal process.

(5) Using this approach, the middle graph shows the result of selecting time T_x (from the timeline in Figure 5), which is included by time intervals a and c. The right graph shows the result of selecting time T_y , which is included by time intervals b and c. This technique provides

a simple mechanism for building selectable graphs using a single parameter (i.e., time) even though there may be many different intervals associated with the nodes and links of the graph. Notice that this technique may be used with ANY sequence of always increasing (or decreasing) numbers. Time just happens to be a very familiar and natural choice because many processes are based upon it. If time is always used as a selection criterion, then to eliminate an entity from inclusion in selections of future times, the entity does not have to be deleted, but only have its end-time modified to be a value earlier than the present time. Thus, using time-based trees, entities are not deleted but “turned-off” by setting their start and end times to appropriate values. In the OFSC, time is always a criterion in the selection process.

3. DEFAULT OPERATIONAL ORGANIZATION

a. Stable Nodes and Dynamic Links

(1) Although the structure of real-world forces is highly dynamic, some pieces of the structure are relatively stable; or to be more precise, the OEs (nodes) are relatively stable while the associations (links) are very dynamic. This is coined the principle of “stable nodes and dynamic links.” The composition of units is dynamic, but the OEs from which they are built are relatively stable. It is the set of the associations between OEs that is changing frequently to create new units. Rather than create new OEs, existing OEs are reconfigured, or task organized, to create a new unit. This also applies to the root OE of the unit. Reconfiguring the descendants of an OE does not change the root OEs identity, which is an important characteristic in the OFSC. If one wants to rename the unit rooted by an OE, it is done via an alias. Thus, using time as a discriminator, one can view the history of how an OE was used as the root of various units. In other words, the history of the descendants of an OE is equivalent to the history of the task organization of a unit.

(2) One objective of the GFM DI strategy is to develop a set of relatively stable OEs (i.e., aggregation points) and maintain them within OSs so that they can be readily obtained and used by a diverse set of applications to task organize units to fulfill desired capabilities within DoD information systems that require force structure data. The set of relatively stable OEs, which are maintained by the OSs, is called the default operational organization (DOO). The term “operational” is used to indicate the inclusion of OEs that are used routinely in the employment of the unit. However, the DOO alone is clearly not sufficient. To maintain the tree graph property within the OSs, the DOO must be connected by a set of default associations which create a tree graph and, ultimately, one vast unit called the DoD. These default associations serve as the starting point for creating myriad real-world units, such as orders of battle, deployment suites, or budget configurations. The transition from independent nodes to connected graphs presents exponential opportunities for data integration.

b. Authorization Inventory and Related Terms

(1) The origin of any force structure development is the authorization process. This process is chosen or actually prescribed by Congress in accordance with Reference (f). The

annual authorization of appropriations is used as the basis for creating the DOO structure and relationships.

(2) By embedding authorization data within the DOO structure and traversing the default org tree, one can determine the default OEs required to conduct nominal operations and the collection of the complete authorization inventory of manpower and equipment associated with any size unit. Not all OEs in the default org tree have authorization inventory associated with them; some have only manpower or equipment and some have both or none.

(3) An OE that has associated authorization inventory is categorized as an inventory OE. An OE is classified as accountable when it has one or more inventory OEs as descendants below it in the org tree. In other words, an organization is accountable when it has people or equipment authorized somewhere within its descendant hierarchy. An active OE is an accountable OE that has manpower authorized within its descendants. In Figure 4, if all the leaf nodes (white background boxes) are inventory OEs, then all the non-leaf nodes are accountable OEs. If node H has manpower associated with it, then nodes A, B, and D are active OEs.

(4) An objective of the OFSC is to ensure that there will be at least one org tree that, when traversed, will result in the collection of all authorization inventory for a unit. An OS contains no information about real people or equipment, only authorized manpower and types of equipment. Information systems download copies of the default org tree from the OSs and use it as the basis to relate real people and equipment to the default structure. This occurs at whatever security domain is appropriate for the information.

c. Five Conditions that Induce an Organizational Element

(1) Five conditions induce an OE to be created: manpower (billet), operation of a crew carrying platform (crew), operation of an installation or facility (garrison force), doctrine, and amalgamation of authorization inventory that is to be embedded in another organization (augmentation). Every OE in an org tree will be present for one of these five reasons.

(2) In the OFSC, two conditions always result in an inventory OE:

(a) Billet (OE). Created for the purpose of employing a person (i.e., manpower). A billet may represent a military end-strength authorization for the purpose of employing a Military Service member or a workload equivalent created for the purpose of employing a civilian that may be either a Government employee or a non-government employee. Attributes assigned to the billet define its required qualifications. Equipment authorizations may also be associated with the billet (i.e., the equipment necessary to fulfill the billet's function). In the OFSC, one person has one billet, and only one billet.

(b) Crew (OE). Created for the purpose of employing a piece of materiel, commonly called a platform, that requires one or more persons to operate and transports those persons. A platform authorization that fits this criterion is always associated with a crew. This authorization must not be misconstrued as the actual equipment. Crew membership and associations with actual equipment may be habitual or non-habitual (i.e., ad hoc; see section 13 of this enclosure).

(3) The other three conditions for an OE may or may not have associated authorization inventory but they are usually accountable (have inventory OEs as descendants):

(a) Doctrinal (OE). Created to facilitate mission accomplishment. This may be for a multitude of reasons, including the employment of tactics, techniques, procedures, or administrative functions. Doctrinal OEs reflect the way organizations conduct their business, either operationally or administratively, via leadership channels.

(b) Garrison Force (OE). Created for the purpose of operating an installation and managing the assets assigned to accomplish the installation mission. Some type of real property is always associated with a garrison force. Real property includes land, land rights, and improvements to land including all types of facilities such as buildings and structures. Although not authorizations, installations and facilities require operation; thus these can be analogously considered as “crews” for fixed sites.

(c) Augmentation (OE). Created to unite and account for a grouping of manpower and/or equipment that is to be embedded in another unit. An augmentation OE is not expected to operate without being embedded; therefore, the requirement for a leadership billet is optional. This is the only exception to Rule 1 (see sections 14 and 15 of this enclosure).

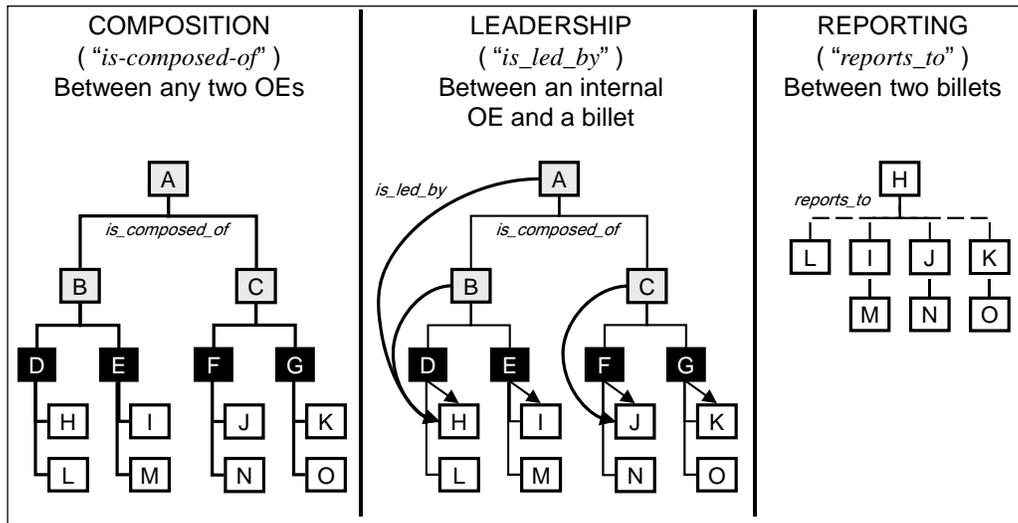
d. Associations

(1) Associations are the links between the OEs in a graph. In conventional organizational charts, linkages are ill-defined and subjective. The OSFC provides rigor by specifying three classes of associations, illustrated in Figure 6, based on whether the link is documenting the command structure (composition associations), the leadership of a command structure element (leadership associations), or the chain of command (reporting associations). Technically, these graphs are called directed graphs because each link is represented via an arrow showing the direction of the function, such as “A is composed of B,” “A is led by H,” and “N reports to J.” However, due to the obvious nature of these functions, the arrowheads will be masked in the figures when the intent is clear.

(2) In the OFSC, the primary function of an org tree is to define aggregation (or decomposition) of units; therefore, composition associations serve as the primary class of associations. The interpretation of the composition association is read “is-composed-of.” In Figure 6, the left tree is a composition tree and one would state that node B is composed of nodes D and E. Figure 3 illustrates how set theory supported the decomposition of a UIC level organization into smaller and smaller subsets until a one-to-one mapping was achieved between individual people and the billets they occupy. Billet OE resolution exhausts the decomposition process (Rule 3).

(3) The two other classes of associations implement the Rule 1 requirement that any active OE (one with manpower authorized within its descendants) must have a designated leader. These are the leadership and reporting associations.

Figure 6. Three Classes of OFSC Associations



(a) Leadership within the command structure is represented by associations whose basic interpretation is read “is led by.” Leadership associations are illustrated in the middle org tree of Figure 6. As with composition OEs, the is-led-by association is never used to directly link two billet OEs. It connects a non-billet OE serving as a root node of a unit to the billet OE that leads the unit, and the same billet OE may have is-led-by links to multiple non-billet OEs. It is echelon independent and can be used at any level of a command structure. Currently, there are two types of leadership associations; is-led-by, default (ILD), and a special case, is-led-by, command conditional (ILC) that is described in section 16 of this enclosure.

(b) By manipulating the leadership associations in conjunction with the decomposition structure, one derives the third class of OFSC associations; the reporting association. The reporting association reflects supervision responsibilities and formally represents a chain of command, as illustrated by the right org tree in Figure 6. The distinction between a command structure and a chain of command is paramount to understanding Rule 2 of the OFSC formalism, since their equivalence significantly impacts command structure design.

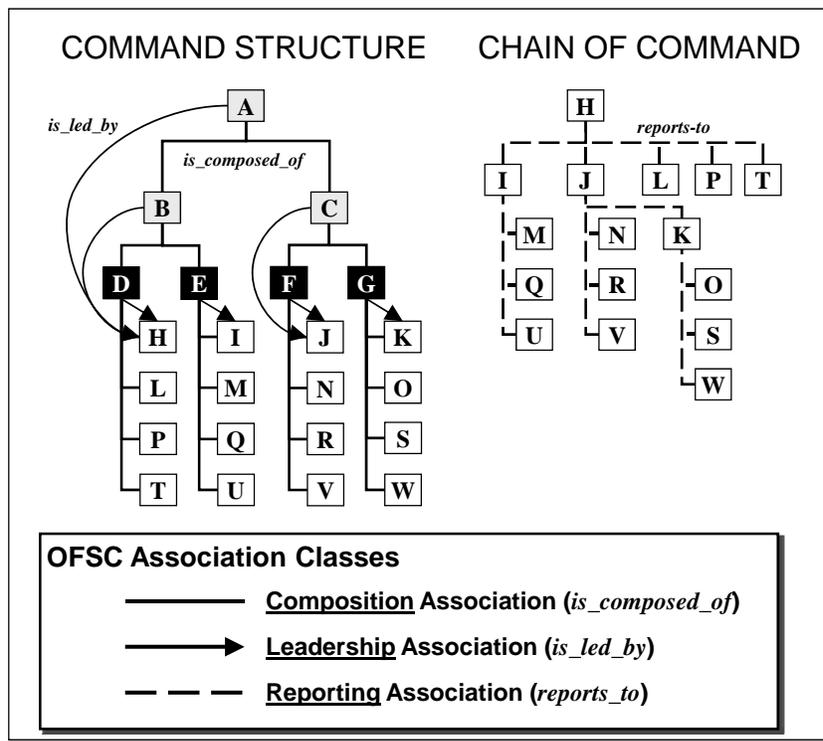
e. Equivalence of Command Structures and Chains of Command

(1) There is a close relationship between the three classes of associations just defined. Composition associations define a command structure that unites OEs of any type based upon the OFSC discriminators of time, classification, and the DoD levels of authority (Reference (e)).

(2) Reporting associations portray a chain of command that is an org tree composed only of billet OEs. Since it is based on the same set of properties as the organization’s command structure, the reporting associations are derived from the leadership associations. This is a formal representation of the same term defined in JP 1-02 (Reference (h)), except it extends to any leadership authority, not just official command. The billet OEs of a chain of command are the same ones that reside in the command structure.

(3) Leadership associations unify a command structure and a chain of command by indicating within the command structure the billet OE that provides leadership for each internal OE (an OE with descendants). The leadership association provides the connection between an internal OE and its leadership billet. This association assures that there is an equivalent chain of command for every command structure, and that a command structure is correctly assembled for a chain of command. This equivalency is illustrated in Figure 7.

Figure 7. Command Structure and Chain of Command



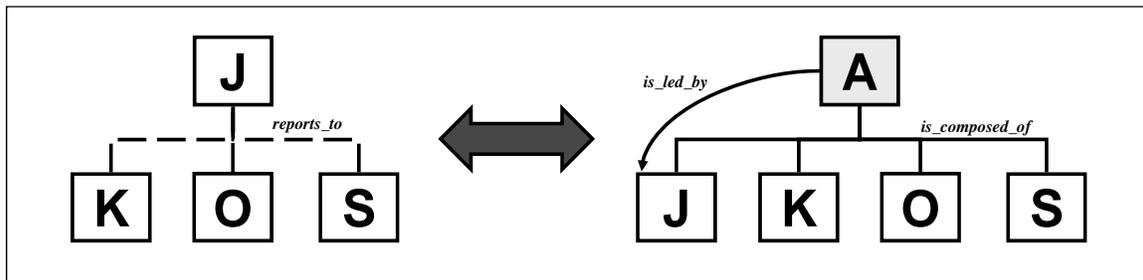
(4) On the left of Figure 7 is a command structure with the is-led-by associations included. The leaves of the org tree (H – W) are billet OEs and every internal OE (A – G) has an is-led-by association to the billet OE that, by default, provides the leader for the unit rooted at that internal OE. Thus, a person assigned to billet K would be the leader of those people assigned to billets O, S, or W under unit G, and a person in billet H would be the leader of anyone assigned to Unit A (as well as internal OEs B and D). Leadership associations provide command structures flexibility because they allow a leadership billet to be located anywhere in the hierarchy.

(5) The right org tree of Figure 7 is the chain of command that can be derived from (and corresponds to) the command structure. It is composed of the billet OEs of the command structure and denotes who reports to whom. An algorithm exists (described in Army Research Laboratory Technical Report ARL-TR-2172 (Reference (i))) that traverses the composition

associations of a command structure and, using the leadership associations, derive the chain of command and its reporting relations. This algorithm easily resolves multiple leadership associations. For example, in the command structure, there are three leadership associations to billet H, but this is reduced to a single billet in the chain of command (the most senior case).

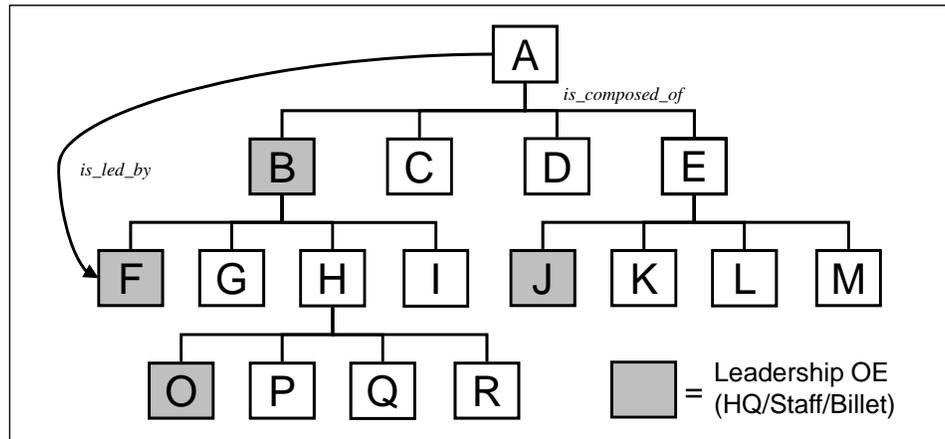
(6) In accordance with Rule 2, to be correct a command structure must produce a single, unambiguous chain of command. However, the same chain of command can be produced from many command structures. But just as a command structure must produce a single chain of command, a chain of command can be used to produce a minimal command structure. Thus, one can start with the chain of command and build a command structure, or start with a command structure and derive the chain of command. This is illustrated in Figure 8. On the left is a chain of command indicating that (the people in) the three billet OEs, K, O, and S report to (the person in) billet OE J. This group of OEs forms an identifiable aggregated set based upon leadership that can be represented via a separate OE named A. The command structure on the right is a composition tree indicating that OE A refers to the group of billets J, K, O, and S, or in OFSC vernacular, Unit A is composed of billets J, K, O, and S. The leadership association (is-led-by) is added to indicate the leadership billet for Unit A and allows the command structure to be converted back to a chain of command. When designing command structures, one can begin directly with a command structure, or with a chain of command; both are equivalent. However, for a given situation, one of these structures may be more familiar than the other. For example, at the highest echelons, the chain of command is often better known than the command structure.

Figure 8. Minimal Command Structure from a Chain of Command



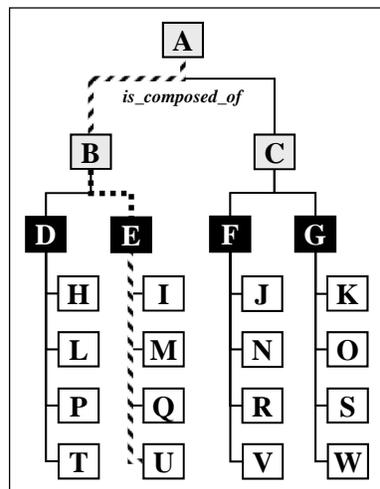
(7) The general form of an OFSC command structure is shown in Figure 9, and portrays a unit's decomposition into a leadership OE and subunit OEs. At the lowest echelons, the leadership OE is a leadership billet. At higher echelons, the leadership OE will be a group of OEs, typically called a headquarters (HQ), command staff, or staff. The staff itself may be a hierarchy, and because of the presence of the is-led-by associations, the leadership billet of the parent unit can always be identified regardless of where the leadership billet actually resides. This is illustrated in Figure 9 between OE A and its leadership billet OE F: OE F can be placed anywhere and still be identified as the leadership billet for OE A via the is-led-by association.

Figure 9. General Form of OFSC Unit Decomposition

f. Relations versus Associations

(1) The toughest challenge of the OFSC is the integration of the GFM relationships (see Figure 2) into the construct of a command structure. The distinctions between a link and a path in a graph, as illustrated in Figure 4, are reiterated in Figure 10: an OFSC association corresponds to a link, while an OFSC relation corresponds to a path. Using OFSC terminology, Unit A is composed of 23 OEs (A-W) with OE A being its root. Unit A obtains its name from its root OE; thus, there is both a Unit A and an OE A. A relation (a path) exists between OEs A and I through OEs B and E via associations (A,B), (B,E), and (E,I). The associations of Unit A can be traversed to reach OE I from OE A. The relation between OE A and OE I is “of length three” because three associations are traversed to go from OE A to OE I. A relation may be of length one or greater; therefore, between OEs A and B there is an association and a relation. The OFSC distinguishes between associations and relations by using different names with different qualifiers.

Figure 10. Associations and Relations



(2) When all the associations in a unit are the same, the results are predictable. Simply stated, the transitive property means that for a given relationship R, if a R b and b R c, then a R c. (Using equality as an example, if a = b and b = c, then a = c.) Conversely, the determination of the relation between the endpoints is rarely obvious when the associations encountered between the endpoints are different. In Figure 10, the association between A and B is one type, between B and E is another type, and between E and I is a third type. It is not obvious what the “type” of the relation between A and I should be. Defining these relations and their behavior is a key component of the OFSC.

(3) A key characteristic of the DOOs is that they are operational in nature, which means they include all the organizations, as defined by the five types of OEs, routinely used in the employment of a unit. The default command structure represents a standard operational configuration. One application of the OFSC is to guide the population of the ADSs to produce a default structure from which any task organized force can be constructed by re-linking existing OEs through new associations, thus rarely having to create new OEs (or aggregation points) to define a task organized force.

(4) As with any command structure and chain of command, task organized forces must abide by the principles of the OFSC so that a common set of algorithms can be implemented that provide consistent results when applied to the data. This is why the OFSC must address all the GFM DI relationships and not just the default subset maintained in the GFM OSs. With these fundamental concepts defined, the next step is to formally integrate the DoD levels of authority (via the GFM DI relationships) into the OFSC by formally describing their behavior.

4. IMPLEMENTING LEVELS OF AUTHORITY WITH RELATIONS AND ASSOCIATIONS

a. Interpreting DoD Levels of Authority

(1) A taxonomy of the DoD levels of authority was presented in Figure 1 with an enhanced version in Figure 2 that provides additional details about the administrative functions required for the more rigorous treatment by the OFSC. Two key points are emphasized about the OFSC representation of this taxonomy:

- (a) In the OFSC, levels of authority are represented as relations, not associations.
- (b) In GFM DI data, associations are explicit while relations are derived.

(2) In specific terms, OFSC associations are defined in the GFM XSD using category and subcategory codes, while the OFSC relations are defined and derived from those associations. Table 1 lists the OFSC relations by type, and their invoking associations by class, full name, abbreviation, and GFM XSD code. All but the last two associations are composition associations, which invoke relations that are subcategorized as default, operational, and support. The “default relations” (ADMIN and Command and Control Default (C2DEF), see sections 5 and 6) were specifically created for use by GFM DI to identify specially qualified default command structures. This subcategory includes an administrative variant and a C2 variant to

facilitate the common practice of partitioning command structures into administrative and operational components, to include documenting operational requirements that are only fulfilled at certain times (see section 7). The “operational relations” (COCOM, OPCON, and TACON, see sections 9 through 11) facilitate documentation of the dynamic real-world instances of the operational command structure resulting from force assignment and allocation. The “support relations” (Direct and General Support, described in section 12 of this enclosure) entail flexible support relationships. Albeit classed akin with the operational relationships (per Reference (e) and illustrated in Figures 1 and 2), technical implementation of the support relations in the OFSC is sufficiently distinct from assignment and allocation of forces that they warrant their own subcategory. Detailed characteristics of each relationship are explained in their respective sections. The final associations in Table 1 (leadership and reporting) are described in section 8 of this enclosure.

Table 1. OFSC Relations and Associations

RELATION TYPE	OFSC RELATION	ASSOCIATION CLASS	INVOKING OFSC ASSOCIATION	GFM XSD Code
Default	ADMIN (Admin Default)	Composition	Has-Admin Default (<u>HAD</u>)	HSADMIN/DEFAULT
Default	C2DEF (C2 Default)	Composition	C2 Default (<u>CCD</u>)	CMDCTL/DEFAULT
Operational	COCOM	Composition	COCOM Assign (<u>COA</u>) COCOM Unassign (<u>COU</u>)	COCOM/ASSIGN COCOM/UNASGN
Operational	OPCON	Composition	C2 OPCON (<u>CCO</u>) C2 Suspend (<u>CCS</u>)	CMDCTL/OPCON CMDCTL/SUSPND
Operational	TACON	Composition	C2 TACON (<u>CCT</u>)	CMDCTL/TACCNT
Support	DS (Direct Support)	Composition	Fire Unit and Combat Support / Direct Support (<u>FDS</u>)	FUCS/DIRSUP
Support	GS (General Support)	Composition	Fire Unit and Combat Support / General Support (<u>FGS</u>)	FUCS/GENSUP
		Leadership	Is-Led-By Default (<u>ILD</u>), Is-Led-By Command Conditional (<u>ILC</u>)	ISLEDB/DEFAULT ISLEDB/CMDCON
		Reporting	Reports-To (Derived from the Composition and Is-Led-By associations)	

b. Unity of Command

(1) These relations and associations are used to define command structures and drive the selection of OEs for inclusion in the DOO. These two processes (OE and command structure determination) are inextricably intertwined via the chain of command, with one directly affecting the other. They are also used to formally describe the fundamental joint GFM processes of assignment (see section 9 of this enclosure), allocation (see section 10 of this enclosure), and apportionment planning.

(2) The OFSC litmus test for a given command structure is that its clarity allows transformation into a single chain of command (Rule 2). An important objective of the OFSC

and its implementation, therefore, is clarity of command. A clear chain of command requires that, for a given criterion, a single leadership path can be automatically resolved between a billet and the President of the United States. This is clearly exemplified in the description of unity of command provided in Reference (f). Unity of command requires that two commanders may not exercise the same command relationship over the same force at any one time. In most cases, this can be achieved by ensuring the tree property is maintained within a command structure. This requires that associations and relations be scrutinized for multiplicity under identical conditions; specifically, circumstances that prohibit resolution are forbidden (Rules 4 and 5), and guidelines must ensure consistent resolution where discriminators exist (Rules 9 and 11).

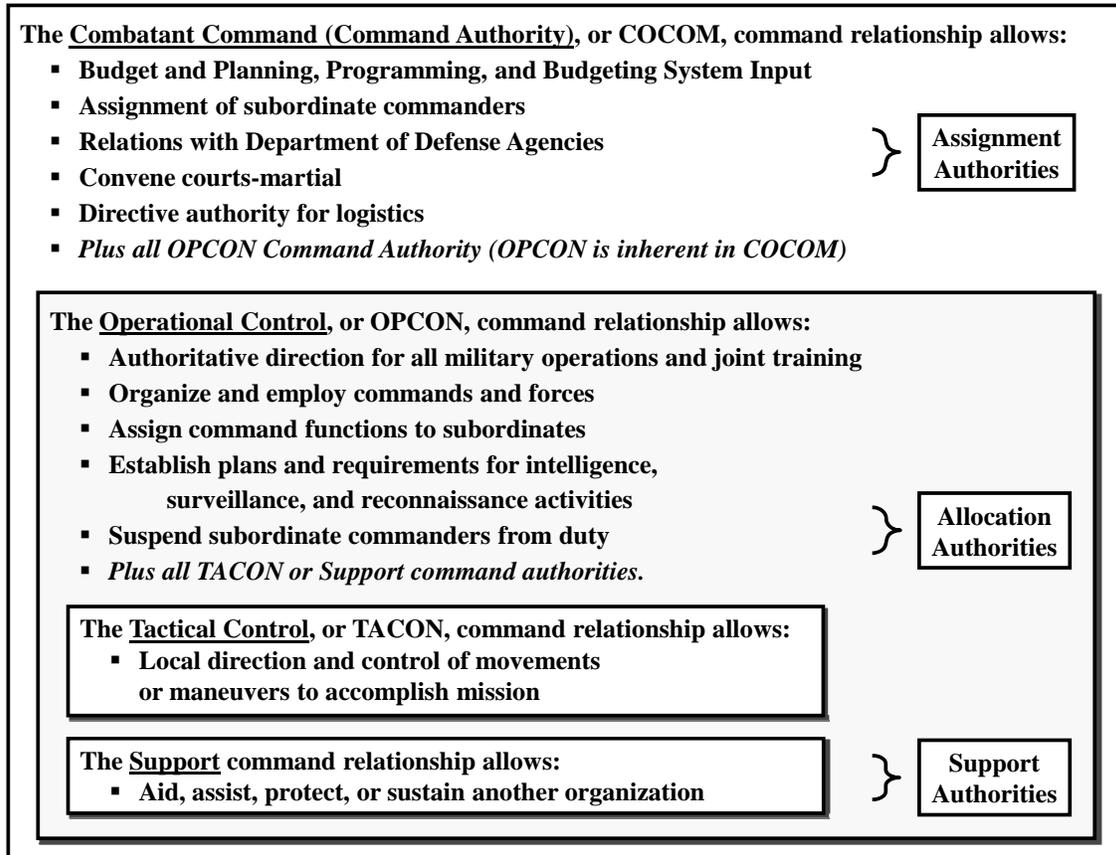
c. Deriving Relations from Associations

(1) Discriminators among multiple, concurrent associations ensure that user defined parameters filter to only one active association and relation at any given time to uphold Rules 4 and 5. This process of derivation involves a technical terminology that is understood as follows. An explicit relation exists in an org tree due to the presence of its invoking association (Rule 6). For example, per Rule 6 a HAD association invokes an explicit ADMIN relation. At any point in an org tree that its invoking association is present, the resulting relation is referred to as an invoked relation. Thereafter, explicit relations inhabit an org tree in one of two ways. First, an explicit default or operational (but not support) relation may traverse over a path of its own invoking associations exhibiting the transitive property (Rule 7). Second, an explicit C2DEF or operational (but not support) relation may propagate over the path of a different default relation without the presence of its invoking association (Rule 8). Therefore, at any point along its path, a traversing relation remains an invoked relation whereas a propagated relation does not. Both traversing and propagating relations continue until all possible paths are exhausted (by reaching a leaf node, such as the terminal OE of a subordinate assigned unit) or, for the operational relations, suspended (by the direct invocation of a suspending association (i.e., COU or CCS; Rules 12 and 13). Propagation may also be preempted by an invoked relation of the same type (Rule 9). Propagation simplifies the task organization of default force structure into operational units. For instance, an organization placed under combatant commander (CCDR) authority via a COA association will propagate the COCOM relation via the extant ADMIN relation without requiring the invocation of the COCOM relation at every link in that structure. Documenting CCMD assignment may thus be accomplished using relatively few COA associations since a significant part of the forces under COCOM authority to a CCMD will be comprised of whole units whose ADMIN structure remains unaltered.

(2) In contrast to an explicit relation is an implied relation, the properties of which are considered an inherent aspect of another relation without being invoked (Rule 10). An implied relation is preempted by an explicit relation of the same type (Rule 11). For example, the COCOM relation implies the OPCON relation until preempted by an explicit OPCON relation. Figure 11 illustrates this situation for the operational relations in a form that emphasizes the nested partitions of those properties, as described by Figure IV-1 of Reference (e). As shown, the COCOM relation includes its own assignment authorities plus those for the OPCON relationship. Likewise, the OPCON relation includes its own authorities plus those for TACON. The OPCON and TACON authorities define the set of allocation authorities. For example, when a unit is assigned to a CCMD, all the authorities listed within the surrounding COCOM box are

included. However, if that unit is allocated to another CCMD, only those authorities listed within the OPCON and/or TACON boxes are included. The nesting of the support authorities within the OPCON box denotes that OPCON includes the authority to designate a support relationship, though no support relation exists independent of an explicit designation. Details of these operational processes are described in sections 6-11 of this enclosure, and section 12 details the support relations.

Figure 11. Nested Properties of Operational Relations



(3) A summary of these salient characteristics of the OFSC relations is presented in Table 2. Provided for each relation is the invoking association (from Table 1), the relations implied or propagated by the relation, the relations that may preempt that relation if directly invoked, the suspending association if applicable, and whether concurrent instances of the relation may exist to a single OE. Concurrency refers to duplicate relations of the same type, which is only possible with the General Support relation. Different types of relations may coexist to an OE, reinforcing the fact that an OE may simultaneously be a member of multiple command structures (and chains of command) via different relations.

Table 2. OFSC Relation Characteristics

OFSC Relation	Invoking Association	Implied Relations*	Propagated Relations	Preempting Relations	Suspending Association	Concurrent Relations
ADMIN	HAD	C2DEF	C2DEF COCOM OPCON TACON	C2DEF OPCON TACON	NA	No
C2DEF	CCD	OPCON	OPCON TACON	OPCON TACON	NA	No
COCOM	COA	OPCON	None	OPCON TACON	COU	No
OPCON	CCO	TACON	None	TACON	CCS	No
TACON	CCT	NA	None	NA	CCS	No
DS	FDS	NA	None	NA	NA	No
GS	FGS	NA	None	NA	NA	Yes

* Unless otherwise preempted

5. ADCON AND THE ADMIN RELATION

a. ADCON

(1) The set of ADCON functions and their association with the 12 responsibilities listed in Reference (f) is complex; further, the subclasses of ADCON are not defined or interpreted consistently across Service and joint boundaries. Reference (e) provides some doctrinal definitions and high level command relationships, but is insufficient for purposes of formally documenting command and support relationships in a manner that may be reasoned upon by computers. Reference (e) also discusses two basic branches of chain of command that are informally referred to as the administrative or operational branches in many communities. The OFSC must provide formal guidance, definitions, and taxonomy to allow Service, OSD, and joint community force structure developers to document the command relationships for the operational and administrative branches of chain of command and harmonize the interactions and use between them. For these reasons, the ADMIN relation is used in the OFSC rather than ADCON.

(2) While titled administrative, ADCON may also be concurrently operational in nature. It is not uncommon for an individual's administrative and operational commander or leader to be the same person. Frequently, Military Departments exercising authority over their forces do so for operational purposes, as is recognized throughout Reference (e).

b. ADMIN

(1) Per Reference (f), the Military Departments (via the Secretaries of the Military Departments) have responsibility to organize their forces administratively and operationally. To support this, the OFSC defines an administrative relationship called administrative default, abbreviated ADMIN, that serves as the primary mechanism for the development of default

command structures. In this case, the term administrative default is used in the context of the general Reference (f) function of a Service, or other DoD Component (e.g., OSD), organizing itself for any purpose and is not restricted to tasks traditionally considered administrative in nature. The ADMIN relation is designed to be usable for any default structure to include command structures that are operational in nature as would exist in combat oriented organizations.

(2) The ADMIN relation defines a default administrative command structure that includes all forms of ADCON unless otherwise directed (this will evolve as more ADCON functions are formally defined).

(3) The ADMIN relation is invoked using the Has-Admin Default (HAD) association (Rule 6), named for the GFM XSD category code of HSADMI, for “has under command for admin,” and subcategory code of DEFAULT, for “default.” The ADMIN relation is transitive through sequences of HAD associations (Rule 7). As the foundation for all other OFSC relations, the ADMIN relation is never propagated or implied and must be explicitly invoked (i.e., Rules 8, 9, and 11 do not apply to the ADMIN relation). Furthermore, it must extend to the entire authorization inventory of a unit. Locally, every billet OE and any OE with an associated platform authorization (e.g., a crew OE) must have a HAD association to them. Globally, this requires that a path of HAD associations must exist from any inventory OE to the component’s primary unit root OE; that is, the DoD OE for Reference (f) units and State National Guard (NG) OEs for units described by title 32, U.S.C. (Reference (j)). This condition guarantees that beginning with any unit OE and traversing the HAD associations, every inventory OE will be discovered for that unit whether it is within the DoD or any State NG.

(4) To ensure unity of command, identical HAD associations cannot exist simultaneously (Rule 4) and there can be only one ADMIN relation traversing between a superior and subordinate OE at a time (Rule 5).

(5) In the absence of any other operational relations, ADMIN implies C2DEF (Rule 10). This is because administrative and operational command structures often coincide via the same leadership (see section 6 of this enclosure). By explicitly stating this property, duplicative command structures can be averted by allowing operational relationships to overlay the administrative command structure.

(6) The ADMIN relation is the enabler for two valuable elements of information resident in the default command structure. First, it allows one to identify, account for, and enumerate all personnel and platform authorizations in the org tree via the OE to which they are correlated (e.g., manpower with billet OEs and platforms with crew OEs). Second, it allows one to identify and enumerate the leadership of the active organizations of a unit at any echelon.

6. THE C2DEF RELATION

a. C2DEF is a second default relation. In many cases command structures are routinely partitioned into administrative and operational branches. The C2DEF relation allows the default

operational branch to be represented explicitly. The C2DEF relation is invoked by the command and control default association (CCD, Rule 6). It is transitive through sequences of CCD associations (Rule 7). To ensure unity of command, there can be only one CCD association (invoking one C2DEF relation) between two OEs at a time (Rules 4 and 5).

b. The C2DEF relation is propagated by the ADMIN relation (Rule 8). The C2DEF relation is supplementary and complements, but does not replace, the ADMIN relation. Although every inventory OE must have an ADMIN relation between itself and its root OE (either the DoD or the State National Guard, per Rule 6), an inventory OE may also have a C2DEF relation from a different parent OE that takes operational precedence when selected by a user. Command structures defined solely by C2DEF relations may thus be void of any inventory OEs, either manpower (billet) or platform (crew) authorizations, due to these OEs already being accounted for through the ADMIN relation. This allows the C2DEF relation significant flexibility.

c. As the C2DEF relation is typically used to describe an expected, or routinely used, operational command structure, it functions as a “default OPCON” that implies the properties of the OPCON and TACON relations until exhausted (Rule 10) or preempted by an explicit relation of these types (Rule 11). C2DEF may also propagate explicit OPCON and TACON relations until exhausted (Rule 8), preempted by an invoking relation of the same type (Rule 9) or suspended (Rule 13). The C2DEF relation does not propagate, imply, or in any way affect the assignment property of the COCOM relation (Rules 8 and 10). Details of how the C2DEF relation interacts with the operational relationships are provided in section 10 of this enclosure.

d. As both default relations propagate OPCON, one must not provide concurrent ADMIN and C2DEF relations from a parent OE to a common descendant OE, lest the parent OE become task organized via the OPCON relation. In this case, the identical OPCON relation would then be propagated between a superior and subordinate OE in different paths simultaneously, in violation of Rule 5. In this case, one of the relations must be implemented over the other - normally the ADMIN relation with the C2DEF relation being implemented as a role (see section 7 of this enclosure).

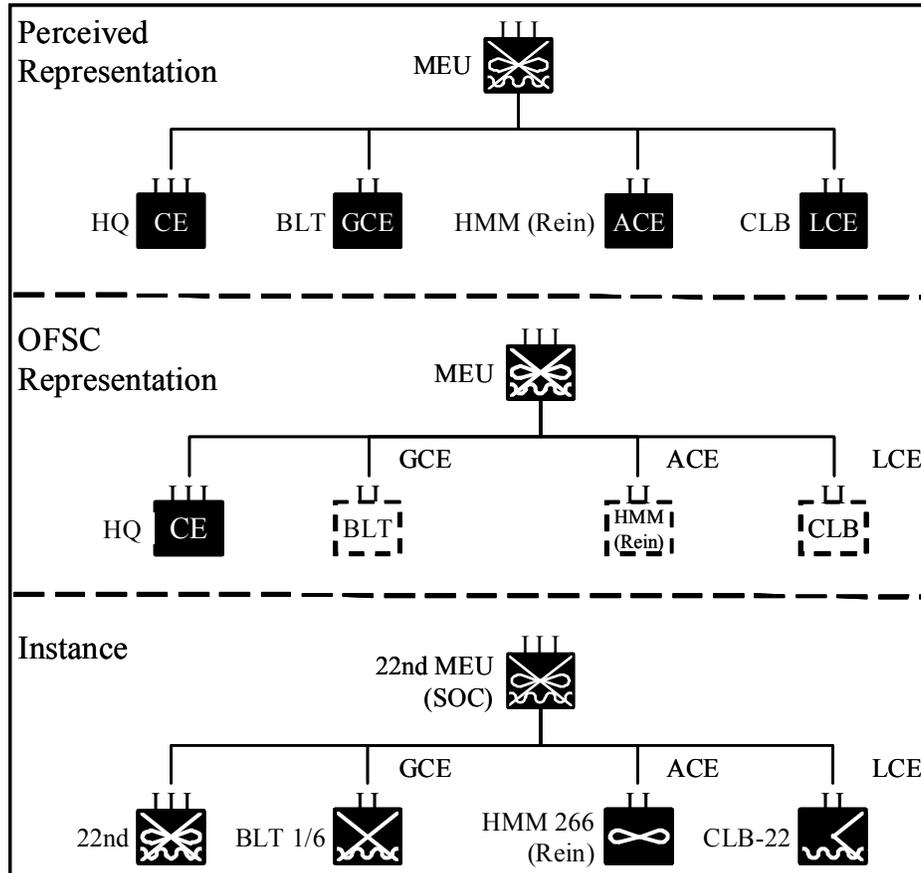
7. ROLES AND REPRESENTING REQUIREMENTS

a. As requirements and authorizations differ, it may be necessary at times to accurately represent the former. A role is a link that specifies a requirement for an association between a parent OE and an undetermined child OE. Often a role is used to represent an operational function required to make the parent OE viable or usable. For this reason, roles are normally represented using the C2DEF relation. Pragmatically, a role is implemented as a link in an org tree template; that is, a role is not an instance of an association but exists in the class or type hierarchy to denote the requirement for a real association. It indicates that to be viable or usable, the corresponding parent OE in the org tree that is established from the org tree template must have an association created that meets the specification of the role. Therefore, a role is not used as an actual association, but defines the need and parameters to create associations. Over time, many associations may be created to satisfy a single role.

b. Roles may have labels to further define the purpose of the role and a role may be qualified or unqualified. An unqualified role means that no further information is provided about the child entity required to fill the role. In this case, the value of the child entity is simply a dummy value. Conversely, a qualified role means that the child entity contains additional information about the requirements to fill the roll. Any valid child entity may be used to accomplish this. If the child entity is to be a billet, then a common practice is to provide qualification data for the entity such as the minimum grade and skills required to occupy the billet. This allows one to define the requirements of a billet without specifying a particular billet. It is reiterated that the child entity of a role is not a real OE. The role represents the requirement that a real association with a real OE be established in the real org tree.

c. An example of the use of roles occurs when representing a default, non-deployed Air-Ground Task Force of the Marine Corps, such as a Marine Expeditionary Unit (MEU). The sub-elements of a MEU typify recurring, routine operational functions with no specific child OE designated, but are required to make the MEU viable when it is established. These elements have the names Ground Combat Element (GCE), Air Combat Element (ACE), and Marine Logistics Group (MLG). In reality, only the command element is a real OE. The other elements describe functional parts of a MEU required for the MEU to be viable; as illustrated in Figure 12.

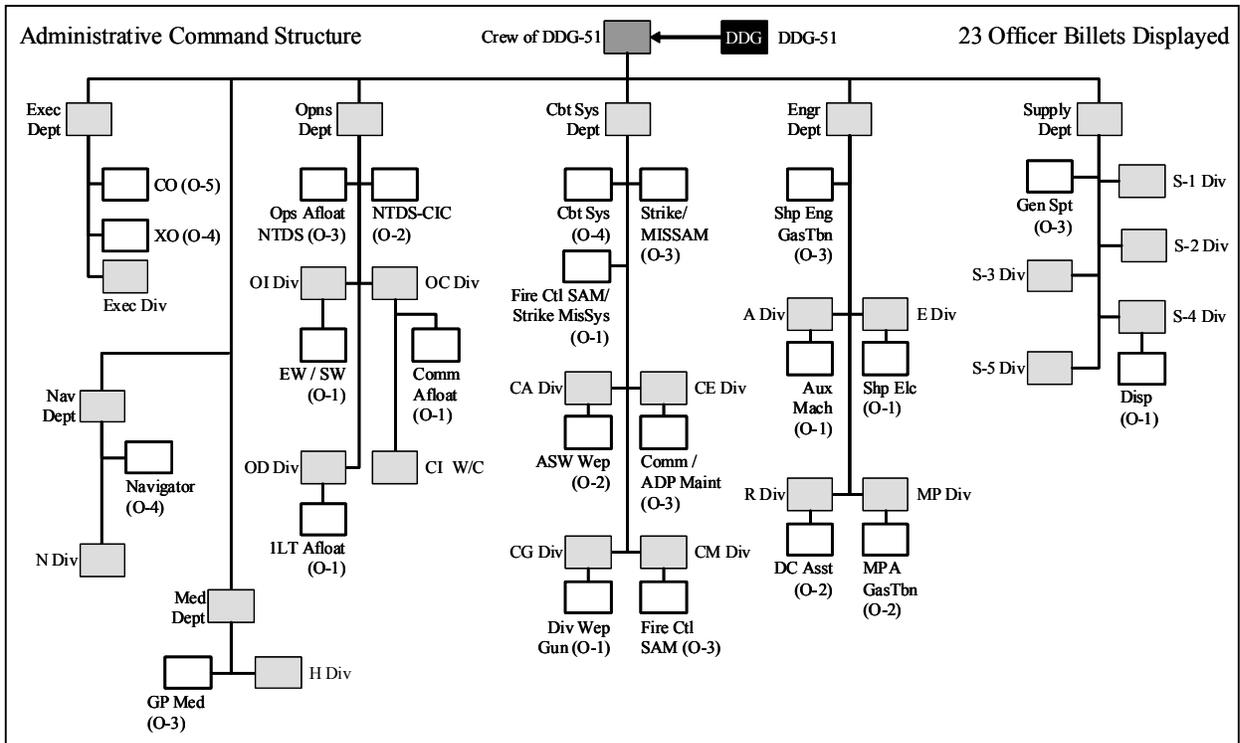
Figure 12. Example of Roles in a USMC MEU Representation



d. The top structure shows an incorrect, but common representation of the MEU structure using a command structure composed of OEs named GCE, ACE, and MLG. In reality, these are not real organizations, or even types of organizations (like a battalion landing team), but are roles that must be filled to establish an operational MEU. The middle diagram illustrates the same structure using roles instead of OEs. In this case, the terms GCE, ACE, and MLG are labels on three associations rather than on OEs. If the role is qualified, then additional information is provided about the requirements necessary to fill the role. In this example, the name of the type of organization that is created to fill the role is listed inside a dotted box (e.g., a battalion landing team, a reinforced medium helicopter squadron, and a combat logistics battalion). The bottom diagram illustrates an instance of a MEU with each role filled with a task organized unit for deployment. Although visually subtle, each of the structures in Figure 12 is very different and represents a different interpretation of force structure. In the OFSC, only the middle and bottom structures are correct. Enabling this degree of consistency has a significant impact on formalisms, especially for design of algorithms and software that manipulate data and implement functions expected to return answers to standard questions. Consequently, using roles and OEs correctly is important to providing a consistent representation.

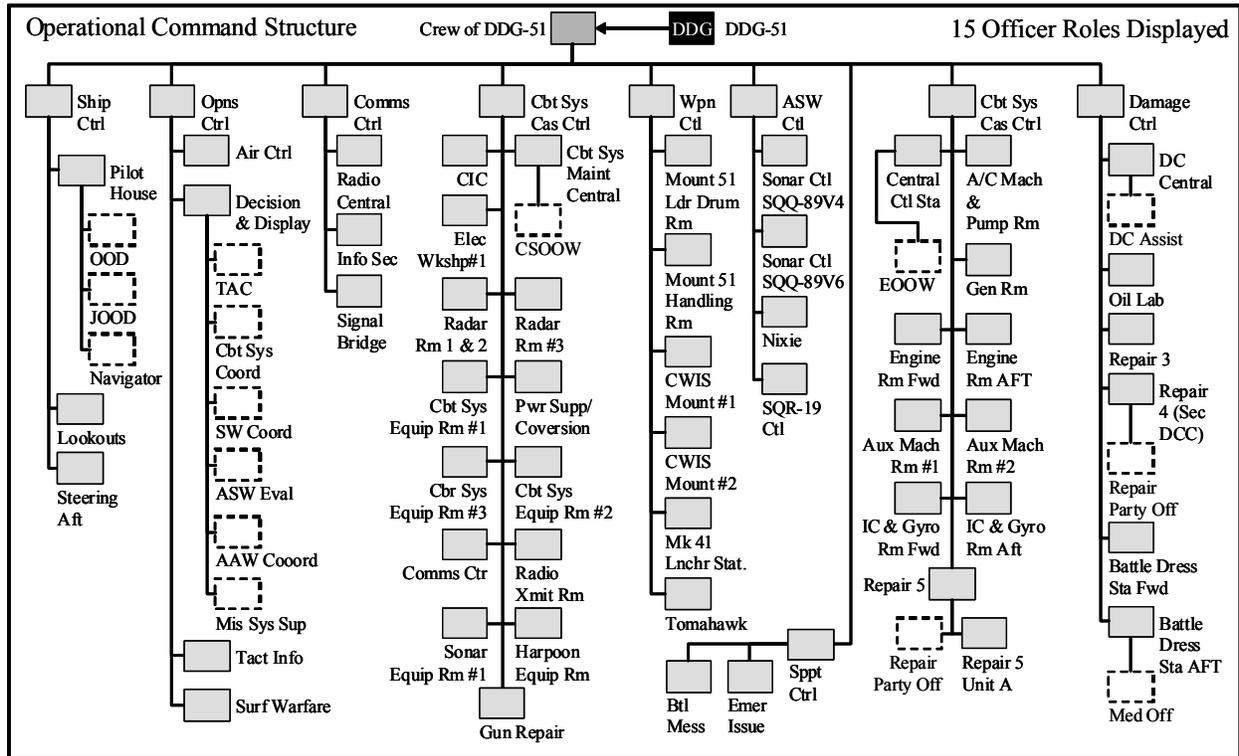
e. A second example of the use of roles is the operational view of a ship's crew, the Battle Bill, as is illustrated by comparing Figures 13 and 14. Figure 13 is the administrative structure produced using the ADMIN relation. It includes the doctrinal OEs, such as departments and divisions, plus all the billet OEs. For simplicity, Figure 13 includes only the officer billets.

Figure 13. Administrative Command Structure of a Ship Crew



f. Figure 14 is the operational command structure known as the Battle Bill produced using the C2DEF relation. It includes doctrinal OEs and roles that are denoted by labeled lines with dashed boxes to indicate that a billet OE, from the administrative command structure, must be explicitly invoked into the operational structure to fill the role to operate the ship. Typically, this is implemented via a periodic rotation known as a “watch.” In this particular case, roles are used to define the 15 officer watch positions required to operate a ship. For example, a billet must be associated with the Pilot House Watch Station OE to fill the role of Officer of the Deck (OOD). There is no specific billet that always fills this role; the role simply indicates that some billet must fill this void. The role of OOD could be a qualified role with the required qualification of “any ship officer.” Therefore, a command structure based upon the C2DEF relation can explicitly represent the Battle Bill and distinguish it from the administrative structure of the ship crew. The Battle Bill command structure can then be used to automate the process of maintaining the watch schedule.

Figure 14. Operational Command Structure of a Ship Crew



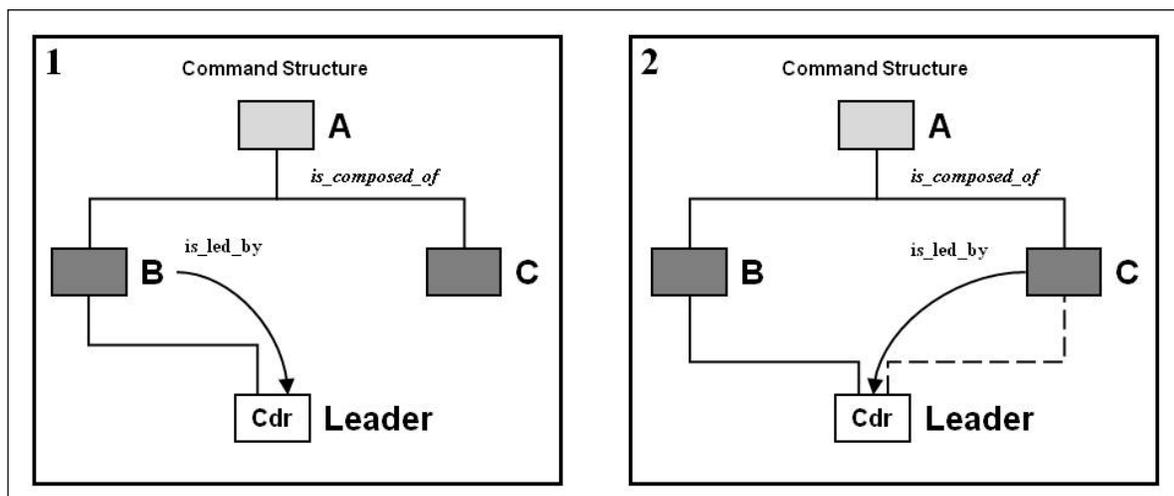
8. IDENTIFYING LEADERSHIP USING THE IS-LED-BY DEFAULT ASSOCIATION

a. As illustrated by Figures 6 and 7, a command structure is built using composition associations while a chain of command is built by deriving reporting associations among billets from the leadership associations between leadership billet OEs and doctrinal OEs. There must be equivalence between a command structure and a chain of command. This is formally established within a command structure by adding a leadership association that connects an

internal OE with the billet OE that has leadership responsibility over the org tree rooted at the internal OE. The is-led-by category explicitly identifies a leadership association, and the term is synonymous with the leadership association. Any OE with descendants that contain billet OEs is designated an active OE and must have an identifiable leader using an is-led-by association. This is a fundamental precept in military organizations: someone is always in charge as defined by leadership authority. If an OE is not active, then an is-led-by association is not required. However, once billets are assigned beneath an OE, a leadership billet must be identifiable.

b. The is-led-by association provides significant flexibility in the design of command structures because it allows a leadership billet to be located anywhere in the hierarchy. There are two basic conditions that can exist when a leadership association is embedded in a command structure. The first is where the leadership billet is part of the command structure or org tree that it leads, and the second is where it is not. Figure 15 provides a simple illustration of these two conditions. In diagram 1 on the left, the leader billet OE is part of the command structure it leads, as indicated by the composition association between it and OE B. In diagram 2 on the right, the leader billet is not part of the command structure it leads because no composition association exists between it and OE C, as indicated by the dashed line. Both of these situations are bona fide and represent different situations. Diagram 1 is the expected case because a leadership billet OE is normally part of the unit it leads; however, this is not always true as will be explained in section 16 of this enclosure, in the discussion of multi-hatted positions. Technically, it is not required that a leadership billet be a part of all the units it leads, but it must be part of one. However, it is permissible for a leadership billet to have several is-led-by associations to it. These associations may lead to any internal OE in the overall command structure. A leadership billet may retain leadership of OEs in different parts of the overall command structure and will be part of the derived chain of command for each OE that it leads, even those OEs outside its default command structure. Therefore, in diagram 2, the leader billet OE will be included in any chain of command that includes OE C, even if it is not part of OE C's command structure.

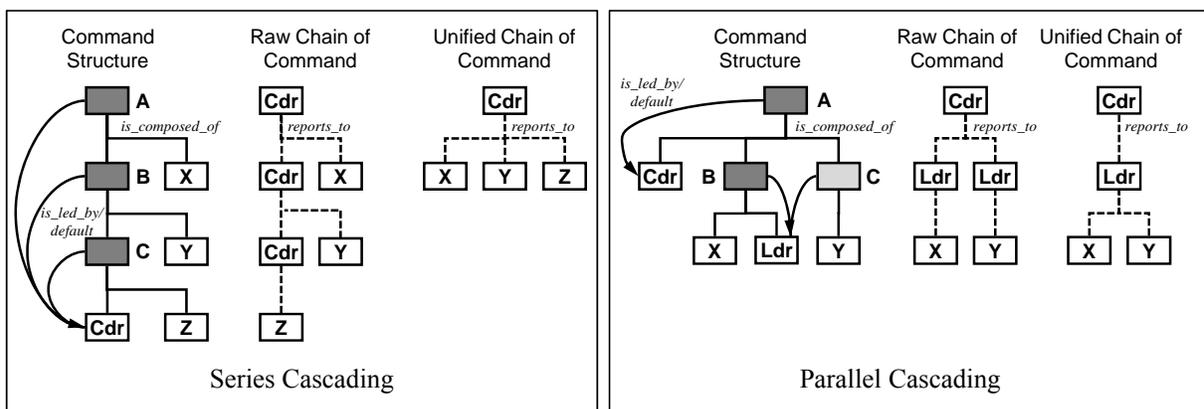
Figure 15. Configurations of Leadership Associations



c. When a leadership billet OE is included in multiple command structures, then a separate composition association, based on a distinguishable command relationship, may be included for each command structure. Diagram 2 in Figure 15 illustrates this by using the dashed line between the leader billet and OE C. To maintain clarity of command, the two composition associations, Leader OE to OE B and Leader OE to OE C, must be distinguishable to maintain the tree property. Attributes must be present that somehow make the two composition associations mutually exclusive; this can be accomplished by using time, command relationships (e.g., ADMIN versus OPCON), classification, or any number of other options. As a result, these constraints require that OEs residing in more than one command structure do so in different modes. This restriction is applicable to composition associations but NOT to reporting and leadership associations because one billet can be simultaneously designated as the leader billet of multiple organizations (see section 12 of this enclosure).

d. Multiple redundant echelons in a command structure is a common occurrence and is referred to as cascading leadership associations, as illustrated in Figure 16. Cascading occurs as either a series cascade (left diagram) or as a parallel cascade (right diagram). In both cases, when the chain of command is derived from the command structure, redundant leadership billet OEs result from the multiple leadership associations to them as illustrated in the “raw” chain of command structures. The redundant billet OEs in the raw chains of command are easily coalesced into an equivalent, single billet by a simple conversion algorithm as illustrated in the “unified” chain of command structures. For series cascades, the unified form is preferred because of the pointless display of a billet OE reporting to itself. However, for parallel cascades, the raw form is preferred because it often represents distinct command structures through which groups of subordinates report (see section 16 of this enclosure that describes multi-hatted billets). In either case, cascading causes no problem for the OFSC. However, problems can occur when leadership associations are improperly configured and violate unity of command.

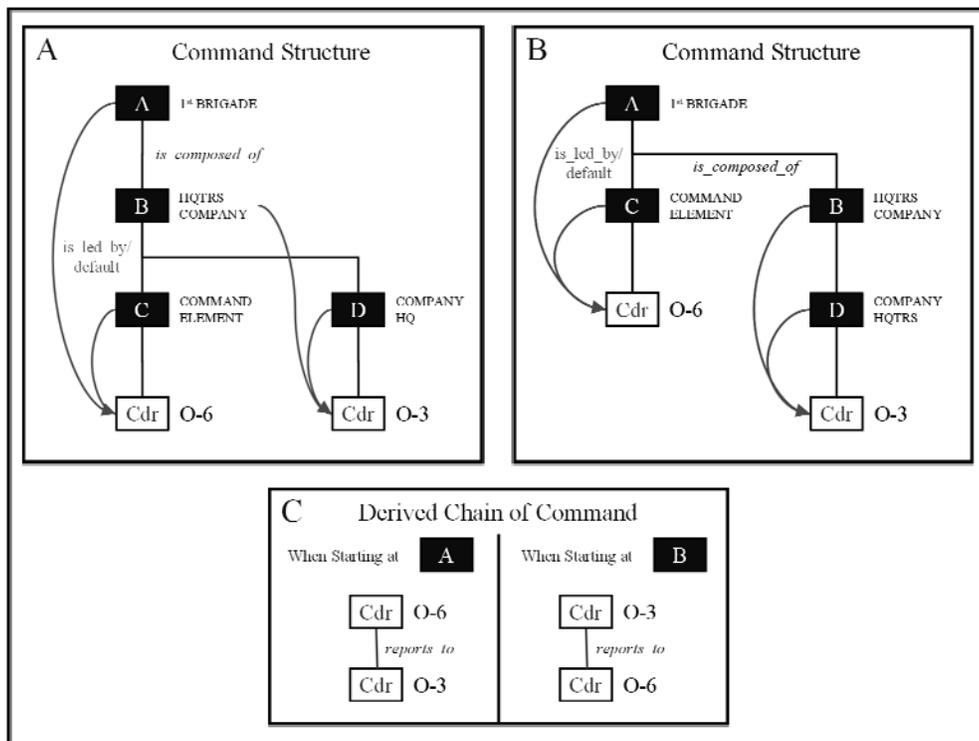
Figure 16. Cascading Leadership Associations



e. While leadership associations add considerable flexibility to command structure design, they also induce additional constraints because of the consistency requirements between command structure and chains of command. This is exemplified by the occasional practice of

placing the leadership billet of a superior unit under a subordinate unit with a leader subordinate to the superior leader. The problem arises because the location of the subordinate leader is not actually based upon a command relationship, but on some other criteria, such as logistic responsibility. Figure 17 illustrates the problematic situation. Diagram A (top left) depicts a situation when a leadership association cascade is interrupted. In this case, OE C contains the leadership billet (designated an officer of grade O-6) that is associated with the top OE A, but it is placed under OE B, whose associated leadership billet (designated an officer of grade O-3) is subordinate to the leadership billet associated with OE A. If one derives the chain of command beginning at OE A, then a correct chain of command results, as illustrated on the left side of diagram C. However, if one derives the chain of command beginning with OE B, an incorrect chain of command results that depicts the leader of OE C being supervised by the leader of OE B (as illustrated on the right side of diagram C). This type of inconsistency is unacceptable in formalism such as the OFSC. Although obtaining the correct results may appear easy in this example, the general solution is not. Any number of interruptions can occur at any place in the path to the top of the command structure being tested. The only acceptable criterion is that a correct chain of command must be derived beginning from any OE selected in a command structure. The fix for this situation is straight forward – resume the cascade by moving the interrupted OE to become a sibling of the interrupting OE. This is illustrated in diagram B of Figure 17, where OE C is moved from under OE B to be a sibling OE to OE B. By doing this, a correct chain of command will be derived regardless of which OE is used as the starting point.

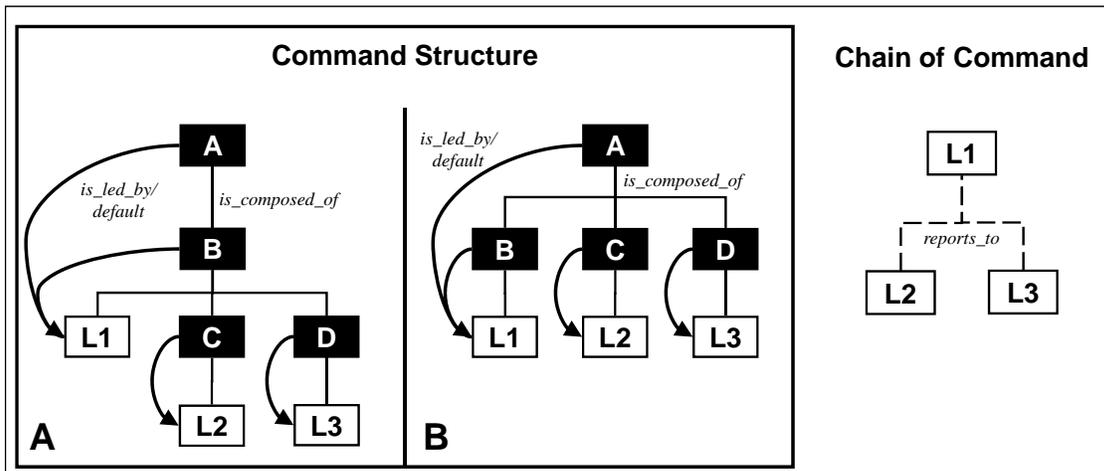
Figure 17. Command Structure Violations



f. As one evaluates the situation in Figure 17, two characteristics become apparent. First, the reason the interruption of a cascade causes a problem is because of the inherent property of leadership hierarchies (such as command structures and chains of command) where rank is commensurate with the relative position of an OE in a unit. The higher up one is in the tree, the higher the rank. Second, this situation occurs because of an invalid command structure that is inadvertently confounded by using a relation other than leadership authority. A common cause is when logistics responsibility is confused with a leadership relationship. This does not imply that logistic, financial, or any other relations should not be developed; only that they should be distinguished from the allowable set used to create leadership based structures.

g. In many instances, the chain of command is well-known and understood while the exact, or preferable, command structure that produces it may be vague. There is significant flexibility in creating command structures since many may produce the same, correct chain of command. A common example is illustrated in Figure 18. Both command structures, A and B, produce the same chain of command (on the right); these are just two of many that can produce this chain of command. It is up to the force structure designer to decide, based upon other well-defined factors, which command structure best suits the situation as the default command structure. The ultimate goal is to produce a default command structure that can serve as the basis for many operational, task organized forces without having to create new OEs.

Figure 18. Many Command Structures May Produce the Same Chain of Command



9. ASSIGNMENT AND THE COCOM RELATION

a. The Process and Properties of Assignment

(1) Assignment and the operational, war fighting branch of the chain of command are explained in detail in Reference (e). Assignment is initiated through a process known as the assignment of forces, defined in Reference (f). The President, through the Unified Command Plan (UCP) (Reference (k)), instructs the Secretary of Defense to document the direction for

assigning forces to CCMDs or the U.S. element of the North American Aerospace Defense Command (NORAD). Assignment is performed by the Secretaries of the Military Departments for all forces under their jurisdiction, with exceptions as described in section 162(a) of Reference (f).

(2) The authoritative source for the assignment of forces is the GFM Implementation Guidance (Reference (l)), or GFMIG document. It states that, based upon direction provided by the Secretary of Defense on the number and type of forces to be assigned to each CCMD, the Secretaries of the Military Departments select the actual forces for assignment (i.e., they assign the forces).

(3) Assignment establishes two important conditions.

(a) It categorizes every uniformed military person and military organization as either assigned or not assigned to a CCMD. Assigned forces are uniformed military personnel under the command authority of a CCMD, either in individual positions or in units, as described in Reference (l), page A-2-2.

(b) It establishes the COCOM relationship of the CCMD over the assigned forces. Paragraph 1.b.(4) on pg. II-2 of Reference (e) describes the COCOM relationship as being commensurate with the term assignment.

(4) Assignment is implemented using the COCOM relationship and includes several key characteristics, as described by Reference (e). COCOM is exercised only by CCMDs unless otherwise directed by the President or the Secretary of Defense. It cannot be delegated, though it is exercised through the commanders of subordinate organizations (normally joint force commanders (JFCs) and Service and/or functional component commanders).

(5) The COCOM relationship is mutually exclusive. A unit or individual can be assigned to only one combatant command at a time. The assignment of these forces is relatively stable, is recorded in section II of Reference (l), and requires written approval of the Secretary of Defense to change.

(6) Per Reference (e), and as illustrated in Figure 11, the OPCON and TACON operational relationships are inherent to the COCOM relationship.

b. The COCOM Relation

(1) The basic premise of the formal representation of assignment and the COCOM relation is that once a unit is designated as assigned, the assignment property follows the administrative command structure defined by the Service down to the billet OEs of the designated unit unless otherwise specified. This means that when a unit is assigned to a CCMD, unless otherwise specified, every part of the unit, down to the billet OE level, is also assigned to the CCMD. This is a common process, and the propagation of the COCOM relation by the ADMIN relation does not confound the administrative and operational command structures. It reflects the fact that, in most cases, significant portions of the command structure developed

under the Service's authority (Reference (f)) are assigned to a CCMD as a unit. Within these units, administrative and operational leaders are usually the same, whereas at higher echelons the command structures split. Mechanisms are provided to allow the assignment propagation property to be terminated and restarted or pre-empted to handle diverse cases and circumstances. An algorithm may then be executed that identifies all the assigned joint forces (down to the billet level) of a Unified Command (UC) by traversing the organization trees that are defined using the joint semantics of the OFSC. By definition (and as noted in Rule 6), civilian and contractor personnel are not assigned to CCMDs. Assigned forces are uniformed military personnel under the legal authority of a CCDR, either in individual positions or in units. Therefore, as the HAD associations are traversed, non-military "billets" are not added to the set, thus removing civilian and contractor personnel from the set of assigned forces.

(2) The properties of the COCOM relation are as follows:

(a) Assignment of forces is invoked via a COA association between a CCMD OE and a subordinate unit (Rule 6). The COCOM relation must always begin with a CCMD OE. Conversely, every OE in a COCOM relation must have a CCMD OE as an ancestor. At any time, an OE can be assigned to only one CCMD (Rule 5).

(b) Although the COCOM relation may traverse a path of its own associations (Rule 7), once invoked its typical existence in an org tree is via propagation by the ADMIN relation until it is exhausted (Rule 8), preempted (Rule 9), or suspended (Rule 12). The COA association may also be invoked to continue the COCOM relation beyond the end of propagation by the ADMIN relation (Rule 8), or to preempt propagation by the ADMIN relation (Rule 9).

(c) The COCOM relation implies the OPCON relation until exhausted (Rule 10) or preempted by an explicit relation of the same type (Rule 11).

(d) The COCOM relation may be suspended via the COCOM Unassign (COU) association (Rule 12).

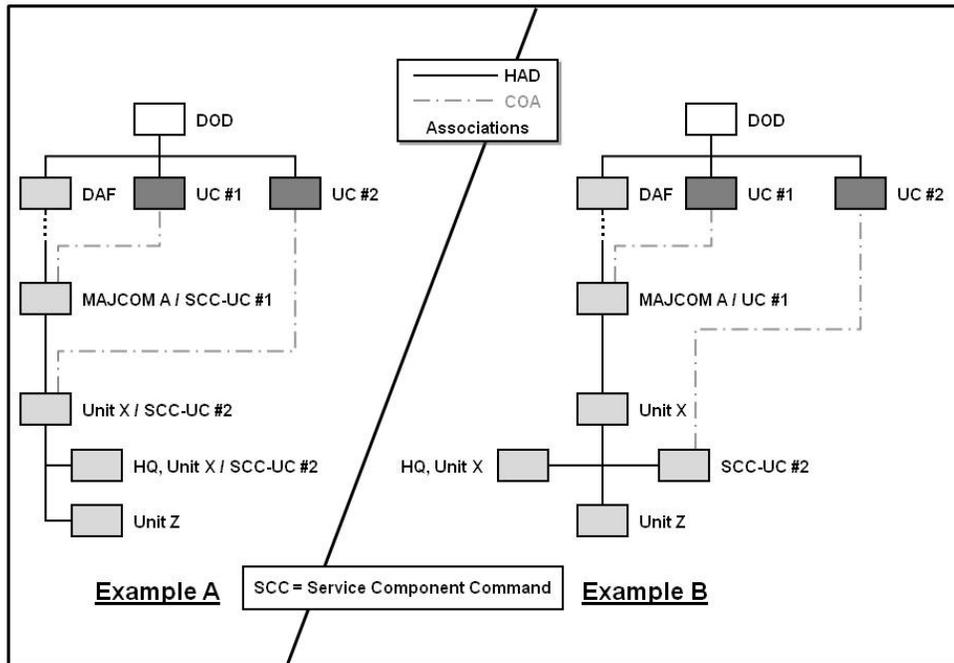
c. Interacting Assignment and COCOM Propagation

(1) Situations exist in which parts of a unit are assigned to different CCMDs. The OFSC business rules allow this to be represented with minimal complexity. By considering assignment in the design of the default command structures, this situation can be easily managed.

(2) Figure 19 depicts a situation in which a subordinate unit is assigned to a different CCMD than its parent. This is indicated by the two dashed COA lines. Adding to the confusion, the OEs may be labeled as serving two purposes. For example, a unit may be labeled as a major Service headquarters and a Service Component Command (SCC) for a CCMD. Its name may be stated as: "Headquarters, Unit M and SCC-UC N." Figure 19 illustrates two interpretations of what this statement means. Example A is a literal interpretation. There are two COA associations: one between Major Command (MAJCOM) A and UC #1, and one between Unit X and UC #2. Thus, a superior and its subordinate unit are designated as the SCC to different CCMDs as is reflected in their names. Based upon Rule 9, the direct COA association to Unit X

preempts the propagating COCOM relation via the HAD association from MAJCOM A. As a result, unless otherwise specified, Unit X and all of its subordinates, like Unit Z, are assigned to UC #2. If this is not the intent, then an exception occurs and a more rigorous and complicated approach is required to build the desired configuration.

Figure 19. COA Association Preempts an Existing COCOM Relationship

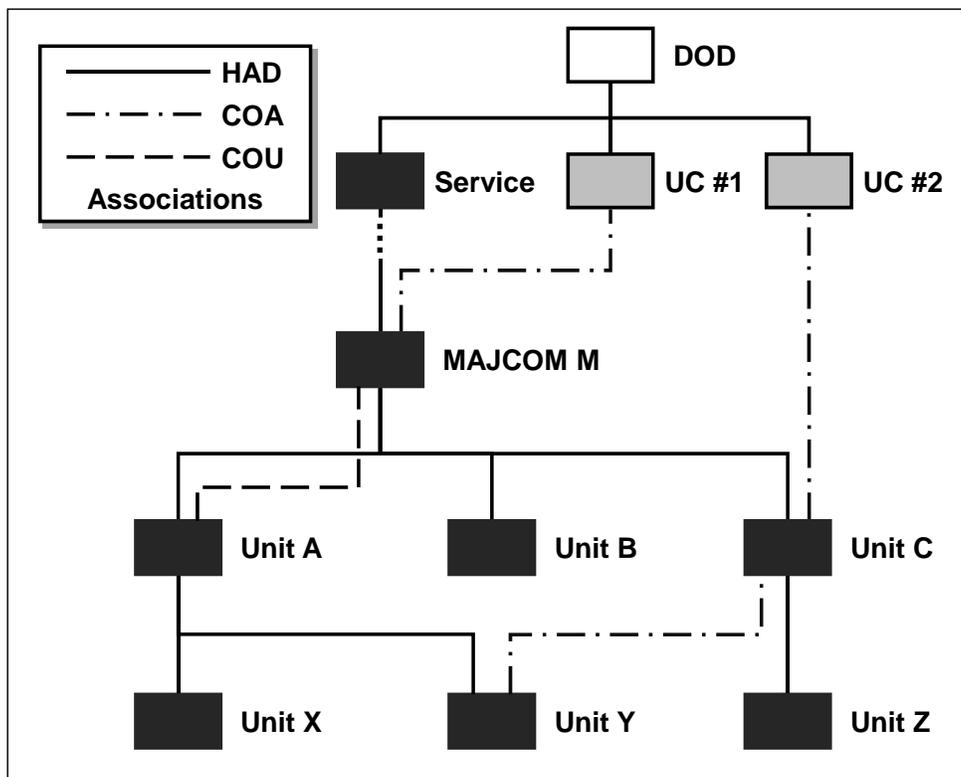


(3) Example B illustrates a different configuration. In this case, the OE named Unit X is decomposed into subparts that reflect its assignment partition to multiple CCMDs. It is a parent OE with a headquarters that is partitioned into two components: one that is the HQ for Unit X and another that is the SCC for the CCMD that will have its own HQ subcomponent. In this case, the direct COA association from UC #2 asserts that only the SCC OE is assigned to UC #2 and the rest of Unit X is assigned to UC #1. Both components can be led by the same commander as would be indicated by three is-led-by associations to the same leadership billet OE: one from Unit X, one from HQ-Unit X, and one from SCC-UC #2. The question then becomes where to place the leadership billet. Again, the answer is simple: if the commander is assigned to UC #2, then the billet OE will be somewhere under the SCC-UC #2 OE. Otherwise, it belongs somewhere under the HQ-Unit X OE, which makes it assigned to UC #1. This maintains the OFSC tenet of one person-one billet. The handling of multi-hatted leadership positions is described in more detail in section 16 of this enclosure.

(4) There are cases in which the assignment of forces may be complex and fragmented. Some subunits of an assigned force may not be included, and then a sub-subunit may be included, thus requiring adjustments to the assignment propagation process. The COU association allows suspension of assignment propagation, and the COA association allows joining a unit to the propagating COCOM relation. The combined effect of utilizing the COA,

COU, and HAD associations to implement the COCOM relation is illustrated in Figure 20. As required, all Service OEs (solid boxes) are connected via HAD associations that provide an ADMIN relation to the root Service OE, labeled “Service.” This forms the Service administrative command structure that includes all Service units and authorization inventory. Two COA associations initiate COCOM relations by designating MAJCOM M and Unit C as being assigned to UC #1 and UC #2, respectively. Per Rule 8, in the absence of any other associations, the COCOM relation from UC #1 to MAJCOM M continues to propagate to all the descendants of MAJCOM M via the HAD associations. As in the previous example, the COA association to Unit C from UC #2 preempts the COCOM relation from UC #1 that is propagating down the ADMIN relation from MAJCOM M, and it initiates the propagation of a COCOM relation to any ADMIN descendants of Unit C, such as Unit Z. In this example, Unit A is not to be assigned to UC #1. This is accomplished by inserting a COU association (dashed line) between MAJCOM M and Unit A, which suspends the COCOM relation propagation to Unit A and its ADMIN descendants, Units X and Y. Finally, a COA association from Unit C to Unit Y assigns Unit Y to UC #2 via Unit C.

Figure 20. Use of COA and COU Associations



(5) The COCOM relation does not change the ADMIN relation. In accordance with Rules 6 and 7, all of the Service subunits remain within the administrative command structure of the Service regardless of the COCOM relations established. Using the rules of invocation, traversal, propagation, and preemption, one can derive that:

(a) MAJCOM M and Unit B are assigned to UC #1 by invocation and propagation (Rules 6 and 8).

(b) Unit C, Unit Z, and Unit Y are assigned to UC #2 by invocation, traversal, propagation, and explicit preemption (Rules 6-9).

(c) Unit A and Unit X are not assigned to either UC due to suspension and explicit preemption (Rules 12 and 9).

10. ALLOCATION AND THE OPCON RELATION

a. The Process and Properties of Allocation

(1) Assigned forces may be moved or deployed to meet U.S. national security objectives, to include transferring forces between CCMDs without transferring COCOM. Additionally, unassigned forces may be task organized straight from administrative command structures into operational command structures. These relationships are normally manipulated by operational systems that actively track changes and support day to day activities.

(2) In providing an overview of command relationships, Figure IV-2 of Reference (e) states that forces transferred to a joint force either permanently or for a lengthy duration are reassigned, those transferred temporarily are attached, and that subordinate JFCs exercise OPCON over their forces, since COCOM may not be delegated by the CCDR. Reassignment is represented in the OFSC by the COCOM and ADMIN relations as already described in the assignment process. Allocation is represented in the OFSC by the operational relations of OPCON and TACON.

(3) The term allocation is defined in Reference (1) as applying to forces transferred between CCDRs. However, forces may also be allocated from unassigned forces in the administrative command structure to a CCMD. The OFSC recognizes this by defining allocation as the transfer of a unit's OPCON or TACON to a CCMD to which the unit is not assigned. This broader definition does not specify that assignment is a prerequisite for allocation. However, like assignment, it does specify that a force may be deemed allocated only to a CCMD OE and nowhere else, to include the descendants of a CCMD OE. If after a force is allocated it is placed under subsequent OPCON or TACON to different descendants within the same CCMD, this is not to be coined "re-allocated." To reiterate, the term allocation is used only when a CCMD OE is involved. It requires the approval, normally written, of the Secretary of Defense. Allocation does not change assignment. Once allocation is completed, the temporary OPCON or TACON authority expires. The unit then returns to its original command structure (whether assigned COCOM-based or unassigned ADMIN-based), and it is erroneous to describe this reversion as allocation or re-allocation. Furthermore, a unit may not be both assigned and allocated to the same CCMD. Forces designated to a function of their Service or a mission of their assigned CCMD such that they are unavailable for global allocation are referred to as fenced.

(4) Allocation involves operational relations with fewer authorities than COCOM. The invocation of OPCON and TACON relations for allocation does not affect the assignment property of the original COCOM relation, just as the administrative command structure remains unaffected by invocation of the COCOM relation. When allocation from a CCMD occurs, the relinquishing CCDR transfers the implied OPCON component of COCOM authority. This typically provides the gaining CCDR with sufficient power and authority to execute designated missions. The command channels for the COCOM properties remain as originally assigned (as documented in Reference (l)).

b. The OPCON Relation

(1) The OPCON relation is invoked by the C2 OPCON (CCO) association (Rule 6). It is transitive through sequences of CCO associations (Rule 7). To ensure unity of command, there can be only one CCO association or relation between a subordinate and superior OE at a time (Rules 4 and 5).

(2) The OPCON relation normally exists in an org tree via propagation by a default relation (ADMIN or C2DEF) until it is exhausted (Rule 8), preempted (Rule 9), or suspended (Rule 13). The propagation of the OPCON relation by the C2DEF relation in no way affects the assignment property of a COCOM relation propagated by the ADMIN relation. This does not confound the ADMIN and OPCON command structures. It reflects that, in most cases, significant portions of the command structure developed under the Service's authority (Reference (f)) operate as a Service unit. Within these units, administrative and operational leaders are usually the same. At the higher echelons, the command structures split.

(3) The OPCON relation may be suspended via the C2 Suspend (CCS) association (Rule 13). The CCS association only suspends an explicit OPCON relation being propagated by a default relation and not an implied relation. These distinctive properties produce the behaviors required to correctly implement assignment and allocation.

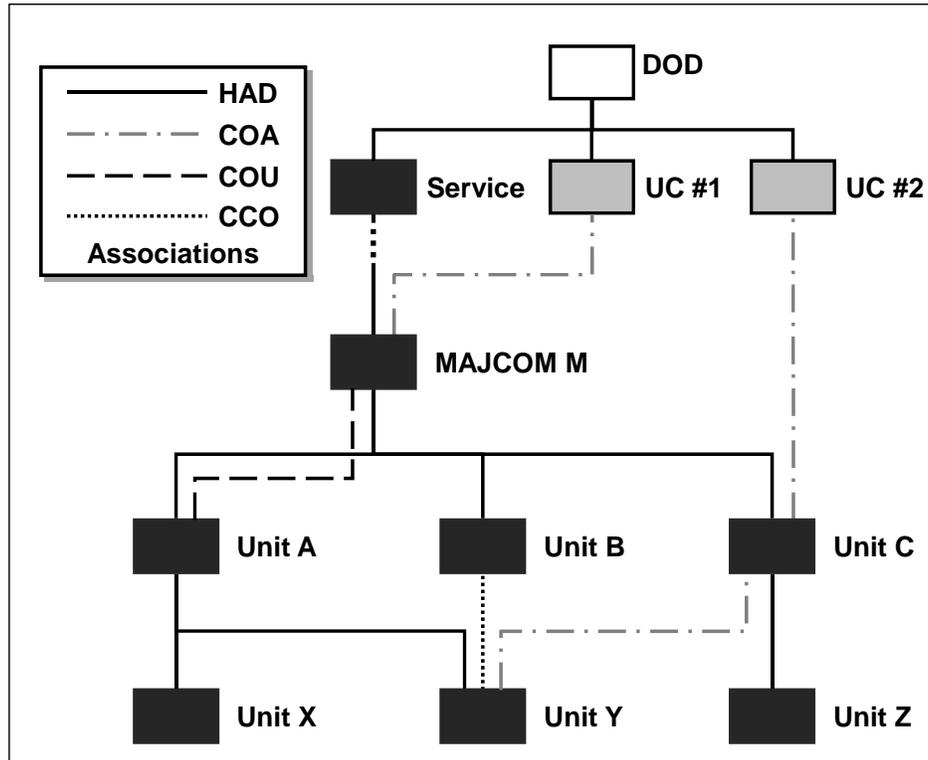
(4) The OPCON relation implies the properties of the TACON relation until exhausted (Rule 10) or preempted by an explicit TACON relation (Rule 11).

c. Consistent Implementation of Assignment and Allocation

(1) As with assignment, per Rule 5 a unit may only be allocated to a single CCMD. The terms allocation and OPCON are not equivalent. Allocation uses the OPCON or TACON relations, but the term allocation is used only in reference to a CCMD while OPCON and TACON can be used anywhere. Figure 21 illustrates the OPCON relation in the context of COCOM relations, or in other words, allocation in conjunction with assignment. The dotted line between Unit B and Unit Y denotes that Unit Y is OPCON to Unit B.

(2) Using the semantics for assignment and allocation and the rules for invocation, traversal, propagation, and explicit preemption, it can be derived from Figure 21 that:

Figure 21. OPCON Associations and Relations



(a) Unit B is ASSIGNED to UC #1. This is because, in accordance with invocation (Rule 6) and propagation (Rule 8), a COA association between UC#1 and MAJCOM M, and a HAD association between MAJCOM M and Unit B, denotes that the COCOM relation exists between UC#1 and Unit B.

(b) Unit Y is ASSIGNED to UC #2. This is because, in accordance with invocation (Rule 6) and traversal (Rule 7), a COA association between UC#2 and Unit C, and a COA association between Unit C and Unit Y, denotes that the COCOM relation exists between UC#2 and Unit Y.

(c) Unit Y is ALLOCATED to UC #1 because, in accordance with invocation (Rule 6) and propagation (Rule 9), a COCOM relation between UC#2 and Unit Y, a COCOM relation between UC#1 and Unit B, and a CCO association between Unit B and Unit Y, denotes an OPCON relation exists between UC#1 and Unit Y.

(d) Unit A remains unassigned to a CCMD because, in accordance with suspension (Rule 13), a COU association between MAJCOM M and Unit A suspends the propagation of the COCOM relation to Unit A. Otherwise, the COCOM relation would have propagated via the ADMIN relation between MAJCOM M and Unit A that was initiated by the COA association between UC#1 and MAJCOM M.

- (3) The operational relationships demonstrated in Figure 21 share common traits.
- (a) They propagate via the ADMIN relation until exhausted, suspended, or preempted (Rule 8).
 - (b) A relation invoked directly preempts a relation that is propagated (Rule 9). These constraints are necessary for the semantics to mimic the actual situation and to conform to the properties of assignment and allocation.
 - (c) The addition of an operational relation does not change the ADMIN relation.
 - (d) Because the COCOM relation propagates via the ADMIN relation, assignment is not changed by the addition of OPCON or TACON relationships.
 - (e) The COCOM and OPCON relations are simultaneously propagating down the same ADMIN relation, but they may originate from different sources. This upholds the semantics of allocation so that designating Unit Y as OPCON to Unit B (which is assigned to UC #1) does not change Unit Y's assignment to UC #2.

(4) Assignment and allocation interactions with the C2DEF relation and CCD associations have the following properties.

- (a) Consistent with the properties of allocation of forces using OPCON relations, assignment of forces (via the COCOM relation) never propagates down a C2DEF relation. If an OE in a unit has ADMIN and C2DEF relations to it, assignment (if present) occurs via the ADMIN relation and not the C2DEF relation. This is the reason that all inventory OEs must have an ADMIN relation to them, to facilitate assignment independently from allocation.
- (b) If a C2DEF command structure is void of any inventory OEs, then an OPCON relation to the command structure will have no effect on any inventory OE. However, if a C2DEF command structure does include inventory OEs, then any OPCON relation to the C2DEF command structure will cause any of its OEs, including inventory OEs, to become OPCON to the unit from which the OPCON relation originates, exactly as expected.
- (c) The OPCON or TACON relation propagates via the C2DEF relation to allow the C2DEF relation to build routine operational command structures (e.g., templates) as part of a larger command structure (e.g., the Battle Bill for a USN ship). This facilitates reuse and avoids having to produce redundant command structures of OPCON and or TACON relations (although this approach is not prohibited). A CCS association will suspend these propagating relations.

11. TACON COMMAND AUTHORITIES

- a. As the name and definition infers, TACON occurs at the tactical level to facilitate and coordinate the maneuver of forces. The TACON semantics are simpler than those for OPCON, although they do follow the same basic rules.

b. The TACON relation is invoked by a C2 TACON (CCT) association (Rule 6), may traverse a path of its own associations (Rule 7), and is propagated by the default relations (ADMIN or C2DEF) until it is exhausted (Rule 8), preempted (Rule 9), or suspended (Rule 13). Per Rule 9, since multiple operational relations propagate down the default relations, an invoked relation always preempts a propagating relation of the same type. Rule 13 applies equally to the TACON relation as to OPCON relation: the CCS association suspends a propagating, explicit TACON relation but not an implied relation (e.g., by the ADMIN or COCOM relation).

c. Like OPCON and COCOM, to maintain unity of command a subordinate OE can be TACON to only one unit at a time (Rules 4 and 5). When a unit is placed TACON under another unit, unless otherwise noted, that receiving commander exercises the authorities listed in Figure 11 for TACON (per Reference (e)). As illustrated by Figure 11 (and per Rule 10), TACON is implied by OPCON. The original OPCON commander relinquishes the TACON portion of the OPCON authority to the newly designated TACON commander. Analogous to COCOM and OPCON, this consistently maintains the property that an invoked TACON relation always preempts an implied TACON relation (Rule 11). As expected, the OPCON commander retains all the authority listed in Figure 11 under OPCON, minus the TACON authority for maneuver.

d. The propagation of the TACON relation by a default relation does not confound the ADMIN and TACON structures, nor does it affect the assignment property of a COCOM relation propagating by the ADMIN relation. It merely reflects that, in most cases, significant portions of the command structure developed under the Service's authority (Reference (f)) are attached as a unit. Within these units, administrative and operational leaders are usually the same. At the higher echelons, the command structures split.

12. SUPPORT COMMAND AUTHORITIES

a. Review of Direct and General Support Relationships

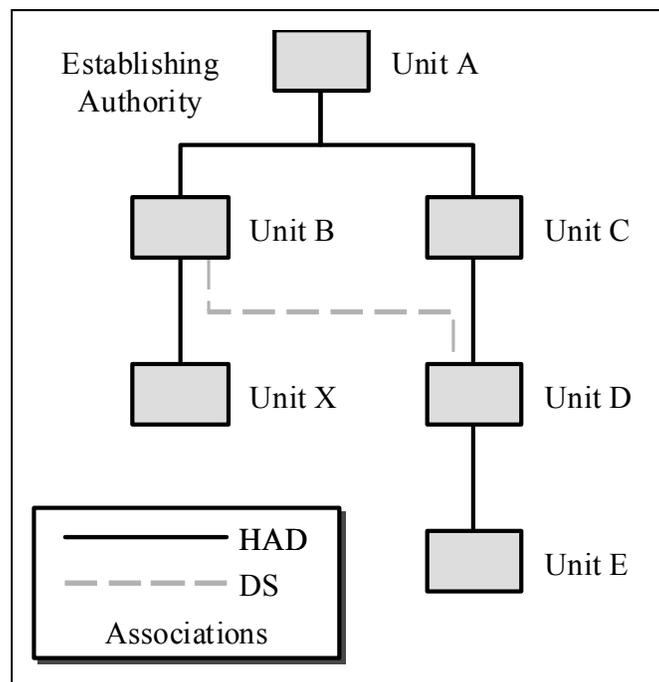
(1) Chapter 4, paragraph 6.a. of Reference (e) emphasizes the flexibility of the support command relationship, which includes direct, general, mutual, and close support. The establishing authority (the common superior commander) is responsible for ensuring that the degree of authority that the supported commander is granted is understood by both the supported and supporting commanders.

(2) The OFSC addresses direct support (DS) (where a force supports and answers directly to another force per Reference (h)) and general support (GS) (Reference (h)) relationships. Some definition may be achieved about relation initiation, propagation, and concurrency, but more details must be described using additional attributes that define the conditions specified by the establishing authority.

(3) DS and GS are invoked via a Fire Unit and Combat Support (FUCS) association with their own distinguishing subcategory: FUCS Direct Support (FDS) and FUCS General Support

(FGS) (Rule 6). After they are invoked, however, support relations do not follow the same rules as are inherent with the default and operational relations. They are neither transitive (Rule 7) nor are they propagated to subordinate OEs by the default relations (Rule 8). Consider the DS situation illustrated in Figure 22. If Unit D is in DS to Unit B, then it is allowed to answer directly to requests from Unit B. However, if this property were to propagate to Unit E, then it too is allowed to answer requests directly from Unit B, and this property extends to the lowest echelons of the Unit D command structure, down to the billet level. A similar propagation could be defined for Unit X, and it could be allowed to request support from Unit D or its descendants. This is not the intent for support relationships. The designated supporting unit controls the support its command structure provides to the supported force and any DS provided by its lower echelon units is designated on a case by case basis with the establishment of explicit supporting relations. Hence, support relations are never implied (Rule 10), although the authority to designate a support relation is inherent in OPCON (see Figure 11). Being neither propagated nor implied, the rules of preemption (Rules 9 and 11) are also inapplicable to the support relations.

Figure 22. Support Relation Propagation



(4) The presence of concurrent support relations, specifically, multiple relations of the same type, varies by situation. By definition, a DS relation should be constrained to a single supported unit at a time. However, this is not the default for the other three support relations. Therefore, the OFSC permits multiple simultaneous occurrences of the GS relation (via multiple associations). In this manner the GS relation is the one exception to the unity of command constraints (see Rule 4, Rule 5, and Table 2).

(5) GS provides support to the force as a whole and not to any particular subdivision.

The OFSC requires that three OEs be explicitly identified when describing support relationships: the supporting and supported units (or their commanders), plus an establishing authority. The establishing authority must be an OE that is a common ancestor to the supporting and supported OEs. Often, this is the first common ancestor, which would be Unit A in Figure 22. The commander of the establishing authority is somewhere in both the supporting and supported commander's chain of command. In Figure 22, this means that, unless otherwise designated, Unit A, or its commander, is the establishing authority, and that Unit A, or the unit rooted at OE A, is the "force as a whole." Unit B is the supported force, and Unit D is the supporting force as designated by (the commander of) Unit A.

(6) If the DS relation in Figure 22 is changed to GS, then the semantics change slightly. In this situation, Unit D is GS to Unit B, but Unit D can still answer requests from any member of Unit A, the force as a whole. However, the establishing authority, Unit A, could designate a smaller subset of Unit A as being allowed to request support from Unit D. In this case, that subset, or smaller force as a whole, must be specified by the establishing authority, Unit A.

b. General Support and the COCOM Relation. The GS relation is of special interest because of its use to describe relationships between forces assigned to combatant commands. In accordance with Section II, Part 3.1.b of Reference (1), an SCC may be tasked to provide GS for planning and coordinating to more than one combatant command without engendering a COCOM relationship with the additional CCDRs. As illustrated by the dashed line in Diagram 2 of Figure 15 the use of the GS relation to build composition associations between supporting commander billets and supported commands is justified. This technique is utilized for documenting multi-hatted positions, as further described in section 15 of this enclosure.

13. SPECIAL AND SPECIFIC CASES: CREWS

a. Introduction to Crews

(1) It is a common practice in the Military Services to create organizations for the purpose of operating a piece of equipment. In the OFSC, these OEs are formally called "crews." The size of a crew can vary widely from a single person, such as a fighter pilot, to thousands of people, such as a ship's crew that is further organized into several echelons of sub-organizations. Common traits and practices can be applied to the representation of crews, regardless of size, complexity, or the type of equipment that is operated. Three aspects of crew OE employment are described: the placement of the platform authorization that caused the crew OE to be established; the persistence of the association between the crew and the actual asset that the crew operates; and the placement of the crew within the command structure.

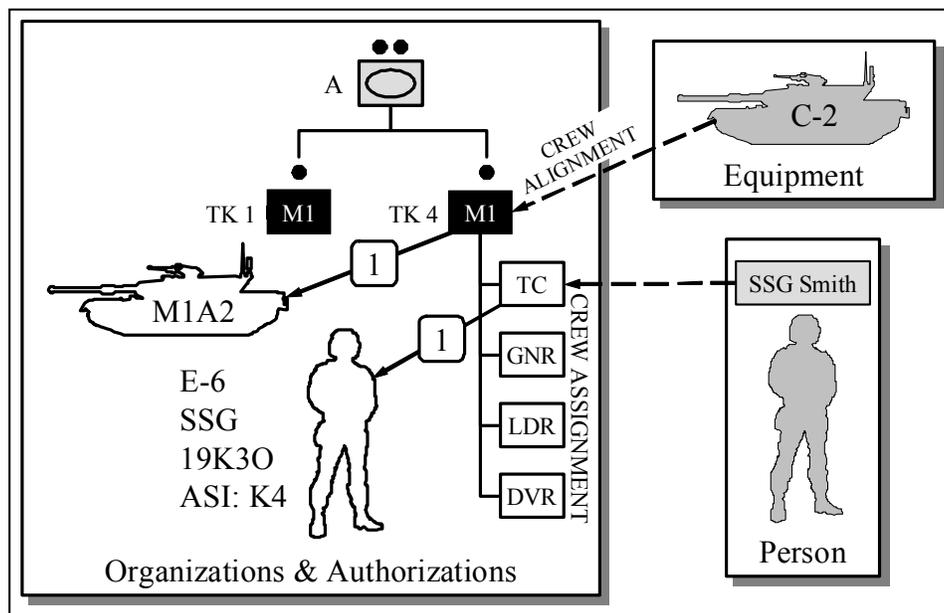
(2) In the OFSC, a crew is an OE created to operate a mobile platform that transports its members. Ultimately, it serves as an aggregation point for people and the operated equipment.

(3) Crew properties are defined from two perspectives: crew membership and asset affiliation. Crew membership refers to the subordinate OEs that ultimately include the billet OEs that operate the asset. Asset affiliation refers to the physical platform the crew operates. For

clarity and simplicity, the process of configuring these two crew properties will be referred to as crew assignment and crew alignment.

(4) Figure 23 illustrates the distinction between a crew, a platform authorization, and equipment. The crew OE is an organization; the platform authorization is a type of materiel and describes the type of platform for which the crew OE was established; and the actual equipment (with a serial number) may ultimately be aligned with the crew OE. The large box on the left in Figure 23 contains a default organization structure that includes two crew OEs, labeled “TK 1” and “TK 4” for Tank Crew #1 and Tank Crew #4. Associated with crew OE “TK 4” is a set of subordinate OEs, in this case four billets, that define the default membership of the crew called a default crew assignment. Also associated with crew OE “TK 4” is the platform authorization that caused the crew OE to be established. This is denoted by the solid arrow to the vehicle outline labeled “M1A2” that indicates that one M1A2 Tank is authorized for crew OE “TK 4,” or conversely, that crew OE “TK 4” was established to operate an authorized M1A2 Tank. An important characteristic is that the platform authorization is not the actual asset, but only the permission to obtain the asset. To the right of the large box is a smaller box labeled “Equipment” that contains a solid icon labeled “C-2,” which represents an actual, physical asset with the identification number “C-2.” The dashed line between this icon and the crew OE is the alignment between the asset and the crew OE. This association would be created by a logistics system, such as a property book application. Therefore, the alignment between “C-2” and OE “TK 4” is a different association from the platform authorization for the OE “TK 4.” As explained in paragraph 3.a.(1) of this enclosure, the reason the OFSC incorporates the crew OE is because it is relatively stable. While the asset affiliation and crew membership may frequently rotate, the crew OE remains stable over an extended and predictable duration. Crew OEs exist because a platform authorization exists. To support the maximum case when all authorized assets are present and in use, a crew OE must be established for each authorized platform.

Figure 23. Organizations and Authorizations versus Real People and Equipment



(5) Figure 23 includes an example of the analogous associations between a billet OE, its associated manpower authorization, and the actual person occupying the billet. In this example, the solid arrow indicates that the billet labeled “TC” has a manpower authorization, with the qualifications listed next to the outlined soldier. This is not the skill set of the person in the billet, but the qualifications required to occupy the billet. On the right is a box labeled “Person” that encloses a solid icon of a soldier that represents an actual person and is labeled SSG Smith. As with the asset case, the dashed line denotes that SSG Smith is occupying the TC billet. This association would be created by a personnel system.

(6) Crew assignment and alignment may be habitual or non-habitual, and the OFSC representation handles any combinations of assignment and alignment. Non-habitual relationships are the general case, while habitual relationships are the special case. In habitual crew assignment, the composition of the crew OE is intended to be routine, with the norm being that the same crew members work together on a recurring basis. The routine relationships are documented in the forces structure with a fixed set of billet OEs placed under the crew OE. This is a common characteristic for many ground crews, such as those in Army armor units and for Navy ships. In the OFSC, this means that an ADMIN relation will exist between the crew members and their crew OE. In non-habitual assignment, crew composition is ad hoc and is established only when the crew OE, with its aligned asset, is to be used. This is the default case with aviation units. This means that the billet OEs will have their ADMIN relations established somewhere else in the force structure and the billet OEs will be operationally attached to the crew OE for each use. Although preference may be to train and employ aviation crew members as a group, this is by operational practice rather than permanent organizational structure. In these cases, specific crew membership will not be part of the force structure data. Aviation force structure often reflects this perspective, and crew member billets may reside in a subtree of the administrative command structure, often named flights in the Air Force, completely separate from the portion of the command structure containing the crew OEs.

(7) As with assignment, alignment between a crew OE and an asset may be habitual or non-habitual. A habitually aligned asset is routinely used by the same crew OE on a recurring basis. A non-habitually aligned asset is determined each time the crew is used. For ground and naval forces, alignment, like assignment, is often habitual. It is common for habitually aligned crews to consider an asset “theirs” (“my vehicle” or “my ship”), and they perform basic maintenance on it. Aviation units, on the other hand, are typically non-habitual in alignment and assignment. The crew rarely expects to get a particular asset (e.g., a particular aircraft) because asset availability is dependent on factors other than personal preference, such as maintenance and other scheduling criteria: no one has a “personal” aircraft, regardless of the tradition of inscribing names on the outside of cockpits.

(8) Table 3 illustrates the four combinations of habitual and non-habitual crew assignment and alignment. Quadrant 1 (habitual assignment and alignment) represents the situation when a crew routinely trains and works together and uses the same asset. Quadrant 4 (non-habitual assignment and alignment) represents the situation when a crew is designated and an asset is selected pursuant to the issuing of a mission. This commonly occurs in aviation units. A common example in the commercial world is the airline flight number that represents an aggregation point for a daily mission. Each day, an airplane and a flight crew (alignment and

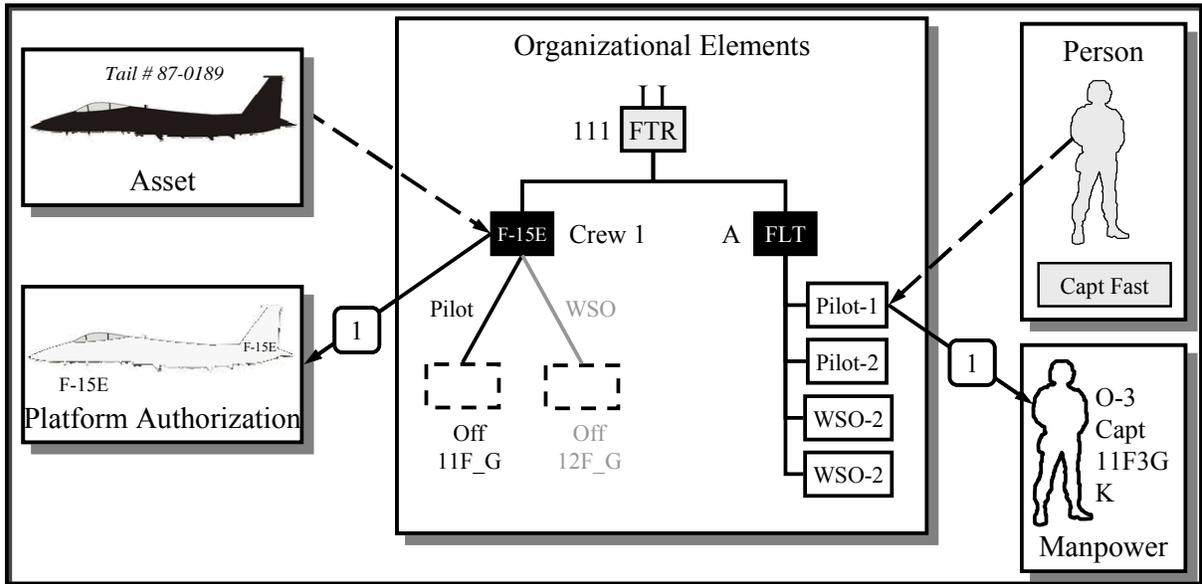
assignment, respectively) appear at the departure gate whose identities are determined independently based upon a variety of criteria and conditions; but the flight number remains constant day after day. Quadrant 3 represents the case when a crew trains and works together but operates different platforms based upon availability or mission requirements. Examples of this exist in special operations forces where a habitual team uses whatever asset they need to complete a mission. Quadrant 2 represents the case when the members of a crew always work on the same asset, but the membership is not fixed and may be rotational. This condition is common in operations that utilize shifts. The OFSC handles all four situations.

Table 3. Example of Habitual and Non-Habitual Relationships

		ASSIGNMENT (CREW MEMBERSHIP)	
		Habitual	Non-Habitual
ALIGNMENT (ASSET USED)	Habitual	1 Recurring Membership and Equipment	2 Ad Hoc Membership Recurring Equipment
	Non-Habitual	3 Recurring Membership Ad Hoc Equipment	4 Ad Hoc Membership and Equipment

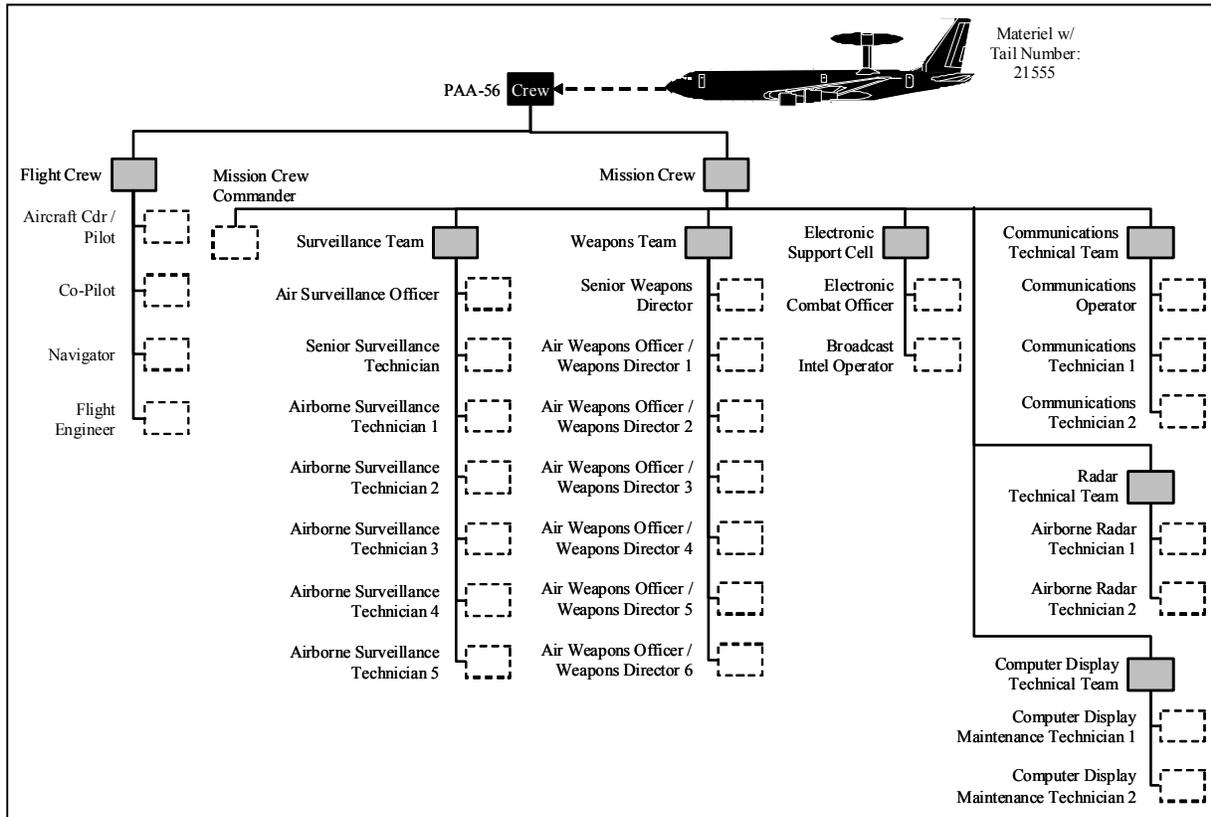
(9) Non-habitual assignment provides an ideal situation to exploit OFSC roles, described in paragraph 6.b of this enclosure. A role is a link that is a specification for an association between a parent OE and an undetermined child OE that serves a function required to make the parent OE viable or usable. Figure 24 illustrates the use of roles to enhance the specification of non-habitual crew assignment. Inside the box marked “Organizational Elements,” there is a crew OE named “Crew 1” and a doctrinal OE named “Flight A” under which flight crew billets reside. The flight crew billets are not assigned to any particular crew. Under the Crew 1 OE are two roles: one labeled “Pilot” and one labeled “WSO” (weapon systems officer). These roles indicate that to operate the authorized platform two OE must be attached to the crew; one called Pilot and one called WSO. The roles in this example are qualified roles. Additional information is provided about the qualifications required to fill the role. In this example, the roles are qualified for USAF officer billets with Air Force Specialty Codes of 11F-G and 12F-G. Billet OEs (or actually, people filling the billets) must have those qualifications to fill those roles. As an example, if the person filling the billet OE Pilot-1 (Capt Fast) has the required qualifications, then that billet OE can be used to satisfy the Pilot role for Crew 1. This would be implemented by placing the Pilot-1 OE OPCON to the Crew-1 OE for the duration of the mission. Similarly, an asset would be aligned with the Crew-1 OE for the mission. The Crew-1 OE provides a stable aggregation point to integrate information about the mission for which Crew-1 has been assigned.

Figure 24. Non-Habitual Assignment with Roles



(10) Roles can be used in more complicated command structure that includes many OEs. Figure 25 depicts a crew of an E-3 Airborne Warning and Control System (AWACS) aircraft that is composed of CCD associations and roles. The roles describe the default skeletal structure to which billets are attached when a mission is executed. This structure provides only the default structure and actual composition will vary based on the requirements and duration of the mission. When a mission package is created, billets from various squadron flights are inserted into the crew structure using OPCON associations to the actual billet OEs chosen to fill the roles. Similarly, an aircraft is selected and aligned with the crew OE as indicated by the dashed arrow between the aircraft icon and the crew organization. Therefore, given a time, one can traverse the org tree, beginning with the crew OE, to reproduce the crew composition for that instance in time. Because an aircraft is associated with the crew OE and people are associated with the billet OEs, one can easily derive a list of crew members' names onboard the specified aircraft by traversing the org tree and collecting the desired associated data.

Figure 25. A Default USAF E-3 AWACS Crew Incorporating Roles



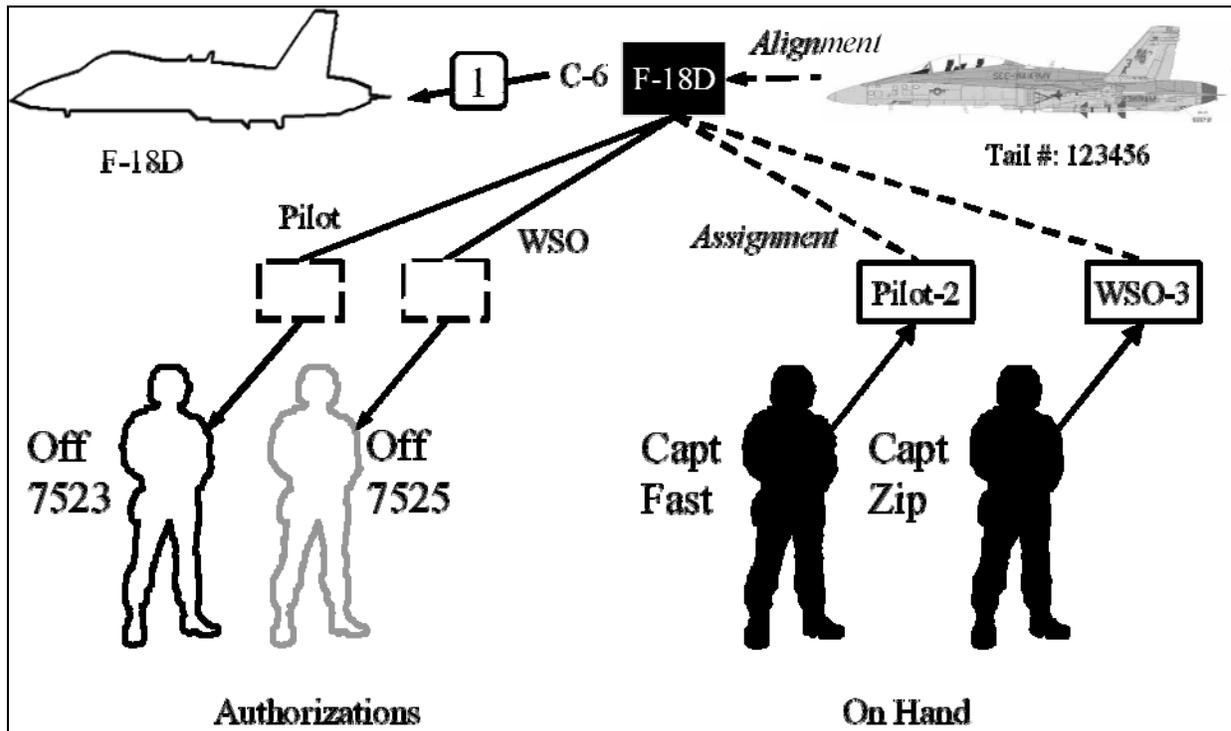
(11) Habitual alignment is often preferred with either habitual or non-habitual assignment (e.g., Quadrants 1 and 2 in Table 3). By using a persistent association between a crew OE and an asset while it is present, the asset can be referred to by either the crew OE identifier or the asset identifier. This allows one to move an asset between subunits simply by moving its crew OE. When an aircraft arrives at a squadron, it can be aligned with a crew OE for the duration of its tenure. Crew assignment can still be non-habitual. The first step in crew assignment is to select the crew OE of the asset to be used for the mission; then crew members, via their billets, are assigned to the crew OE for the mission.

b. Placement of Crews within Command Structures

(1) The OFSC requires that a crew OE exist for each platform authorization so that a crew OE is available to be aligned with each real asset. Unless a special situation exists, the platform authorization that caused the establishment of a crew OE should be directly associated with that OE. When an asset is aligned with the crew OE, this scheme integrates the associations between the crew OE, its platform authorization, the aligned asset, the roles required to operate the crew, and the assigned crew members, as illustrated in Figure 26. This simplifies tracking and consistency for applications regardless of whether the crew is deployed separately, or as part of a larger unit. This approach retains the property that a crew OE is an inventory OE that requires the crew OE to be part of an ADMIN command structure. By associating real assets and

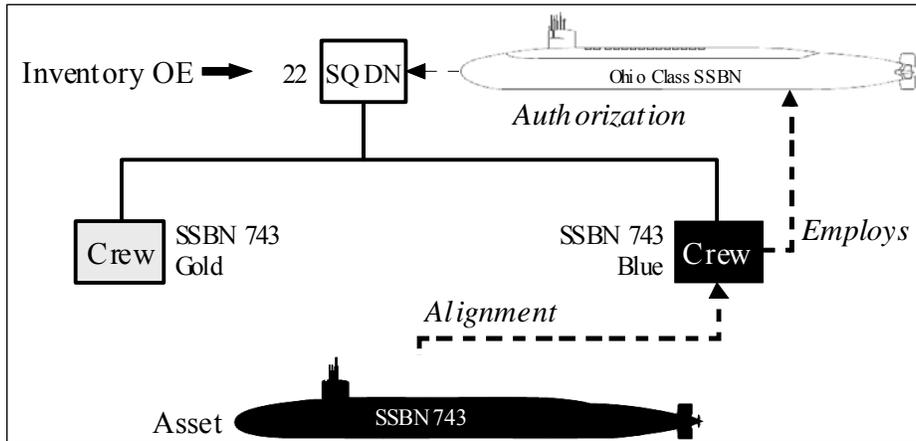
people with inventory OEs, the complete inventory of a unit can be collected by traversing the ADMIN command structure.

Figure 26. Unified Aggregation with Crew OEs



(2) The approach described in subparagraph 13.b.(1) is highly preferred but not mandatory because there are cases for which it is not appropriate. Situations arise in which the authorization must be attached to a different OE than the crew OE that is established because of it. A common case is when multiple crews exist for a single platform. An example is submarine crews where two habitually assigned crews, typically named “Blue” and “Gold,” are established for a single platform. If both crew OEs are inventory OEs and claim the same authorization, then the platform will be double counted. To avoid duplicate counting, a single inventory OE must be selected. In this situation, the parent submarine squadron might be an appropriate selection, as illustrated in Figure 27. There are two crews OEs but neither is an inventory OE. Instead, a single authorization is associated with an ancestor OE that serves as the inventory OE, and therefore, must be in an ADMIN command structure. This results in the authorization only being counted once, but still leaves multiple crew OEs to which actual assets can be aligned when being employed. To avoid confusion, a special association should be created that does not cause the platform authorization to be counted but identifies the platform authorization for which the crew OE was established. This is illustrated in Figure 27 by the “employs” association.

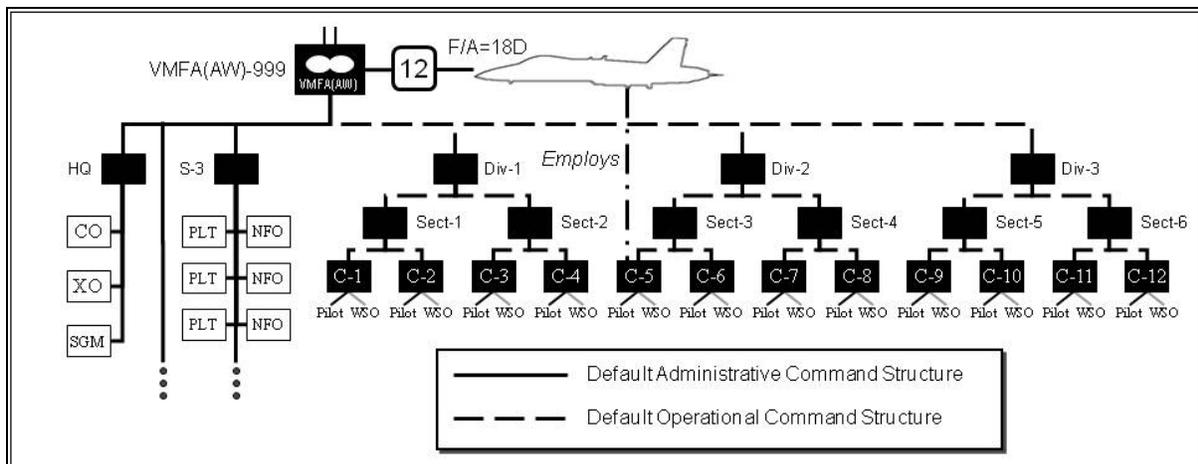
Figure 27. Platform Authorization Separate from Crew OE



(3) Another condition for separating a platform authorization from the crew OE is to document different standing configurations of crews for the same platform. An example is multiple configurations of USAF E-4B aircraft crews that provide the National Airborne Operations Center. The OFSC requires that there is at least one crew OE per platform authorization. Adding additional crew OE for a definitive purpose is permissible. A third reason for making an ancestor OE the inventory OE rather than the crew OE is if the crew OE is better represented as part of an operational structure that uses CCD associations rather than HAD associations. A hypothetical example is illustrated in Figure 28 where the crews are placed under tactical OEs called sections and divisions that are not part of the ADMIN command structure. This would be applicable if two crews were habitually operated in these tactical units. Note the “employs” association depicted for crew OE “C-5” to identify the platform authorization that caused the crew to be established. Subparagraph 13.b.(4) will cover alternatives for crew placement.

(4) The OFSC does not address the cardinality between crew complement and the

Figure 28. Crews as Part of a C2DEF Command Structure



number of billets required to staff the crews. For example, an “Aircrew Ratio” may be used to define the number of billets of certain types that are to exist to cover each role of a crew or the crew as a whole. Instead, the OFSC reflects the result of this analysis through the actual number of crews and billets present. Therefore, aircrew ratios are an input to the analysis that leads to the default command structures contained in OFSC data.

(5) Crew OE placement is independent of platform authorization placement discussed in subparagraph 13.b.(4). For example, in aviation units there are several options as to where crew OEs can be “parked” in a squadron’s default command structure when they are not in use. There are three obvious choices: directly under the squadron (root) OE; somewhere within an operational command structure; or somewhere within the ADMIN command structure. The definition of a good default force structure is one that requires the fewest modifications by its users. This determination is situation dependent.

(a) Placing the crew OEs at the top of the squadron hierarchy denotes that no habitual or routine relationships exist between a crew and any subordinate organization of the squadron. If this approach is employed and the crew OEs are used in an operational context, such as within a strike package, then they will have to be task organized into the operational command structures that include flights and elements in the Air Force or division and sections in the USN and/or USMC.

(b) Placing the crews in an operational command structure is appropriate when crews habitually operate together under a common doctrine as was exemplified in Figure 28. If the crew OEs are inventory OEs, then the command structure must use HAD associations. Otherwise, CCD associations may be used. If crew assignment (membership) is non-habitual, then the crew OEs are not active, or populated, so they do not require a default leadership association. However, once populated, identification of a crew leader is required.

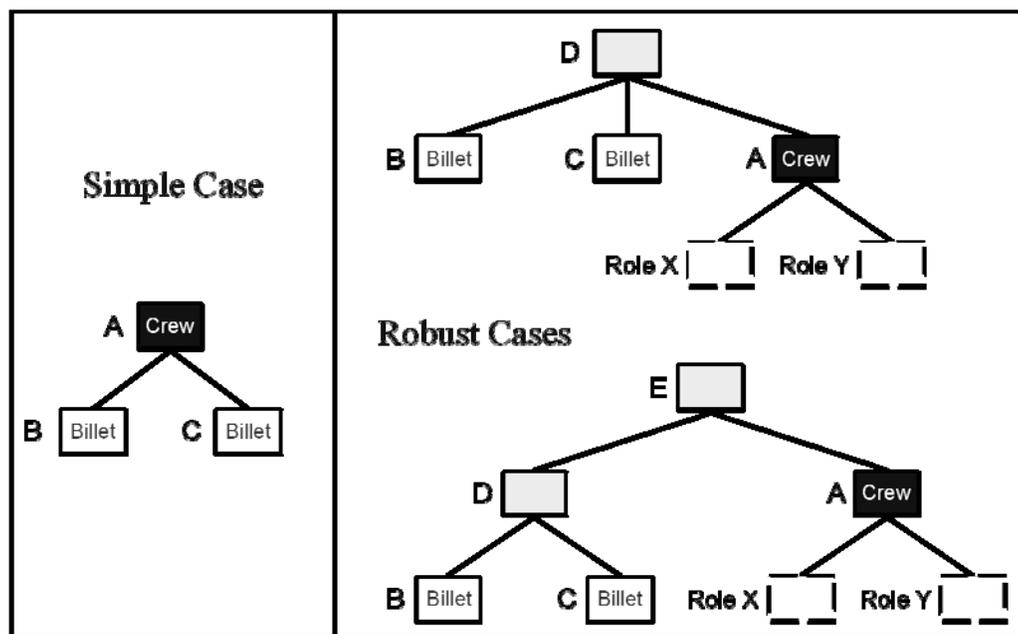
(c) A third option is to place the crew in the ADMIN command structure. A common place is within the maintenance teams where the aircraft resides when not in flight. This configuration is appropriate if a habitual relation exists between a maintenance team and an aircraft. Since an aircraft spends most of its life on the ground, this approach allows the crew OE to rotate routinely between its habitual maintenance team and the dynamic operationally based OEs like flights, elements, divisions, and sections that make up a strike package. All of these configurations are viable, so the situation will determine which of these options is best for a particular default force structure.

c. Crews with Separate Transportation and Mobility Requirements

(1) A common misconception is that if the unit includes a platform, then the crew of the platform must be the root OE of the unit. Often, the platform and its operators are intermixed with other systems. In these cases, crew OEs should be incorporated as part of a larger doctrinal OE. Consider the unit configurations illustrated in Figure 29. The left diagram depicts a habitually assigned crew OE with two subordinate billets. This indicates that the primary reason the billets exist is to operate the asset aligned with the crew OE. However, this could be a misrepresentation. In reality, the reason for the billets may be to execute missions that may or

may not involve the platform, or that some of the team operate the platform while some do not. The diagrams on the right represent different interpretations. The top diagram denotes that the billets are part of a “team” that includes a platform that may be used depending on the mission. When the platform is being used, the billet(s) are attached to the crew. The bottom diagram adds another doctrinal OE (E) to denote a slightly more complex configuration that allows arbitrary combinations of “mounted” members who operate or use the platform via OE A and “dismounted” members who together form a team collectively denoted by OE D. This configuration allows the complete group to be referenced and tracked through OE E, or as any combination of billets on or off the platform.

Figure 29. Crew OEs as Part of Teams



(a) In an aviation example, where an aircraft crew OE is parked under a maintenance team when not in use, billet OEs B and C would be maintenance team members, and the Roles X and Y would be filled by aviators whose billets exist in a totally different part of the command structure.

(b) In a towed howitzer example, the section is a doctrinal OE with an aligned howitzer, and subordinate to the section OE is the prime mover’s crew OE. The towed howitzer is not aligned with a crew OE because it does not transport the howitzer section members; that is the purpose of the prime mover’s crew OE. This configuration allows the crew OE to be tracked independently or as part of the section.

(2) OFSC flexibility should be exploited to correctly represent conditions required for default command structures. There are no fixed or standard configurations because the command structure conditions are as varied as the missions that are executed. A force structure should include as many OEs as possible to support operational conditions expected when

executing assigned missions. The goal is to have OEs already available without having to create them ad hoc. It is perfectly permissible to include OEs that are rarely used but are predicted. It is better to have the OEs predefined and available for immediate use than to have to create, configure, and distribute them in real-time.

d. Reserve Stock, Floaters, Pre-Positioned Stocks

(1) Platform authorizations may include assets that are in storage, spares, or pre-positioned for future use. When the asset is to be operated, there must be a crew OE available to align with the asset. There are two general situations.

(a) If an asset is truly a spare and will never be used unless another is replaced or taken out of service, then it is not necessary to have a crew OE for the spare platform authorization. In this case, the platform authorization and the aligned asset can be associated with any convenient doctrinal OE (e.g., the root squadron OE). When the spare asset is to be used, it is aligned with the crew OE that had the asset that it is replacing. The crew OE remains stable and the assets alignments are interchanged.

(b) If a reserve asset is maintained with the intent of ad hoc collocation with non-resident operators, then it is beneficial to have crew OEs pre-established in the default force structure for that purpose. This situation is informally called “falling in on the equipment.” This can be for either habitual or non-habitual crew assignments. There are two implementation options: 1) the crew OEs are in command structure of the arriving unit; or 2) the crew OEs are in the command structure of the pre-position force. In the first approach, the assets are aligned with the crew OEs of the arriving unit. In the second approach, the crew OEs with the assets are inserted into the command structure of the arriving unit. For pre-positioned stocks, the selection of which implementation is simplest depends on the circumstances of the unit rotation. If the rotation is planned and the equipment is what is expected, then the first approach is better because all the crew OEs are already in the units C2 and logistics information systems. However, if the assets are different or unplanned, then the second approach is simpler.

(2) Due to the possibility of unplanned or contingency operations, pre-positioned stocks must have a crew OE established for each platform authorization. This structure will likely be flat without a command hierarchy, although a hierarchy based upon platform characteristics can be implemented if deemed helpful. The OEs used in the hierarchy can be augmentation OEs due to the absence of any billet OEs. Depending upon the circumstances, the arriving unit has the option to align the pre-positioned assets to their crew OEs, or to use the crew OEs from the command structure of the pre-position unit, whichever is simplest.

14. SPECIAL AND SPECIFIC CASES: BILLETS

a. Civilian Billets or Willets

(1) Civilian billets share many properties of military billets, but there are several major differences. In the OFSC, a military billet is a billet intended to be occupied by a Military

Service member. All other billets are considered civilian. Bureaucratically, military billets are authorized while civilian billets are a result of periodic decisions regarding how to fund and execute Government programs. Congress separates these into two categories: military end strength and authorized programs. Military end strength, as defined in Reference (g), refers to the number of people authorized in the military services, which clearly drives the number of military billets. Programs refer to the plans of action to accomplish specified objectives, and the establishment of civilian billets is a result of this action. Consequently, a basic distinction is that civilian billets are determined by the funding appropriated for programs while military end strength is determined and then the budget is calculated to meet that number of billets.

(2) Military billets are counted in number of spaces, while civilian billets are based upon workload equivalent, a measure in work-hours required to execute a program. For this reason civilian billets in the OFSC are termed “willetts,” for workload equivalent. Because of the prevalence of cases that require one work year of labor, typically 2087 labor hours, there are several common equivalent conversions, namely full-time equivalent (FTE) as defined in Reference (g), and contract man-year equivalents (CME), as described in Air Force Manual 38-208, Volume 2 (Reference (m)). Therefore, it is necessary to define the units being specified when referring to willetts. If FTE or CME is used as the units of count, then an additional document is required to define how these values are computed. The OFSC standard for a willet is one FTE or CME or between 2080 and 2088 labor hours. If the number of hours is less than this, the actual number of hours funded can be specified.

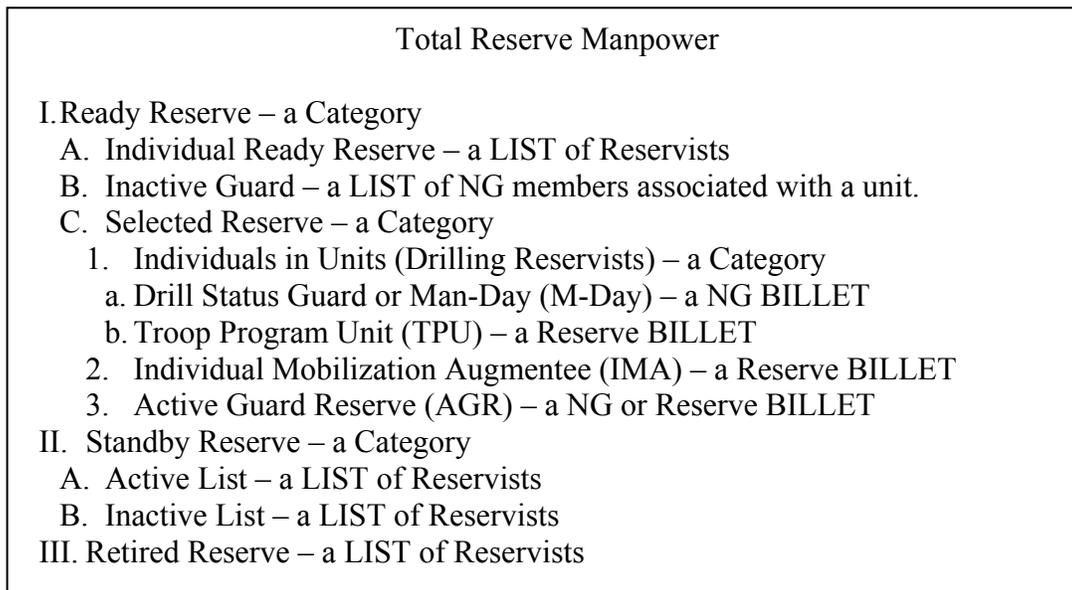
(3) In the OFSC, there is only a single type of willet. However, a willet is categorized as either a government employee or a non-government employee (usually contractor). This allows workload to be combined regardless of the category of employee used to execute the workload, while allowing it to be broken into subcategories when required. In both cases, the default unit of measure is the FTE or CME, so values that are not multiples of these must be represented as work-hours. Willetts can be further categorized in any way required, such as direct hires, foreign hires, part-time, etc. Similarly, job sharing positions can be implemented as two part-time willetts (using work-hours), or a single FTE that is shared by multiple employees. These choices are outside the scope of the OFSC and are left to the force structure developer. As experience evolves, additional constraints may be developed.

b. Reserve Component Billets

(1) Reserve Component billet OEs, those of the NG and Service Reserves, are treated the same as regular military billets. The primary difference is the source of the ADMIN command structure and chain of command. While Service regular and Reserve billets have an administrative chain of command that begins with the President of the United States as defined in Reference (f), the administrative command structure of most National Guard billets originates from the State governor as defined in Reference (j).

(2) Reserve Component personnel may be in billets or be a member of a list. Figure 30 provides a taxonomy of Reserve Component status terms and identifies those that are categories, those for which billets exists, and those that are lists of personnel. The OFSC only addresses manpower in terms of billets, which are indicated in Figure 30 as NG Drill Status Guard (or Man-Day) billets, Reserve Troop Program Unit (TPU) billets, Reserve Individual Mobilization Augmentee (IMA) billets, and NG or Reserve Active Guard Reserve (AGR) billets. A subset of personnel in the Drilling Reservist category may be in training status and non-deployable. However, this is a characteristic of a person, not the billet OE. NG AGR billets ADMIN command structure is derived from authority either in accordance with Reference (f) or Reference (j), depending upon the legal circumstances. When a person in a list is brought back on active status, they must be put in a billet OE.

Figure 30. Reserve Component Billet Taxonomy



(3) The OFSC allows one military billet per person. However, a person is allowed to be in both a civilian willet and military billet simultaneously. Clearly, many Government and contractor civilians are also members of the NG and Reserves. For consistency, this policy must include Federal Government willets of NG military technicians (MTs) with dual status. These willets require that its incumbent also be a member of the Selected Reserve in a mobilization billet. This may occur in completely different organizations. If the MT willet and military billet happen to be in the same drilling unit, then this situation must be accounted for when providing data on manpower resources.

(4) IMA billets are associated with an Active Component, Selective Service System, or Federal Emergency Management Agency organization. This relation is normally well-known and stable allowing a CCD association to link the billet with its associated mobilization organization. When not mobilized or training, the IMA billet may reside in the ADMIN command structure of a local Reserve unit.

c. Billets for Temporary Status Personnel

(1) All the Services have special accounts to track personnel in temporary status as described in DoDI 1120.11 (Reference (n)). These statuses include transients, students, trainees, holdees (patients, prisoners, and separatees), and cadets and/or midshipmen. Because these are personnel in the Armed Forces, but not assigned to a standard force structure billet, a separate method of accounting for them is required.

(2) This cache of billets would have ADMIN relations to some set of augmentation OEs within the Service, as decided by that Service. When a person enters one of these statuses, a billet OE would be temporarily “checked out” of the Services cache and the person aligned with it. That billet could then be operationally attached to any other OE in the DoD based upon the situation of the person. For example, while executing a permanent change of station, the billet could be placed operationally under the losing unit by convention. This operational association could be changed several times based upon the real-world situation of the person. When the person signs in to the new unit, that person would be assigned to a new permanent billet, or could be left in the temporary one with a new command association until the permanent billet is identified. When the person is assigned to the new permanent billet, the temporary billet is returned to the Service cache for future use.

(3) This approach utilizes and implements the principle of “stable node and dynamic links” described in paragraph 3.a of this enclosure. Command relationships allow tracking a person through arbitrary status changes. Through the ADMIN relationship, all the transient billets in use can be gathered, regardless of the reason a person is in the transient status or the phase of their move. Through the operational association to the transition billet, the current command structure of which the billet is a member and even the chain of command for the person can be determined. Once conventions are established, the same applications and algorithms used to track personnel via permanent billets can be used to track them via temporary billets, adding a structured tracking process.

d. Individual Augmentees (IAs). An IA is not represented as a billet OE in the OFSC but as a requirement to obtain a billet OE. IA requirements are represented as qualified roles. An existing billet OE from somewhere within the military establishment is selected to fill the role via an operational relation such as OPCON, enforcing the one person, one military billet property and maintaining consistency of resource allocations. Creating a new billet OE for an IA requirement introduces duplicative and conflicting information into the enterprise.

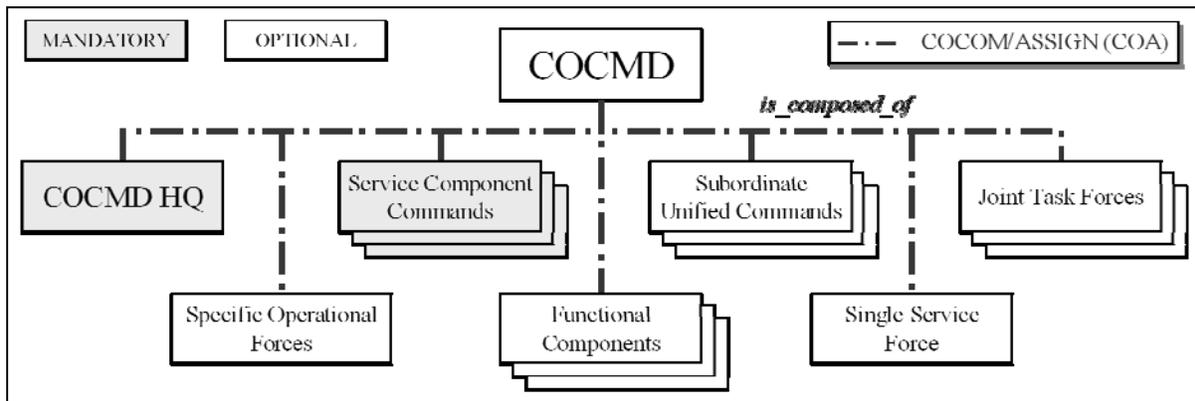
15. SPECIAL AND SPECIFIC CASES: JOINT OEs INCLUDING BILLETS

a. Joint OEs, including billets, are not substantially different from their regular Service counterparts. The primary difference is how they are placed in command structures. A key point is recognizing they are “task organized” just like any other OE. Joint OEs are routinely part of three command structures: default administrative, default operational, and current operational.

b. All assigned forces must be explicitly included in the command structure. Use a COCOM relation originating at the CCMD OE to represent assignment. All OEs directly subordinate to a CCMD are related via the COCOM relation. A CCMD OE is the initiation point of the COCOM relation and is invoked via COA (COCOM/Assign) associations between the CCMD OE and its subordinate OEs, to include the Service component commands, joint functional component commands, joint task forces (JTFs), and other joint organizations that are assigned to the CCMD. This set must also include the CCMD HQ whose members are also assigned to the CCMD. Like all subordinate OEs, the CCMD HQs has a COA association with the CCMD, thus invoking the COCOM relation and assignment of forces to the CCMD of the military billets within the HQ (see Figure 31).

c. Administratively, the Services own the military billets, not the joint organization. The

Figure 31. Revised Set of Unified Command Organizational Options

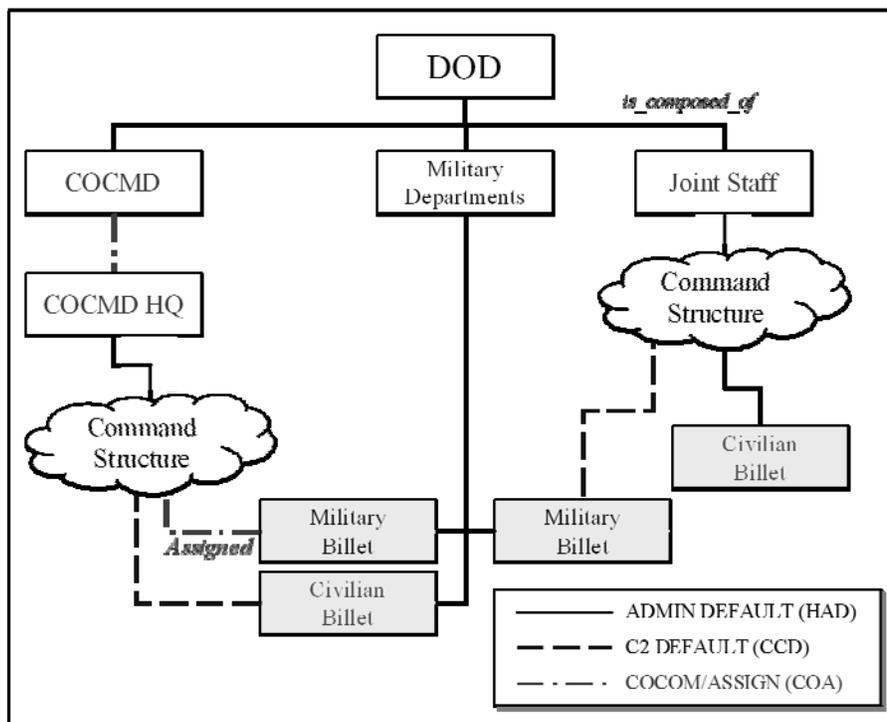


Services also own civilian billets when the Service is the executive agent for a joint activity, as defined in DoDD 5101.1 (Reference (o)) for the CCMDs. For example, when the ADMIN command structure (i.e., ADMIN relation) of a CCMD HQ is evaluated, it is void of inventory nodes such as billets and crews. The requirement and authorization is generated by the CCMDs and Joint Staff, but the billet remains administratively with the Services as demonstrated by the fact that every Service has a category of manpower documents that defines their joint billets. The groupings of the joint billets in the Service manpower documents exemplify the use of the OFSC “augmentation OE” that was described in section 3 of this enclosure. Since an augmentation OE aggregates groups of OEs that are intended to be embedded somewhere else, it is not required to have a designated leadership billet OE. When the Service is the executive agent for a joint activity the billets also belong to the Service, as described by the list of each CCMD support responsibility in DoDD 5100.3 (Reference (p)). For example, the Air Force is the executive agent for the U.S. Strategic Command (USSTRATCOM), so the civilians hired to work there are in civilian billet OEs administratively under the Department of the Air Force. Conversely, the Joint Staff does not have an executive agent, so the civilian billet OEs are part of the Joint Staff ADMIN command structure.

d. Joint billets are created in response to DoD requirements. Although their ADMIN relation goes to a Service, they have a default operational relation that goes through the joint organization for which they were requested and justified. This is always true for military billets and includes civilian willets when the Service is the executive agent for the joint activity, as with CCMD HQs. In these situations, the billet and willet OEs must have an operational association to identify their default placement within the joint activity for which the OE was established. There is flexibility as to how this is accomplished, but the result must reflect the correct assignment of forces. There are two basic criteria incurred when creating command structures that include joint OEs. The first is whether the joint activity contains any inventory OEs, and the second is whether the personnel in the joint billets are assigned to a CCMD. As a result, different relations are required when creating the command structures for non-assigned billets, like those on the Joint Staff, versus assigned billets like those in a CCMD HQ. This difference is illustrated in Figure 32. The left branch contains CCMDs that require assignment of military billet OEs and the right branch contains the Joint Staff that does not. The final association to a military billet OE in the CCMD branch is a COCOM Assign association so that the assignment property propagates to billet. The final association in the Joint Staff branch is a C2DEF association because the billet is not assigned. In both cases, military billet OEs are administratively related to the Services using the ADMIN relation.

e. In CCMD HQs, willet OEs are civilian members of the administrative command structure of the Service that is the executive agent for that CCMD. A C2DEF relation is used to place a willet OE into the CCMD HQs command structure to identify its default location within the joint

Figure 32. Associations in Joint Units – Preserving Assignment



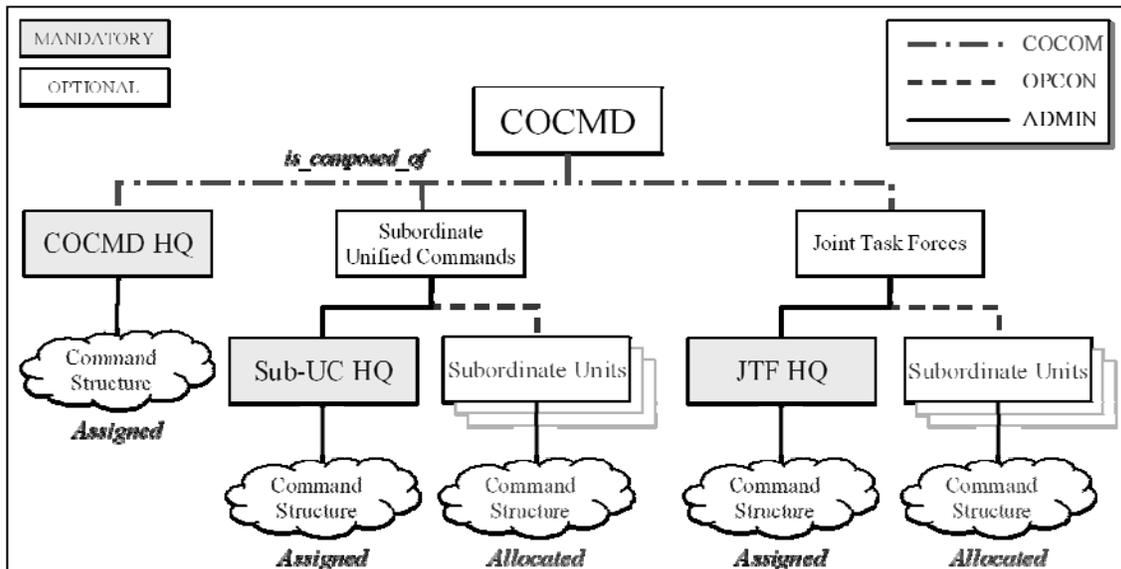
activity. In the Joint Staff, willet OEs are part of the administrative command structure because they are a component of the Joint Staff inventory. They have no Service relation.

f. For non-billet OEs, both types of organizations use an ADMIN command structure internally and to their root OE, the DoD. The Joint Staff does this because the civilian billets are inventory OEs and must be accountable using that relation. The CCMD HQs do this so that the assignment of forces (the COCOM relation) will propagate through the structure. The exception is the relation from the CCMD OE and its direct descendants. In this case, a COCOM relation must be used to invoke the assignment of forces property.

g. The CCMD HQ and other subunits are associated based on specified conditions as illustrated in Figure 33. While the COCOM relation is used to assign units to CCMDs, the OPCON relation is used to allocate units to a CCMD. Normally, as described in Figures V-4 and V-5 of Reference (e), allocation occurs below the first echelon, and preferably, under a Service Component Command. Because the COCOM relation does not propagate through an OPCON association, military billets placed under a unit that is OPCON to a CCMD are not assigned to that CCMD. This correctly represents allocation that is a common mode of operation for deploying forces.

h. The practice of explicitly identifying an HQ as part of the command structure of a joint organization is extended to all joint subunits. Once a COCOM relation is invoked, a HAD

Figure 33. Assignment (COCOM) and Allocation (OPCON) of Forces to a CCMD



association is used to relate the HQ OE to its parent OE so that the COCOM relation will propagate down that association. This allows the HQ OE to be used as a point through which billets can be assigned to the CCMD. To illustrate this option, a HAD association is used to relate the sub-UC HQ and JTF HQ OEs. Although a COA association can be used, a HAD

association is used because it provides the correct functionality should inventory OEs be required in the future.

i. Billets that are external to Service organizations should be created and maintained in the ADS where the preponderance of actions take place. For joint billet OEs, this would be where the joint activities are maintained. Changes to C2DEF or COCOM relations that influence joint billet OE placement will occur in the ADS that maintain the joint activities. Therefore, the joint ADS is the correct place to maintain the joint billets and then share the data with the Service ADSs. The “one person-one billet” model is supported because there will be a single nominative or rotational billet that is shared by all the Services, rather than four billets for each rotational and nominative position that would have to be swapped each time a different Service was to fill the position. Billet names should be selected that are as stable as possible. It is common to over specify joint billet OEs. For example, a joint requirement may specify an Army officer of grade O-5 (lieutenant colonel or LTC) with combat arms experience as well as a specialty in operations research and systems analysis (ORSA). Over time, the job for which the billet was originally justified (e.g., the chief of a branch), may have changed or been eliminated. However, the joint requirement for the Army O-5 ORSA remains and the person in the billet may be used wherever they are most effective for the accomplishment of the joint organization’s mission. In cases like this, the billet can be placed in the default command structure at the highest OE in the organization where it is required, for example, at the division, deputation, or directorate level. It can then be task organized to wherever it is required for whatever duration required using OPCON associations. Similarly, it is best to use a generic name for the joint billet that remains applicable regardless of where the billet is used. Instead of a name like “Chief of Branch X” that reflects the original justification of the billet, it may be better to use a name like “Army LTC ORSA with Combat Arms Experience.” Then, an alias can be used to describe the position for which the billet is currently destined.

j. Joint duty credit is determined by the Joint Duty Assignment List (JDAL) that is independent of the COCOM assignment property. Therefore, membership in the JDAL is a separate topic from command relationships and is not part of the OFSC semantics.

k. A joint billet will typically be a member of multiple command structures, and will have multiple relations to it:

(1) An administrative command structure defined via an ADMIN relation to its Service (or executive agent). Additional augmentation OEs in this command structure may be added by the Services to help them maintain and organize their joint or external billets. This small hierarchy can be developed and shared between the joint ADS and the Service ADSs.

(2) A default operational command structure via C2DEF relations from the joint billet to an appropriate place in the joint hierarchical structure. An actual operational command structure via OPCON relations is appropriate when the actual duty location in the organization is different from that defined by the C2DEF relation.

(3) If assignment of military billets is required, then a COA association is used. The location of the parent depends on the stability of the joint billet.

1. Decisions concerning the use of C2DEF and OPCON relations depend on the situation. Because the Joint Staff has no executive agent, the civilian billets will be part of the administrative command structure and only require an ADMIN relation. Like any task organized OE, an OPCON relation is used for temporary details that require representation. The COCOM relation (defined via the COA association) is used to affect COCOM assignment of forces and to identify operational relationships and subunits as formally established by the CCDR. The COA association is reserved for use between the CCMD and its Service or functional components and other organizations established by the CCDR, to invoke assignment and conduct the operations of the CCMD. To maintain OFSC semantics, HQ OEs will be added to each joint organization, and the type of relation used will be based upon the required command relationship. If assignment of forces is required for members of the HQ, then an ADMIN relation will be established to the HQ OE to propagate the COCOM relation. Per Reference (e), allocated forces will be associated using the OPCON or TACON relation.

16. SPECIAL AND SPECIFIC CASES: MULTI-HATTED POSITIONS

a. Introduction to Multi-Hatted Positions

(1) It is very common to be a member of more than one chain of command or command structure, and usually, the roles are well defined. But the blurring of command channel distinctions will prove problematic for machine manipulation unless rigorously defined.

(2) In the OFSC, multi-hatted positions are implemented using multiple leadership associations (i.e., “is-led-by”). Resolving the issues of multi-hatted positions requires the properties presented in section 8 of this enclosure concerning the distinction and interaction between a command structure, a chain of command, and their integration using leadership associations as illustrated in Figure 7. The interrelationship of these two structures must be correctly maintained or inconsistencies and conflicts may arise that violate the principle of unity of command. This property is used to verify the correctness of a command structure by viewing the resulting chain of command and vice versa. Finally, although an active OE must have a single, designated default leadership billet OE, it is common for a billet OE to be the designated default leader for multiple units. Because of the considerable flexibility required for leadership associations, a billet OE can be designated as the leadership billet OE for multiple units.

(3) When creating leadership associations that cross command structures, inconsistencies occur in two primary areas. First, chains of command may result where a billet OE has multiple supervisors under the same command relationship. Second, command structures may result where a leadership billet is a member of multiple units under the same command relationship. Both of these conditions technically violate OFSC precepts based upon unity of command and should be avoided. However, some violations are inevitable so a warning of the situation must be provided. For example, inserting a leadership association is independent of inserting a composition association because one does not require the other. It is plausible for a leadership billet OE not to be a member of the command structure it leads because its default placement is

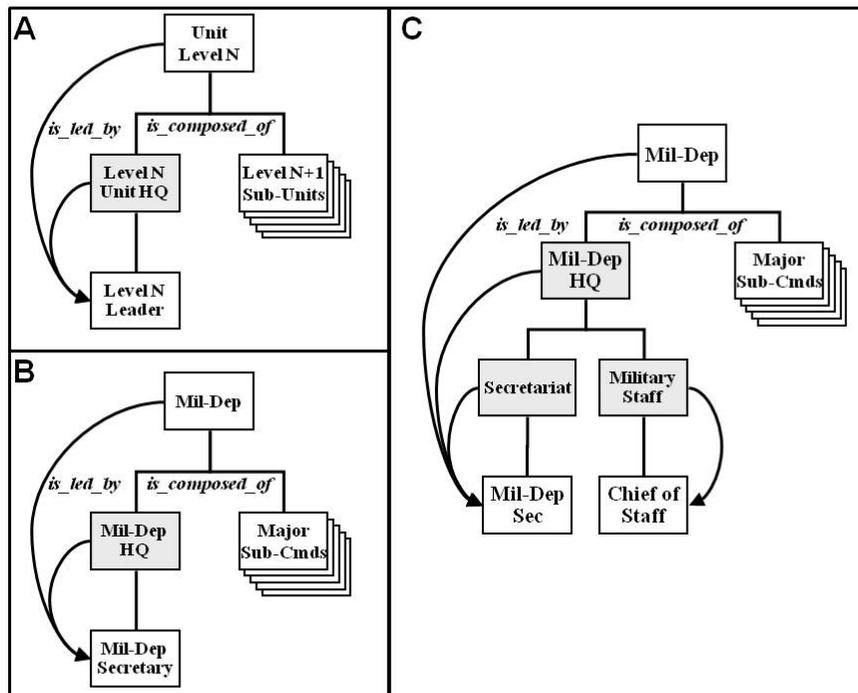
within a different command structure. Such situations may cause unity of command ambiguities that must be further resolved.

b. Simple Case-Service Chief Leadership

(1) An excellent example of consistency constraints is encountered when using the OFSC to create the top levels of the Military Department. Figure 34 illustrates a generic version of military command structures with the associated leadership (is-led-by) associations. Diagram A (top left) depicts the general scheme of a military organization composed of a HQs that include the unit's leader, and multiple subunits. This pattern continues to the lowest echelons of the command structure. Diagram B (bottom left), is the same structure but with generic military OE names. It denotes that, per Reference (f), the Military Departments are under the civilian control and authority of the Military Department Secretaries (Mil-Dep-Secs). Diagram C (right) illustrates a slightly more detailed structure as it decomposes the Military Department HQ into two parts: a Secretariat, under civilian leadership, and a military staff, under military leadership, with a Service Chief of Staff that is part of the staff. Furthermore, every Military Department has a regulation in which the Secretary of the Military Department expands the supervisory powers of the Service Chief of Staff beyond just the Service military staff in accordance with Army Regulation 10-87 (Reference (q)); United States Navy Regulations-1990 (Reference (r)); and Air Force Pamphlet 38-102 (Reference (s)).

(2) This structure is not represented in Diagram C that specifies that all major

Figure 34. Traditional Military Command Structures, Generic View



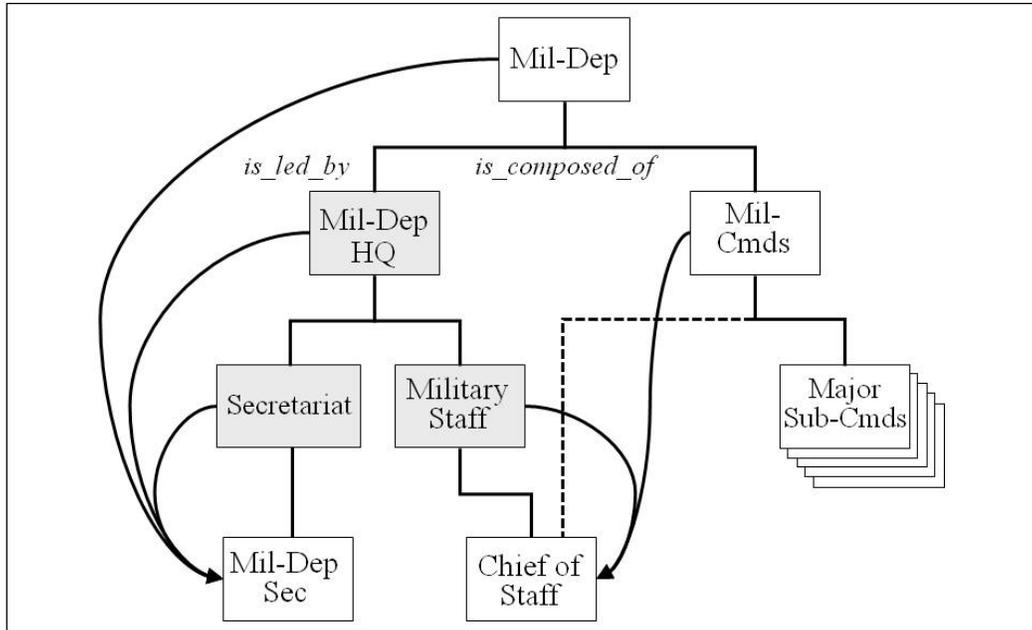
subordinate commands report directly to the Secretary of the Military Department. If the command structure in Diagram C is converted into a chain of command, the Chiefs of Staff will

not appear in the chain of command of the major subordinate commands. To correct this omission, additional OEs may need to be inserted based upon multiple sources, to include: the U.S.C., especially Reference (f), Service Regulations, General Orders, and manpower documents. These new OEs can then exploit leadership associations to produce a correct representation of the chain of command and command structure.

(3) Based on the four types of sources cited in paragraph 16.b.(2), a new OE is introduced to the command structure with a leadership association, but no composition association to the Service Chief billet OE. This simple addition is illustrated generically in Figure 35, and inserts the Service Chiefs into the administrative command structure and chain of command. The new OE is labeled “Mil Cmds,” for military commands, and has an “is-led-by” association to the Chief of Staff billet OE. The Service Chief is multi-hatted as both the leader of the military staff of the Military Department’s HQ, and as the leader of other Service units as directed by the Secretary of the Military Department. When the chain of command is derived from this command structure, it correctly portrays the Service Chief reporting to the Secretary of the Military Department, and many of the non-Secretariat organizations reporting administratively to the Service Chief.

(4) There is no expectation of a composition association between the Mil Cmds OE and

Figure 35. Enhanced Military Command Structures



the Service Chief billet OE as denoted by the dotted line. This property reinforces the general nature of command structures. Nowhere is it required that a supervisor be resident in the organizational hierarchy. This does not restrict the inclusion of a composition association (per the dotted line in Figure 35); it merely means that it is not required provided that the derived chain of command remains correct. This feature offers the flexibility required for military

operations. If a composition association is added, it must be of a different command relation than the existing one to the same billet OE.

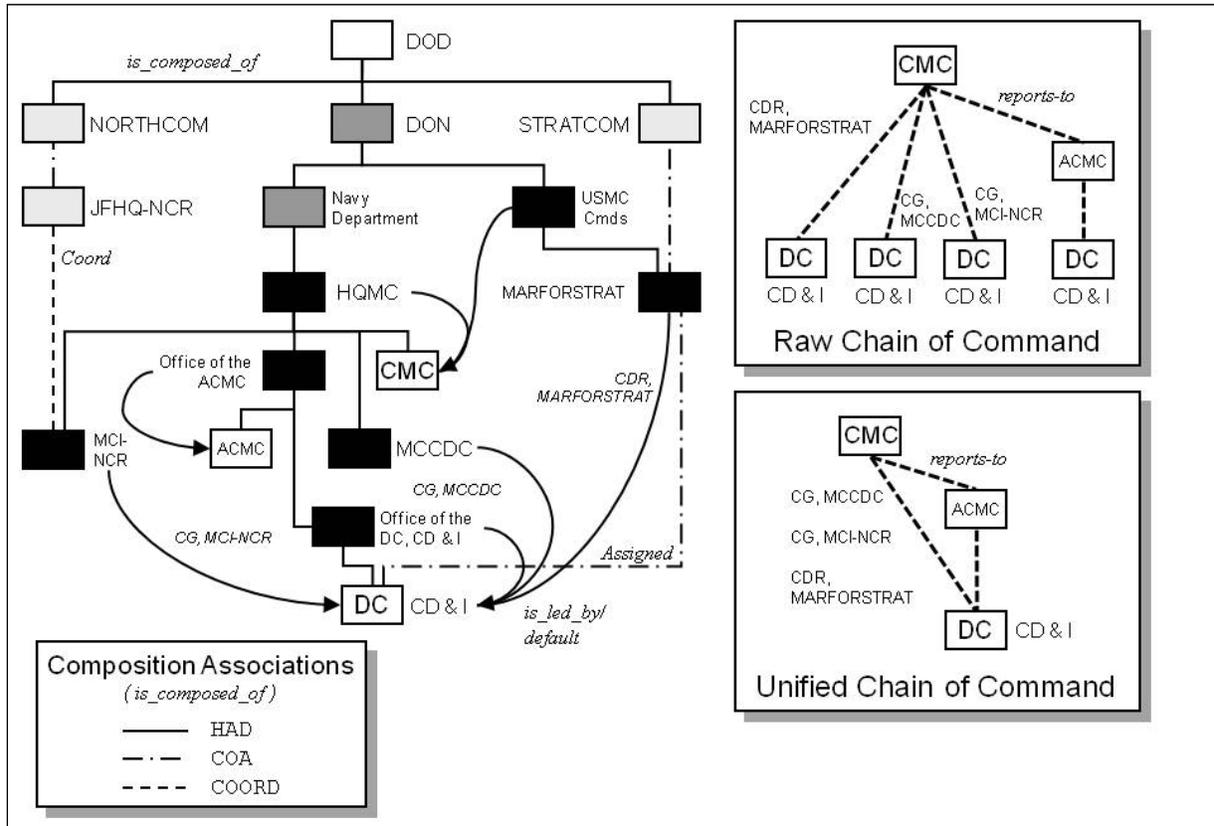
c. More Complicated Cases in Multi-Hatted Leadership

(1) The principle of unity of command upheld in the OFSC prevents an OE from possessing two simultaneous, identical leadership relations. Multiple relationships to supervisors must be distinguishable so that responsibilities and priorities can be determined. For some relationships, the determinants are well-documented. For example, an OE cannot be simultaneously assigned to two CCMDs. The same policy applies to OPCON, TACON, and the OFSC relations of ADMIN and C2DEF. Support relations, being intentionally vague by design, are not as clear. Therefore, the OFSC permits multiple simultaneous GS relations unless further discriminators are developed.

(2) The use of an actual multi-hatted position example is instructive in explaining the implementation of the OFSC principles. A current example (Figure 36) is found in the USMC Deputy Commandant, Combat Development & Integration (DC, CD&I) billet. The person in this billet OE is also: Commanding General Marine Corps Combat Development Command (CG, MCCDC), Commander Marine Forces Strategic Command (CDR, MARFORSTRAT), and Commanding General, Marine Corps Installations National Capital Region (CG, MCI-NCR). Figure 36 illustrates this situation using a slice of a command structure with selected OEs and several leadership associations, with arrows, that implement the above multi-hatted command relationships. The flexibility of leadership associations allow them to be inserted across command structures. While this flexibility is convenient, it requires care in evaluating the effects on the resulting chains of command. Two types of command structure relations are included: ADMIN (via HAD associations); and COCOM (via COA associations). This is a typical ADMIN command structure with COCOM associations added to invoke the assignment of forces. An unspecified “coordination” association is included to indicate a relationship between MCI-NCR and Joint Force Headquarters - National Capital Region (JFHQ-NCR) as a designated functional component. The purpose of the OE entitled USMC Cnds (Commands) was described in subparagraph 16.c.(1). The Navy Department OE is explained in section 17 and non-Marine Corps billets are excluded. Per Reference (r), the Commandant of the Marine Corps (CMC) is multi-hatted as the administrative leader of Headquarters, Marine Corps (HQMC), plus all U.S. Marines that are outside the Office of the Secretary of the Navy that are placed under the OE named “USMC Cnds.” The Assistant Commandant of the Marine Corps (ACMC) is second highest in the chain of command. The command structure contains an OE named “Office of the ACMC” under which the ACMC billet OE is placed to which a leadership association is linked indicating that the person in the ACMC billet OE leads the “Office of the ACMC.” Reporting associations are established by the placement of OEs within the command structure. Placing an OE under the HQMC OE causes it to report administratively to the CMC as will an OE placed under the “USMC Cnds” OE. Via decomposition, OEs placed under the HQMC OE are considered part of HQMC while those placed under the USMC Cnds OE are not. This exemplifies the dual criteria for command structure correctness based upon a correct chain of command and correct decomposition. An OE placed under the “Office of the ACMC” OE reports to the ACMC and is part of HQMC.

(3) Multi-hatted leadership positions and their roles shall be evaluated in sequence using

Figure 36. Leadership Associations for a Multi-Hatted Position



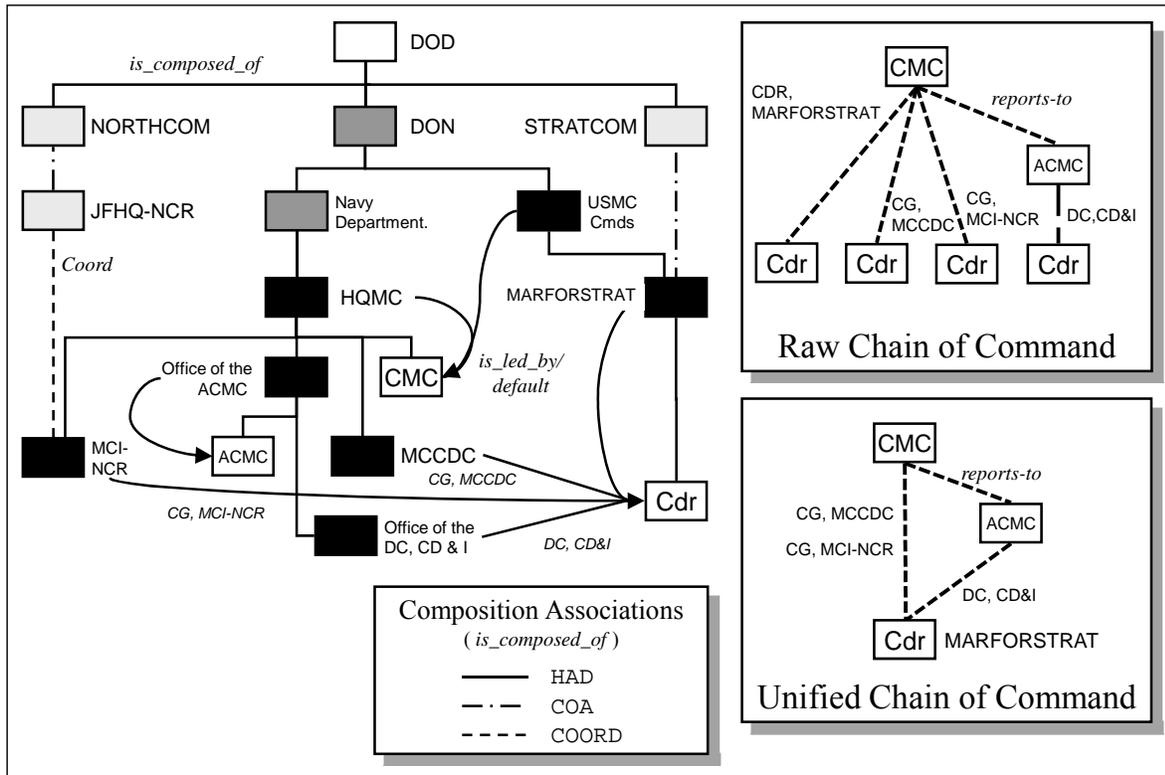
the “one person, one billet” principle; one of the multi-hatted position titles is selected as the primary billet OE. Technically, any of the titles may be selected. For this example, the title of DC, CD&I is selected because it is consistently listed first on a USMC organization chart; this billet OE is used for all the multi-hatted positions. An “Office of the DC, CD&I” OE is created as an aggregation point under which any OEs for the staff of the DC, CD&I are placed, including the DC, CD&I billet OE. Per U.S. Marine Corps Concepts and Programs (Reference (t)), the Deputy Commandants report through the ACMC, so the “DC, CD&I” billet OE and its office OE are descendant of the “Office of the ACMC” OE. Leadership associations are added for the multi-hatted positions: one as the CG, MCCDC from the MCCDC OE; one as the CDR, MARFORSTRAT from MARFORSTRAT OE; and one as CG, MCI-NCR from the MCI-NCR OE. This command structure produces the raw chain of command illustrated in Figure 36. The person in the DC, CD&I billet OE reports administratively to the ACMC in that capacity and reports administratively to the CMC as the CG, MCCDC, the CDR, MARFORSTRAT, and as the CG, MCI-NCR. While a billet OE may appear only once in a command structure, a billet OE may appear multiple times in a chain of command due to possibility of multiple reporting relations. However, these multiple reporting occurrences must not produce unity of command conflicts. Technically, the unified command relations diagram of Figure 36 produces a unity of command conflict because the person in this billet OE reports administratively to two different

bosses simultaneously: the CMC and APMC. Although this is a trivial case due to the tight coupling of the two bosses, one can see how such a situation can present unity of command problems in general. To fix the problem, different command or support relations must be used within the command structure to differentiate the two relationships.

(4) Assignment of forces is added to the command structure using the COCOM relation. Figure 36 illustrates two cases. First, a COA association assigns the person in the DC, CD&I billet OE to MARFORSTRAT, thus establishing a default operational relation between it and the CDR, USSTRATCOM. A COA association must be used because there already exists a HAD association to the DC, CD&I billet OE in the HQMC ADMIN command structure. Because an OE can be assigned to only a one CCMD at a time, this is the only COA association allowed. Second, the JFHQ-NCR is assigned to U.S. Northern Command (USNORTHCOM) via a COA association. OEs placed under the JFHQ-NCR using either an ADMIN or COCOM relation will also be assigned to USNORTHCOM. Some informal documents refer to MCI-NCR as a SCC to the JFHQ-NCR. If true, it would have a COA association to it. However, other documents refer to it as a functional component that conducts coordination. This relation is illustrated in Figure 36. Should an emergency arise, a Joint Task Force-National Capital Region (JTF-NCR) will be established from the JFHQ-NCR to which forces can be allocated using operational relations such as OPCON and TACON. All these cases can be represented using the OFSC. Detailed, operational relations must be specified to correctly represent the situation. There is no COCOM relation between the JFHQ-NCR and the DC, CD&I billet OE because it is already assigned to USSTRATCOM. When necessary, the DC, CD&I billet OE can be placed OPCON or TACON under an assigned NCR OE indicating allocation to USNORTHCOM by the Secretary of Defense.

(5) Figure 36 illustrates that there is no requirement that a leadership billet OE be part of all command structures it leads; the DC, CD&I billet OE is included within only two of the four command structures it leads. It is part of the HQMC ADMIN command structure via its function as a Deputy Commandant, and it is part of the USSTRATCOM COCOM command structure via its function as the CDR, MARFORSTRAT. It does not appear in the command structures of either MCCDC or MCI-NCR. This can be changed based upon how the force developers desire to emphasize the multi-hatted position. The only requirement is abiding by the OFSC principle that a single instance of a command relationship type occur at a time in a command structure. As an example, the same chain of command is produced if the DC, CD&I billet OE is moved to the MARFORSTRAT command structure using an ADMIN relation that propagates the COCOM relation to the CDR, MARFORSTRAT billet OE. This equivalent command structure is illustrated in Figure 37.

Figure 37. Alternate and Equivalent Command Structure

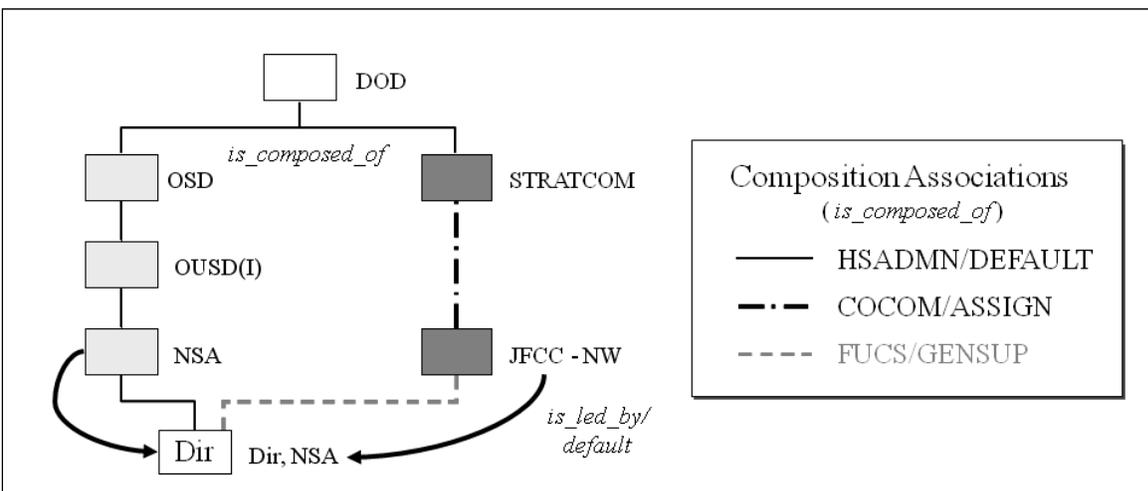


(6) There are situations in which a position is pre-designated as the contingency commander for a unit. If a position will be allocated, typically via an OPCON association, under specified conditions, the special status of the billet OEs is acknowledged so that it may be identified as requiring to be kept in the information cycle of the other units it may have to lead on short notice. To facilitate this situation, the OFSC includes an additional subcategory of leadership association (beyond the default case) named “command conditional” with the association called ILC, as shown in Table 1. The ILC association denotes that a contingency leadership responsibility is pre-designated, but that the actual command relationship must be activated by higher authority when required, which is typically the Secretary of Defense. This approach is analogous to that described by roles but uses a leadership association instead of a decomposition association.

(7) When difficulties arise in representing command structures with multi-hatted positions, it is normally safe to use the GS relationship as defined in Section II of Reference (1). This approach provides a stable association, but retains the flexibility required to allow the details of the supporting and supported relationships to be defined. These situations are typified by Joint Functional Component Commands (JFCC), with dual-hatted commanders designated from distance command structures. For example, the Director, National Security Agency (DIRNSA) is designated as the dual-hatted commander for the USSTRATCOM Joint Functional Component Command for Network Warfare (JFCC-NW). This is implemented by a leadership

association from the JFCC-NW OE to the DIRNSA billet OE as illustrated in Figure 38. If it is desired that the DIRNSA billet OE be part of the JFCC-NW OE command structure, then a composition association must be included. This association cannot be a HAD association because administratively the NSA OE resides within the ADMIN command structure of the Office of the USD(I), which is within the ADMIN command structure of the OSD. Being an OSD organization, the NSA is a national resource and does not belong to any particular CCMD; therefore, the NSA is not assigned to any CCMD so a COA association is inappropriate. Likewise, an OPCON association is not correct. However, a supporting and supported relationship has been established between the NSA and USSTRATCOM as authorized by the first common leader in their chain of command, the Secretary of Defense. Therefore, an appropriate relation is GS, as illustrated in Figure 38. Because of its flexible nature, this representation can be applied to many situations. A similar situation exists between the NSA and the Office of the Director of National Intelligence. Whether the GS relation is appropriate or a less strict coordination relation should be used has to be formally specified via an official document.

Figure 38. Use of the General Support Association

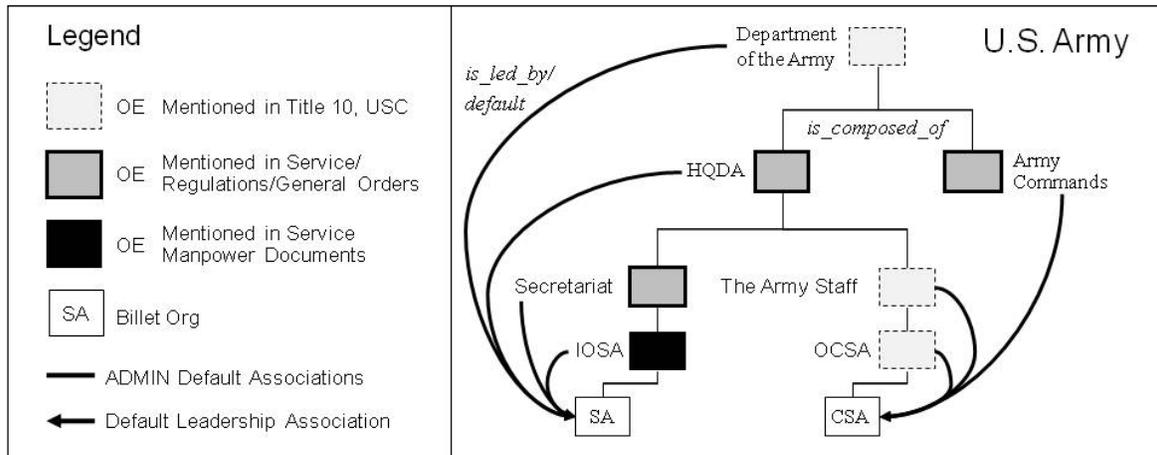


17. REPRESENTING THE UPPER ECHELONS

a. The consistent representation of command structures for the upper-most echelons of the government is an especially challenging task. This is a situation in which it is useful to alternate between viewing command structures (composition associations) and chains of command (reporting associations) because often the chains of command are better known than the command structures that manifest their organizations. The same chain of command can be derived from many command structures, while a command structure will produce only a single chain of command. This property can be exploited to ensure correctness, and more often than not, it is easier to begin with the known chain of command and then verify that the command structure selected produces that chain of command.

b. A fundamental challenge of the upper echelons is that they are governed by several documents that do not always agree, or more often, offer too many options. As an example, a study to create the top layers of the Department of the Army (DA) required documents that included: Reference (f); Reference (q); Department of the Army General Order (GO) Number 3 (Reference (u)); existing Army Tables of Distribution & Allowances (TDA) (Reference (v)); various tables of official office symbols (reflecting a hierarchy); and several unofficial organization charts and briefings. A slice of the top level command structure of the DA is presented in Figure 39, which shows the primary sources of the information used to justify each OE. For example, the billet OEs for the Secretary of the Army (SA) and the CSA are described in Reference (f); while the description of the Army Secretariat is found in GO Number 1 (Reference (w)) and GO Number 3 (Reference (u)); and the Immediate Office of the Secretary of the Army (IOSA) is found in Reference (w). This approach of having to integrate and reconcile several document sources to develop command structures is the norm for the upper echelons of the military and Government and should be expected.

Figure 39. Department of the Army Slice and Source Documents



c. Conversely, it may be difficult to find official records to justify well-known, well-entrenched organizations. The OEs for Headquarters, Department of the Army (HQDA), the Secretariat, and the Army Staff (ARSTAFF) are all well accepted organizations within the USA but, while their sub-organizations have designated and assigned UICs, they themselves do not. This does not prevent HQDA, the Secretariat, and ARSTAFF from being entered into the OS, but it does require careful investigation of the general criteria used to enter organizations into an OS. The criterion often reduces to the basic capabilities provided by the combination of composition and leadership associations. For these reasons, inclusion of leadership associations is imperative. The end result is that an organizational element exists if it has an identifiable leader.

d. The OFSC distinguishes between informal references to the Services. For example, there is a distinction between the DA and the USA. Using OFSC definitions, the USA is an org tree, or unit, defined by the descendants of its root OE named DA. Formally, the DA is an OE while

the USA is a unit. The USA includes any descendant of the tree rooted at the OE named DA that has an ADMIN relation to it, which includes Active and Reserve Component military personnel and civilians. It is interesting to note that for most of the Army National Guard (ARNG), the ADMIN relation originates at the State government, and they are operationally inserted into the USA hierarchy when activated through Reference (f). Formal recognition makes the ARNG part of the default USA, that is, officially part of the Reserve Component. Finally, the OFSC allows differentiation between being “in” the Army and being a member “of” the Army. As a Government civilian, one may be a member of the USA; that is, in a civilian billet OE that resides within the Army command structure. But a civilian is not “in” the Army. Using the OFSC definitions, being “in the Army” means that one is occupying a military billet OE within the Army command structure that requires taking a special oath. So technically, a person, not a billet OE, is “in” the Army and this includes cases when a person is not occupying a billet OE but is on a special list, such as Retired Reserve status.

e. Table 4 provides examples of some of the OEs that reside at the top echelons of the DoD command structure. This is just one set of possible choices for OE names, as several names are often used for a single OE (e.g., Army Secretariat or Office of the Secretary of the Army) and conversely, the same name may be used for multiple OEs (e.g., SecNav for both the Secretary of the Navy and the Office of the Secretary of the Navy).

Table 4. Examples of Upper Echelon OEs

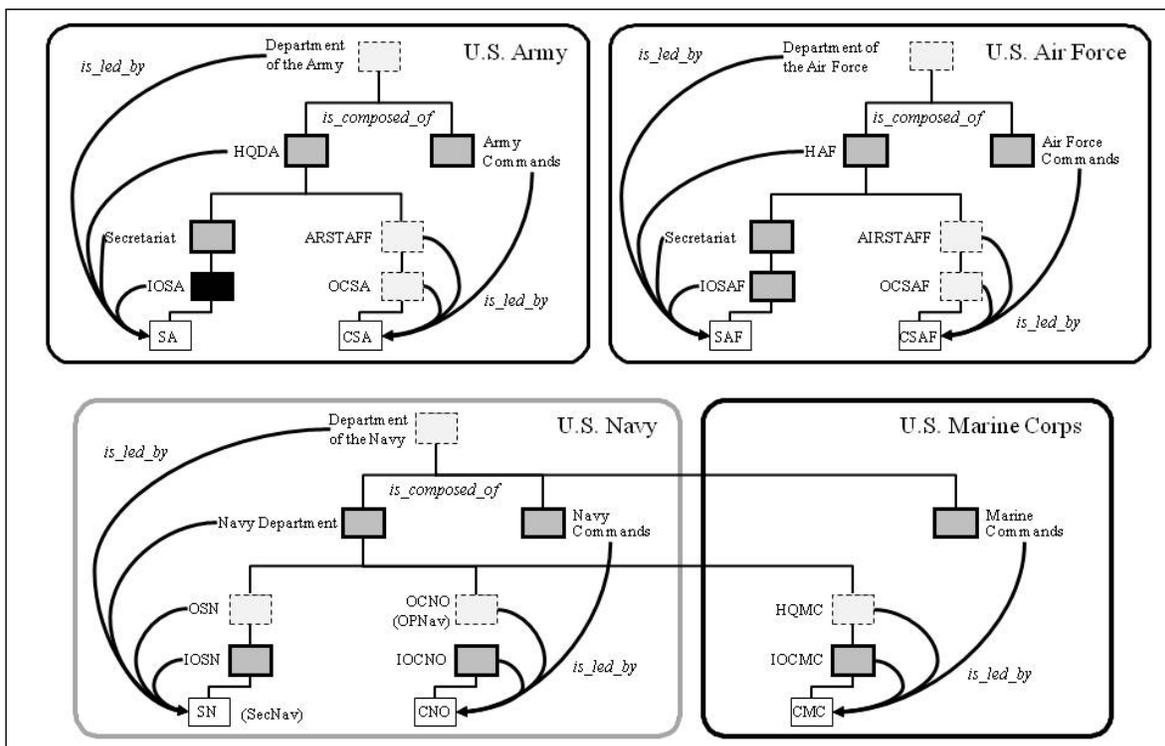
Generic OE	U.S. DoD	U.S. Army	U.S. Air Force	U.S. Navy	U.S. Marine Corps
Department	Department of Defense	Department of the Army (DA)	Department of the Air Force (DAF)	Department of the Navy (DON)	
Department HQ	OSD	Headquarters, DA (HQDA)	Headquarters, Air Force (HAF)	Navy Department	
Civilian Staff		Army Secretariat	Air Force Secretariat	Office of the Secretary of the Navy	
Civilian Leader Office	Immediate Office of the Secretary of Defense (IOSD)	Immediate Office of the Secretary of the Army (IOSA)	Office of the Secretary of the Air Force (OSAF)	Immediate Office of the Secretary of the Navy (OSN)	
Civilian Leader <i>Billet</i>	Secretary of Defense (SecDef)	Secretary of the Army (SA)	Secretary of the Air Force (SAF)	Secretary of the Navy (SECNAV)	
Military Staff	The Joint Staff (JS)	Army Staff (ARSTAFF)	Air Staff (AIRSTAFF)	Office of the Chief of Naval Operations (OPNAV)	Headquarters, Marine Corps (HQMC)
Military Leader Office	Office of the Chairman, Joint Chiefs of Staff (OCJCS)	Office of the Chief of Staff of the Army (OCSA)	Office of the Chief of Staff of the Air Force (OSCAF)	Immediate Office of the Chief of Naval Operations (IOCNO)	Immediate Office of the Commandant (IOCMC)
Military Leader <i>Billet</i>	Chairman of the Joint Chiefs of Staff (CJCS)	Chief of Staff of the Army (CSA)	Chief of Staff of the Air Force (CSAF)	Chief of Naval Operations (CNO)	Commandant of the Marine Corps (CMC)

f. The OFSC requires the upper echelons to be specified with more rigor than is traditionally applied because this data will be consumed by machines that do not have the judgment of

humans. Therefore, it is important to consistently represent “CJCS” as a billet OE and the Office of the Chairman of the Joint Chiefs of Staff (OCJCS) as a doctrinal OE.

g. Figure 40 extends (and includes) Figure 39 to the four military Services and uses the same legend; it also uses the abbreviations from Table 4. The Army and Air Force are defined by separate org trees, the Navy and Marines are defined via a segmented tree with a single OE rooted at the Department of the Navy (DON) OE. The headquarters structure of the DON is slightly more complicated than the other Services since it is composed of the Office of the Secretary of the Navy, the Office of the Chief of Naval Operations (OPNAV), and HQMC. It integrates the civilian and military HQ staffs of the Navy and Marine components. The USMC is defined by two sub-trees: one rooted at the HQMC OE and the other rooted at the Marine Commands OE. The USN is defined as the org tree rooted at DON OE minus the two USMC subtrees. However, it is clear that both are under the DON OE and the leadership of the Secretary of the Navy (SecNav). Using the leadership associations, the chain of command is correctly derived and specifies that the DON is lead by the SecNav, with the Chief of Naval Operations (CNO) and the CMC leading all those elements not under the Office of the Secretary of the Navy.

Figure 40. Selected OEs for the Top Command Structure of the Military Departments

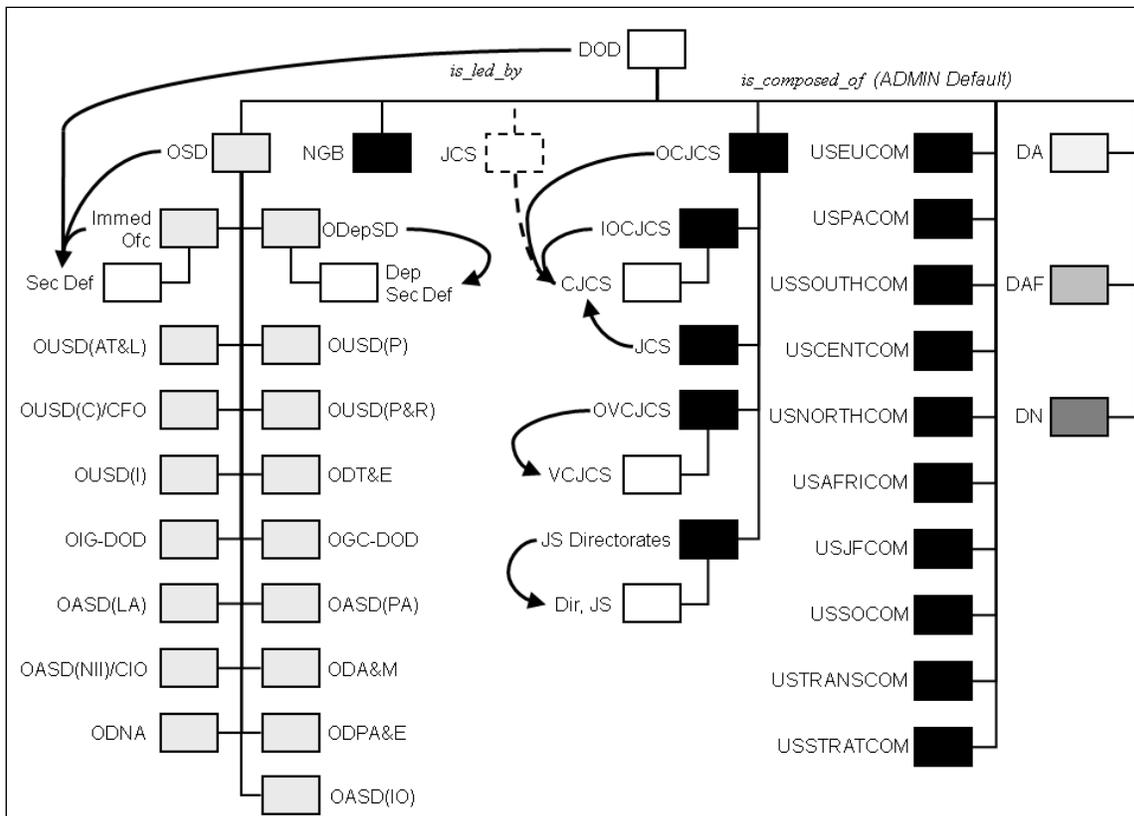


h. Under the Navy command structure, the categories “operating force” and “shore activities” are not based upon command relationships. This division can be implemented by creating two OEs with these names under the Navy and Marine Command OEs, and if necessary,

a single “Shore Activity” OE under the Office of the Secretary of the Navy OE for the subset that fits this category. The two categories can then be combined to get the complete category.

i. OFSC principles are used in the same manner to create the top echelons of the DoD to include OSD and OCJCS. There are numerous options for the command structure; however, the requirement that a correct chain of command be derived from the command structure will drive the design. One possible command structure or decomposition of the DoD is illustrated in Figure 41. This command structure produces a correct chain of command with the Secretary of Defense at the top and the Secretaries of the Military Departments, CCDRs, Chairman of the Joint Chiefs of Staff, and Director, National Guard Bureau (NGB) directly below. However, there are many command structures that can produce this same chain of command, so other factors must be considered. For example, the OE entitled Joint Chiefs of Staff (JCS) can be placed under the OCJCS OE or next to it. Both configurations produce the same chain of command, so other criterion are required to explicitly choose one over the other. An interesting selection is the type of relationship to be used for the JCS command structure. Leadership associations do not infer command; command is but one of the options. The Chairman of the Joint Chiefs of Staff leads the JCS but does not command it. Therefore, membership in the JCS will not be defined by a command relationship. Ideally, one of the DoD levels of authority can be used, perhaps coordinating authority; if not, a new type will have to be synthesized to represent it formally.

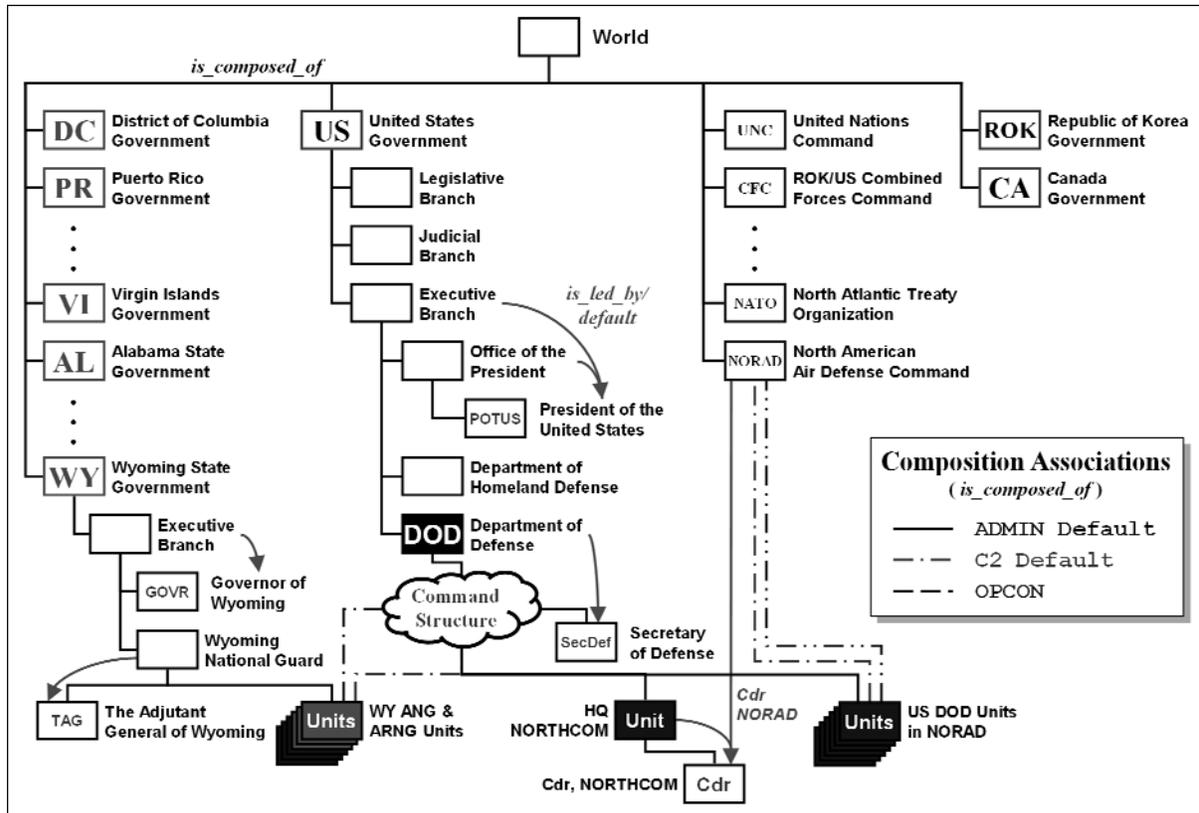
Figure 41. Selected OEs for the Top Command Structure of the Department of Defense



18. THE TOP OF THE WORLD

a. In Figure 41, the top OE, DoD, and next layer down is called “The Bridge” because it spans across the DoD and Service Components to facilitate integration of command structures. The bridge also includes levels of OEs above the DoD OE to consistently represent external organizational structure that interacts with the DoD, as illustrated by Figure 42.

Figure 42. Example of Echelons above the DoD OE



b. Examples are State governments, where the National Guard units reside by default and treaty organizations, such as NATO; NORAD, the United Nations Command (UNC); and the Republic of Korea-United States (ROK-US) Combined Forces Command (CFC). Although the U.S. Military elements within these organizations reside within the Service and joint default command structures, the actual parent organizations transcend the DoD and the U.S. Government and reside at the top of the organizational hierarchy. The top, or root, OE of the default command structure is named “World” and provides a convenient pinnacle from which to begin. Under the root OE of World are various governments: the U.S. Federal Government, the 50 State and the District of Columbia governments, three U.S. territory governments, and treaty organizations. Based on history, these OEs are expected to be relatively stable over many years. At this time, foreign governments, corporations, and civilian organizations (e.g., non-governmental organizations) are expected to be maintained separately through the OSD

controlled and maintained registry for organization unique identifiers (OUIDs). Under the U.S. Government OE are the Legislative, Executive, and Judicial Branches, and any other independent federal organizations, such as the Federal Reserve. Under the Executive Branch reside the Federal Government departments, agencies, and any organizations outside the DoD that are deemed necessary to consistently represent the incorporation of U.S. force structure. For example, the Office of the President is included to account for military aides and the Department of Homeland Security is included as the parent OE of the Coast Guard. The purpose of these OEs is not to produce an accurate representation of the world, but to consistently represent the command structures that may be associated with the U.S. Military. This is merely a slice of the structure and many intermediate OEs are missing. It does provide cases that demonstrate how the OFSC can be applied to these situations. Note that State governments are completely independent from the Federal Government, so they will not be seen under the U.S. Government, but as siblings. The same is true for treaty organizations since they are formed as a result of an agreement between one or more countries, or more specifically, country governments.

c. The level of detail below the government and territory OEs will be determined by the maintainers of the OSD organizational data. The Figure 42 example is designed to emphasize command structure options and the inclusion of key leadership positions. Under the State governments reside two key billets: the Governor and the Adjutant General (TAG), who leads the State's National Guard. From the leadership associations, the TAG works for the Governor. The ADMIN relation for the National Guard units make them part of the State government command structure. Default operational relations, like C2DEF, can be included to represent habitual relationships with active units and real operational relations, such as OPCON, can be included to represent actual deployments. Although the treaty organizations are placed at the top level with other country governments, the U.S. Military elements that make up the command structure of the treaty organizations remain under the DoD in their Service or joint ADMIN command structures. In turn, these OEs are placed within the treaty organization command structure using the C2DEF relations in the same manner described for U.S. joint command structures. Allocation and attachments are executed using command relationships, such as OPCON. Leadership associations are used in the same manner as within the DoD command structure. For example, the fact that the Commander, USNORTHCOM (CDRUSNORTHCOM) is dual-hatted as the Commander of NORAD is represented using two leadership associations: one from the NORAD OE and one from the USNORTHCOM OE. Note that with treaty organizations the chain of command begins with the designated commander. This implies that from the perspective of the treaty organization, the designated commander, per the treaty, is at the top of the treaty organizations chain of command. However, as in the NORAD case, the CDRUSNORTHCOM reports to the President of the United States, through the Secretary of Defense, as derived from the command structure in the Figure 42. If more sophisticated relationships with the leaders of treaty organizations are required, then these must be added with the appropriate command relationship. Finally, the DoD levels of authority do not technically extend above the Executive Branch of the U.S. Government, so the ADMIN relation is used only for consistency and to ensure continuity using tree traversal algorithms.

APPENDIX 1 TO ENCLOSURE 3OFSC BUSINESS RULES

1. To ensure mathematical rigor sufficient to support machine-to-machine data processing, the business rules whereby OFSC relations are derived from OFSC associations are stated in an unambiguous yet simplified version of first-order logic (FOL). Figure 43 explains the logical operators and quantifiers used in these sentences, employing the form $P(t_1, \dots, t_n)$, where P is a predicate and t_1, \dots, t_n is a set of arguments. Predicates that are associations will be underlined (e.g. HAD) to clearly distinguish them from relations (e.g., ADMIN). For both types of predicates, there are two arguments that represent an ancestor and descendant OE (e.g., (x,y)). For an association, the arguments represent the endpoints of a single link (the parent and child OE), while for a relation they represent the endpoints of a path through the tree graph that can be composed of many links. Quantifiers are followed by a list of applicable variables that form the arguments of the predicates. See Table 1 in Enclosure 3 for a complete list of the OFSC relations and their invoking associations.

Figure 43. OFSC Logical Operators and Quantifiers

<p><u>LOGICAL OPERATORS</u></p> <p>“\rightarrow” denotes LOGICAL CONDITIONAL; read “Implies”</p> <p>“\neg” denotes LOGICAL NOT</p> <p>“\wedge” denotes LOGICAL AND</p> <p>“\vee” denotes LOGICAL OR</p> <p>“\leftrightarrow” denotes LOGICAL BI-CONDITIONAL; read “is equivalent to,” which implies “in both directions”</p>	<p><u>QUANTIFIERS</u></p> <p>“\forall” denotes the universal quantifier; read “for all”</p> <p>“\exists” denotes the existential quantifier; read “there exists” or “for some”</p> <p>“$\neg\exists y$” denotes “No y Exists, such that”</p>
<p><u>OTHER</u></p> <p>“\in” denotes “is an element of” a stated set</p> <p>ASSOC is read “OFSC Association”</p> <p>RELAT is read “OFSC Relation”</p>	
<p><u>EXAMPLE:</u> $\forall xy \text{ HAD}(x,y) \rightarrow \text{ADMIN}(x,y)$</p> <p>read: “For any two OEs (called x and y), that are the endpoints of a HAD association, where x is the parent OE and y is the child OE, the association HAD implies that an relation named ADMIN exists between those OEs.”</p> <p>In other words, in the OFSC a HAD association invokes the ADMIN relation.</p>	

2. Figure 44 is a complete listing of the OFSC business rules. As the effects of the rules are cumulative, they are discussed throughout the document as they interact with other rules. Where applicable, FOL is used for rigor (see Figure 43). For further details regarding use of the terms explicit and implied relations, traversal, propagation, preemption, and suspension, see section 4.c of Enclosure 3 and the Glossary.)

Figure 44. OFSC Business Rules

OVERARCHING RULES

Rule 1: Every organization has a leader.

An augmentation OE is the only exception to this rule (see section 3.c of Enclosure 3).

Rule 2: An organization's command structure and its corresponding chain of command must demonstrate equivalence.

Rule 3: A billet cannot be decomposed into any other OEs.

UNITY OF COMMAND

Rule 4: Identical associations cannot exist simultaneously.

$\forall xy \text{ ASSOC}(x,y) \rightarrow \neg \exists z \text{ ASSOC}(z,y)$ where " $\neg \exists z$ " denotes "No z Exists, such that" and $\text{ASSOC} \in \{\text{HAD}, \text{CCD}, \text{COA}, \text{CCO}, \text{CCT}, \text{and FDS}\}$

The one exception to this rule is the FGS association (see section 12 of Enclosure 3).

Rule 5: Identical relations cannot exist between a subordinate and superior OE in different paths simultaneously.

$\forall xy \text{ RELAT}(x,y) \rightarrow \neg \exists z \text{ RELAT}(z,y)$ where

$\text{RELAT} \in \{\text{ADMIN}, \text{C2DEF}, \text{COCOM}, \text{OPCON}, \text{TACON}, \text{and DS}\}$,

If $\text{RELAT} = \text{COCOM}$, then x and z are CCMDs.

- This rule reiterates the ban against identical associations (Rule 4) as applied to the relations invoked by those associations (Rule 6). It also bans conditions defined below regarding simultaneous and identical propagated relations (Rule 8) or implied relations (Rule 9) between a subordinate and superior OE in different paths.
- For other possible cases involving identical relations, the rules of preemption apply (see Rule 10 for explicit relations and Rule 11 for implicit relations).
- The one exception to this rule is the GS relation (see section 12 of Enclosure 3).

Figure 44. OFSC Business Rules, Continued**EXPLICIT RELATIONS: INVOCATION**

Rule 6: An explicit relation is invoked by its association.

- The ADMIN relation is invoked via the HAD association.
 $\forall xy \text{ HAD}(x,y) \rightarrow \text{ADMIN}(x,y)$
 As the foundation for all other OFSC relations, every inventory OE must have an ADMIN relation between it and the DoD (root) OE, or in the case of the National Guard, State NG (root) OE.
- The C2DEF relation is invoked via the CCD association.
 $\forall xy \text{ CCD}(x,y) \rightarrow \text{C2DEF}(x,y)$
- The COCOM relation (i.e., assignment of forces) is invoked by a COA association.
 $\forall xy \text{ COA}(x,y) \rightarrow \text{COCOM}(x,y)$,
 where x exists that is a CCMD and y is a military organizational element.
- By law, COCOM authority may not be delegated from a CCDR. Therefore, the COCOM relation invocation must be initiated from a CCMD and may only apply to military OEs; by definition, civilians may not be assigned.
- The OPCON relation is invoked via the CCO association.
 $\forall xy \text{ CCO}(x,y) \rightarrow \text{OPCON}(x,y)$
- The TACON relation is invoked via the CCT association.
 $\forall xy \text{ CCT}(x,y) \rightarrow \text{TACON}(x,y)$
- The DS relation is invoked via the FDS association.
 $\forall xy \text{ FDS}(x,y) \rightarrow \text{DS}(x,y)$
- The GS relation is invoked via the FGS association.
 $\forall xy \text{ FGS}(x,y) \rightarrow \text{GS}(x,y)$

Figure 44. OFSC Business Rules, Continued**EXPLICIT RELATIONS: TRAVERSAL**

Rule 7: Explicit default and operational relations traverse paths of their own associations via the transitive property.

$\forall xyz \text{ RELAT}(x,y) \text{ AND RELAT}(y,z) \rightarrow \text{RELAT}(x,z)$ where
 $\text{RELAT} \in \{\text{ADMIN}, \text{C2DEF}, \text{COCOM}, \text{OPCON}, \text{TACON}\}$

- Traversal exists providing Rule 4 is not violated.
 $\forall xyz ((\text{ADMIN}(x,y) \text{ AND } \underline{\text{HAD}}(y,z)) \rightarrow \text{ADMIN}(x,z))$
 $\forall xyz ((\text{C2DEF}(x,y) \text{ AND } \underline{\text{CCD}}(y,z)) \rightarrow \text{C2DEF}(x,z))$
 $\forall xyz ((\text{COCOM}(x,y) \text{ AND } \underline{\text{COA}}(y,z)) \rightarrow \text{COCOM}(x,z))$
 $\forall xyz ((\text{OPCON}(x,y) \text{ AND } \underline{\text{CCO}}(y,z)) \rightarrow \text{OPCON}(x,z))$
 $\forall xyz ((\text{TACON}(x,y) \text{ AND } \underline{\text{CCT}}(y,z)) \rightarrow \text{TACON}(x,z))$
- The support relations are not transitive.

EXPLICIT RELATIONS: PROPAGATION

Rule 8: The default relations (ADMIN and C2DEF) may propagate other explicit relations until exhausted, preempted, or suspended.

- An explicit ADMIN relation may propagate an explicit C2DEF relation and all three operational relations (COCOM, OPCON, and TACON) until exhausted, preempted (Rule 10), or suspended (Rules 12 and 13).
 $\forall xyz ((\text{C2DEF}(x,y) \text{ AND } \text{ADMIN}(y,z)) \rightarrow \text{C2DEF}(x,z))$
 $\forall xyz ((\text{COCOM}(x,y) \text{ AND } \text{ADMIN}(y,z)) \rightarrow \text{COCOM}(x,z))$
 Note that x is always a COCMD.
 $\forall xyz ((\text{OPCON}(x,y) \text{ AND } \text{ADMIN}(y,z)) \rightarrow \text{OPCON}(x,z))$
 $\forall xyz ((\text{TACON}(x,y) \text{ AND } \text{ADMIN}(y,z)) \rightarrow \text{TACON}(x,z))$
 Note that the COA association may be used to invoke the COCOM relation to continue it beyond a cessation of ADMIN propagation.
 $\forall xyz ((\text{COCOM}(x,y) \text{ AND } \underline{\text{COA}}(y,z)) \rightarrow \text{COCOM}(x,z))$
- An explicit C2DEF relation may propagate an explicit OPCON or TACON relation until exhausted or preempted (Rule 10).
 $\forall xyz ((\text{OPCON}(x,y) \text{ AND } \text{C2DEF}(y,z)) \rightarrow \text{OPCON}(x,z))$
 $\forall xyz (\text{TACON}(x,y) \text{ AND } \text{C2DEF}(y,z)) \rightarrow \text{TACON}(x,z)$
- Neither the ADMIN nor the support relations are propagated by any other relation. They must be explicitly invoked (Rule 5).

Figure 44. OFSC Business Rules, Continued

EXPLICIT RELATIONS: PREEMPTION

Rule 9: A propagating explicit relation is always preempted by an invoked relation of the same type.

- This situation applies to the C2DEF or COCOM relations as propagated by ADMIN, and the OPCON and TACON relations as propagated by either default relation (ADMIN and C2DEF). This Rule is not applicable to the support relations (DS and GS) that do not propagate.
- An invoked COCOM relation preempts a propagated COCOM relation.
 $\forall wxyz (ADMIN(x,y) \text{ AND } COCOM(w,z) \text{ AND } \underline{COA}(z,y)) \rightarrow COCOM(w,y)$
 If OE y has a COCOM relation propagating via an ADMIN relation from parent x, but an invoking COA association exists to it from parent z via CCMD w, then the COCOM relation generated from the invoked relation from CCMD w always preempts the COCOM relation propagated over the default relation.
- An invoked OPCON relation always preempts a propagating OPCON relation.
 $\forall xyz (ADMIN(x,y) \text{ AND } \underline{CCO}(z,y)) \rightarrow OPCON(z,y)$
 $\forall xyz (C2DEF(x,y) \text{ AND } \underline{CCO}(z,y)) \rightarrow OPCON(z,y)$
- An invoked TACON relation always preempts a propagating TACON relation.
 $\forall xyz (ADMIN(x,y) \text{ AND } \underline{CCT}(z,y)) \rightarrow TACON(z,y)$
 $\forall xyz (C2DEF(x,y) \text{ AND } \underline{CCT}(z,y)) \rightarrow TACON(z,y)$
- Per Rule 5, there can be only one OPCON or TACON relation at a time. As the complexity of task organization increases, this constraint must be maintained in all cases. If a unit with concurrent ADMIN and C2DEF relations (which is permitted) is placed under OPCON to an external organization (also permitted), simultaneous OPCON authorities may propagate to the same OE(s) along different paths, thus violating Rule 5. This contradiction is not resolvable without human intervention.

IMPLIED RELATIONS: NON-INVOCATION

Rule 10: The distinct properties (e.g., authorities) of a relation may be implied by another relation without being invoked.

- The ADMIN relation implies the C2DEF relation.
 $\forall xy \text{ ADMIN}(x,y) \rightarrow \text{C2DEF}(x,y)$
- The C2DEF relation and the COCOM relation both imply the OPCON relation.
 $\forall xy \text{ C2DEF}(x,y) \rightarrow \text{OPCON}(x,y)$
 $\forall xy \text{ COCOM}(x,y) \rightarrow \text{OPCON}(x,y)$
- The OPCON relation implies the TACON relation.
 $\forall xy \text{ OPCON}(x,y) \rightarrow \text{TACON}(x,y)$
 Additionally, the OPCON relation denotes the authority to designate a support relationship, though no support relation exists independent of an invoked support (DS or GS) relation (see section 12 of Enclosure 3).
- The ADMIN, COCOM, and support relations are never implied by any other relation. These relations must be explicitly invoked.

Figure 44. OFSC Business Rules, Continued

IMPLIED RELATIONS: PREEMPTION

Rule 11: An implied relation is always preempted by an explicit relation of the same type.

Note: This rule declares that an implied relation is preempted by either an invoked or a propagated relation. This situation applies to the C2DEF relation and the operational relations of OPCON and TACON.

- A C2DEF relation implied by the ADMIN relation is always preempted by an explicit C2DEF relation.
 $\forall xyz ((\text{ADMIN}(x,y) \text{ AND } \text{C2DEF}(z,y)) \rightarrow \text{C2DEF}(z,y))$
- An OPCON relation implied by the C2DEF, or COCOM relation is always preempted by an explicit OPCON relation.
 $\forall xyz ((\text{C2DEF}(x,y) \text{ AND } \text{OPCON}(z,y)) \rightarrow \text{OPCON}(z,y))$
 $\forall xyz ((\text{COCOM}(x,y) \text{ AND } \text{OPCON}(z,y)) \rightarrow \text{OPCON}(z,y))$
- A TACON relation implied by the OPCON relation, including via the C2DEF or COCOM relation, is always preempted by an explicit TACON relation.
 $\forall xyz ((\text{C2DEF}(x,y) \text{ AND } \text{TACON}(z,y)) \rightarrow \text{TACON}(z,y))$
 $\forall xyz ((\text{COCOM}(x,y) \text{ AND } \text{TACON}(z,y)) \rightarrow \text{TACON}(z,y))$
 $\forall xyz ((\text{OPCON}(x,y) \text{ AND } \text{TACON}(z,y)) \rightarrow \text{TACON}(z,y))$
- The ADMIN, COCOM, and support relations are never implied. The allocation of forces is defined by the temporary preemption of the OPCON or TACON relations implied by the default relation (C2DEF) or of the COCOM relation, by invoked OPCON and TACON relations that do not change either the administrative command structure (documented by the default relations) nor the assignment property (documented by the COCOM relation).

SUSPENSION

Rule 12: Propagation of the COCOM relation (i.e., assignment of forces) is suspended by a COU association.

$$\forall xyz ((\text{COCOM}(x,y) \text{ AND } \underline{\text{COU}}(y,z)) \rightarrow \neg \text{COCOM}(x,z))$$

Rule 13: Propagation of an explicit, but not implied, OPCON or TACON relation is suspended by a CCS association

$$\forall xyz ((\text{OPCON}(x,y) \text{ AND } \underline{\text{CCS}}(y,z)) \rightarrow \neg \text{OPCON}(y,z))$$

$$\forall xyz ((\text{TACON}(x,y) \text{ AND } \underline{\text{CCS}}(y,z)) \rightarrow \neg \text{TACON}(y,z))$$

A CCS association will not suspend an implied OPCON or TACON relation; this can only be accomplished via exhaustion or preemption (see Rule 10).

APPENDIX 2 TO ENCLOSURE 3

IMPLEMENTATION GUIDANCE FOR GFM DI ORG SERVERS

1. OE NAMING

a. Because of the existence of a command structure that includes a formal hierarchy that connects every OE via a parent child relationship, a specific approach is used to name an OE that allows one to fully exploit the properties of the OFSC. The approach is to use a name that refers only to the OE itself so that it can be concatenated with other names up and down the hierarchy to produce more global names. Therefore, references to ancestors or descendants should not be included in the OE name. This approach facilitates the automatic building of concatenated, hierarchical names by using tree traversal algorithms that move up and down the hierarchy collecting OE names in an ordered sequence, usually with delimiters. This is called a derived name and will produce a correct result only when the OE name refers solely to the OE itself. Derived names can be maintained as aliases to OEs. Likewise, other well known, legacy names can also be maintained as aliases for an OE. To facilitate the derived name process, a short version of the OE name should be maintained that is compact so that it can be easily read when in a potentially long sequence of concatenated OE names. If cleverly selected, the short name can also be used for other applications such as map symbology and other visual annotations.

b. The regular, or full OE name should be easily read and understood by anyone and should avoid including abbreviations, acronyms, codes, symbols, and auxiliary information. The use of title case is encouraged as it is easier to read than all upper case letters. Consistency should be maintained whenever practicable. Force developers should establish a set of consistently applied rules (e.g., 2nd versus 2D) for populating their authoritative data. For example, there are many acceptable ways to include numbers (e.g., Second, 2nd, 2D). It does not matter which convention is selected as long as it is consistently applied. As the OSs provide authoritative organizational data for use DoD-wide, the naming conventions employed should be carefully and rigorously maintained.

2. ORGANIZATION SERVER POPULATION AND CONTENT. The OSs contain force structure data that is considered stationary data, meaning that is in not static, but relatively invariant over its lifetime with a known or expected periodicity of significant duration. This allows the authorization data to be treated as if it were static, analogous to a phone book. From an OFSC perspective, this includes default relations, both ADMIN and C2DEF, and COCOM. These are maintained in accordance to the security policies in place. Dynamic relations, such as OPCON, TACON, and support, are not maintained in the OSs. Dynamic force structure data is maintained in the systems that create those dynamic conditions, such as battle command systems and logistic systems. However, any relatively long-term OE may be maintained in the org servers, such as a provisional unit, whose lifetime can range from months to years.

GLOSSARYPART I. ABBREVIATIONS AND ACRONYMS

ACE	Air Combat Element
ACMC	Assistant Commandant of the Marine Corps
ADCON	administrative control
ADMIN	administrative default (Table 1)
ADS	authoritative data source
AGR	Active Guard Reserve
ARNG	Army National Guard
ARSTAFF	The Army Staff
ASD(NII)/DoD CIO	Assistant Secretary of Defense for Networks and Information Integration / Department of Defense Chief Information Officer
AWACS	Airborne Warning and Control System
C2	command and control
C2DEF	command and control default (Table 1)
CCD	command and control default (Table 1)
CCDR	Combatant Commander
CCMD	Combatant Command
CCO	command and control/operational control (Table 1)
CCT	command and control/tactical control (Table 1)
CDR, MARFORSTRAT	Commander, Marine Corps Forces Strategic Command
CDRUSNORTHCOM	Commander, USNORTHCOM
CFC	Combined Forces Command
CG, MCCDC	Commanding General, Marine Corps Combat Development Command
CG, MCI-NCR	Commanding General, Marine Corps Installations National Capital Region
CJCS	Chairman of the Joint Chiefs of Staff
CMC	Commandant of the Marine Corps
CME	contract man-year equivalents
CNO	Chief Naval Operations
COA	COCOM Assign (Table 1)
COCOM	combatant command (command authority)
COU	COCOM Unassign (Table 1)
DA	Department of the Army
DC, CD&I	Deputy Commandant, Combat Development and Integration
DIRNSA	Director National Security Agency
DIRLAUTH	direct liaison authorized
DoDD	Department of Defense Directive
DoDI	Department of Defense Instruction
DON	Department of the Navy

DOO	Default Operational Organization
DS	direct support
FDS	Fire Unit and Combat Support/Direct Support (Table 1)
FGS	Fire Unit and Combat Support/General Support (Table 1)
FOL	first-order logic
FTE	full-time equivalent
FUCS	Fire Unit and Combat Support
FY	fiscal year
GCE	Ground Combat Element
GFM	Global Force Management
GFM DI	Global Force Management Data Initiative
GFM XSD	Global Force Management Extensible Markup Language Schema Definition
GFMIG	Global Force Management Implementation Guidance
GS	general support
HAD	Has-Admin Default (Table 1)
HQ	headquarters
HQDA	Headquarters, Department of the Army
HQMC	Headquarters Marine Corps
HSADMI	has under command for admin (GFM XSD)
IA	individual augmentee
ILC	is-led-by, command conditional (Table 1)
ILD	is-led-default, default (Table 1)
IMA	individual mobilization augmentee
IOSA	Immediate Office of the Secretary of the Army
JCS	Joint Chiefs of Staff
JDAL	Joint Duty Assignment List
JFC	joint force commander
JFCC	Joint Functional Component Commands
JFCC-NW	Joint Functional Component Command for Network Warfare (USSTRATCOM)
JFHQ-NCR	Joint Force Headquarters - National Capital Region
JP	Joint Publication
JTF	joint task force
JTF-NCR	Joint Task Force - National Capital Region
LTC	lieutenant colonel
MAJCOM	Major Command
MARFORSTRAT	Marine Forces Strategic Command
MCCDC	Marine Corps Combat Development Command

MCI-NCR	Marine Corps Installations National Capital Region
MEU	Marine Expeditionary Unit
MLG	Marine Logistics Group
MT	military technician
NATO	North Atlantic Treaty Organization
NDAA	National Defense Authorization Act
NG	National Guard
NGB	National Guard Bureau
NORAD	North American Aerospace Defense Command
NPP	non-permanent party (USAF)
NSA	National Security Agency
OCJCS	Office of the Chairman of the Joint Chiefs of Staff
OE	organizational element
OFSC	Organizational and Force Structure Construct
OOD	Officer of the Deck
OPCON	operational control
OPNAV	Office of the Chief of Naval Operations
ORSA	operations research and systems analysis
OS	organization server
OUID	organization unique identifier
ROK-US	Republic of Korea-United States
SA	Secretary of Army
SAF	Secretary of the Air Force
SCC	Service Component Command
SECDEF	Secretary of Defense
SECNAV	Secretary of the Navy
T2P2	training, transients, patients, prisoners (USMC)
TACON	tactical control
TAG	the Adjutant General
TDA	Army Tables of Distribution and Allowances
TPP&H	transient, patient, prisoner, and holdees (USN)
TPU	troop program unit
TTHS	trainee, transient, holding, and student (USA)
UC	Unified Command
UCP	Unified Command Plan
UIC	Unit Identification Code
UNC	United Nations Command
USA	United States Army
USAF	United States Air Force
U.S.C.	United States Code

USD(AT&L)	Under Secretary of Defense for Acquisition, Technology, and Logistics
USD(I)	Under Secretary of Defense for Intelligence
USD(P&R)	Under Secretary of Defense for Personnel and Readiness
USMC	United States Marine Corps
USN	United States Navy
USNORTHCOM	U.S. Northern Command
USSTRATCOM	U.S. Strategic Command
WSO	weapon systems officer
XML	extensible markup language
XSD	extensible markup language schema definition

PART II. DEFINITIONS

Unless otherwise noted, these terms and their definitions are for the purposes of this Volume.

accountable OE. An OE that has one or more inventory OEs as descendants in its command structure. It may or may not also be an inventory OE.

active association. A single resulting association that remains for a given set of conditions when multiple co-existing associations are distinguished by rigorously defined criteria.

active OE. An accountable OE whose inventory OEs includes one or more manpower authorizations; a default leadership OE, identified as such by an is-led-by association, with descendants that contain billet OEs.

ADCON. Defined in Reference (h).

ADMIN. An OFSC relation called administrative default that is used to reflect the administrative branch of the chain of command (per Reference (e)) as implemented by the Services and components in fulfilling the Reference (f) function to organize their forces. For the National Guard, the ADMIN relation normally goes through the State governor via Reference (j). The ADMIN relation is a surrogate for ADCON for which there are many subcategories of relations that vary across the Services and whose definitions have yet to be unified. It is the foundation for all other GFM DI relations and it includes all aspects of ADCON unless otherwise directed, implies the C2DEF relation in the absence of an explicit C2DEF relation, and encompasses all authorized inventory of a unit.

administrative chain of command. One of the two branches of the chain of command described, though not named as such, by Reference (e).

administrative relationship. An OFSC subcategory of leadership relationship that denotes the exercise of authority in the administrative branch of the chain of command, per Reference (e), at

all levels in the military and civilian organizational hierarchies of the DoD. Its subtypes are ADMIN and ADCON.

allocate (allocation). Based on definitions in References (e) and (l), the OFSC interpretation of allocation is the temporary transferral of forces to a CCMD to which they are not assigned, via the authority of the Secretary of Defense and under procedures prescribed by the Secretary of Defense and approved by the President. This may be represented by an OPCON or TACON relation with a CCMD OE from which the allocated forces do not already possess a COCOM relation.

allocated forces. Defined in Reference (l).

ancestor. A node on the path from a descendant to the root.

apportionment. Defined in Reference (h).

assign (assignment). To lawfully place, by the official action of the Secretary of Defense via section 162 of Reference (f), military units under the COCOM of a CCDR. In the OFSC, this is represented via the COCOM relation.

assigned forces. Those forces and resources that have been placed under the COCOM of a CCDR by the direction of the Secretary of Defense in his Secretary of Defense Memorandum (Reference (x)) in accordance with section 162 of Reference (f). Forces and resources so assigned are available for normal peacetime operations of that command.

association. A link of an OFSC organization tree. The OFSC includes three classes of associations: composition, leadership, and reporting (see Table 1 in Enclosure 3 of this Instruction). Composition associations invoke the OFSC relations (see OFSC Rule 6 in Appendix 1 to Enclosure 3). Reporting associations document the chain of command and may be derived using the composition and leadership associations.

attached. Derived from term “attach,” which is defined in Reference (h).

augmentation OE. An OE created to unite and account for a grouping of OEs that are to be embedded in another unit. They are an exception to OFSC Rule 1 that every internal OE must have a designated leadership billet identified.

authorization inventory. The set of manpower and equipment authorizations associated with one or more OEs.

billet OE. An OE created for the purpose of employing a person (i.e., manpower). A billet OE may represent a military end-strength authorization for the purpose of employing a military service member or a workload equivalent created for the purpose of employing a civilian, either a Government employee or a non-government employee.

C2DEF. An OFSC relation called command and control default that is used to provide details about routine or expected configurations of an operational nature and permits a command structure to be partitioned into administrative and operational components. This allows default operational organizations to be included via a separate operational structure when it is more practical or customary, to describe default unit structure with dual, simultaneous administrative and operational command structures. C2DEF implies OPCON in the absence of any other operational relations. Unlike the ADMIN relation, the C2DEF relation does not propagate the assignment of forces (via the COCOM relation), but it does propagate the OPCON and TACON relations.

cascading leadership associations. The OFSC occurrence of redundant leadership billet OEs in a raw chain of command due to linkages to that leadership billet OE of simultaneous is-led-by associations from different echelons of the command structure. The redundancies may occur in series or in parallel, but either may be resolved to a unified chain of command via a simple conversion algorithm.

CCD. An OFSC composition association explicitly represented in the GFM XSD that derives the C2DEF relation, used to provide details about routine or expected configurations of an operational nature and permits a command structure to be partitioned into administrative and operational components.

CCO. An OFSC composition association explicitly represented in the GFM XSD that derives the OPCON relation.

CCS. An OFSC composition association explicitly represented in the GFM XSD that suspends a previously invoked CCD relation.

CCT. An OFSC composition explicitly represented in the GFM XSD that derives the TACON relation.

chain of command. 1. Defined in Reference (h). 2. An OFSC organization tree composed only of billet OEs with the associations between them defining their supervisory relationships.

chain of leadership. A term used synonymously with chain of command by the OFSC to denote a DoD organization tree, military or civilian, composed only of billet OEs with the associations between them defining their supervisory relationships.

child node. A node within a tree graph with a link to a superior node, in accordance with the tree property.

clarity of command. An OFSC principle that mandates that for a given set of criteria (DoD levels of authority, time, and classification level) a single leadership path can be automatically resolved between any DoD billet and the President of the United States.

CME: Defined in Reference (m).

COA. An OFSC composition association explicitly represented in the GFM XSD that invokes the COCOM relation, initiated only between a UC OE and a subordinate unit. Thereafter, the COCOM relation propagates via the ADMIN relation, derived from HAD associations, to every descendant of the subordinate assigned unit, minus any exceptions as indicated by COU associations.

COCOM. Defined in Reference (h).

command. Defined in Reference (e).

command and control/tactical control. Association category and/or subcategory name.

command authority. The authority that a military commander lawfully exercises over subordinates including authority to assign missions and accountability for their successful completion. Command authority is exercised in the administrative and operational branches of the chain of command. It should not be confused with Combatant Command (Command Authority), or COCOM. The definition for command authority is derived from a description of “Command” in Reference (e).

command relationship. Defined in Reference (h).

command structure. 1. The organizational hierarchy through which command or leadership is exercised. 2. A set of composition associations that define a unit. This term and its definition are proposed for inclusion in Reference (h).

community of interest. Defined in Reference (d).

composition association. The primary links within an OFSC tree graph that define the aggregation (or decomposition) of units, thus representing their organizational structure. The interpretation is read “is-composed-of.” There are eight distinct types depending on the leadership relationship being invoked (CCD, COA, COU, CCO, CCT, FDS, FGS, and HAD. (See OSFC relations and associations in Table 1.)

construct. A concept, model, or schematic idea. In the context of the OFSC, it does not refer to a particular organization tree.

COU. An OFSC composition association explicitly represented in the GFM XSD that suspends a previously invoked COCOM relation.

crew alignment. The process of associating a platform with a crew OE.

crew assignment. The process of associating subordinate OEs (e.g., billet OEs) to a crew OE to build a unit (a crew org tree).

crew OE. An OE created for the purpose of employing a piece of materiel, commonly called a platform, that requires one or more persons to operate and that transports those persons.

cycle. A path in a graph, forbidden by the tree property, wherein the start and end node is the same.

default command structure. The initial command structure on which all other command structures are based that represents the starting point of the force structure development process per title 10 of Reference (f) responsibilities to organize their forces. It is composed of the ADMIN and C2DEF (composition) relations.

default force structure. A unit (org tree) composed of a set of default operational organizations and a default command structure.

default relationship. An OFSC subcategory of leadership relationship that denotes the exercise of authority in the administrative branch of the chain of command, per Reference (e), at all levels in the military and civilian organizational hierarchies of the DoD. Its subtypes are ADMIN and C2DEF.

descendants. Within a tree graph, the set of all the children of a root node.

doctrinal OE. An OE created to facilitate mission accomplishment. This may be for a multitude of reasons, including the employment of tactics, techniques, procedures, or administrative functions. It reflects the way organizations conduct their business, either operationally or administratively.

DOO. The set of relatively stable OEs that are used routinely in the employment of a unit.

DS. Defined in Reference (h).

executive agent. Defined in Reference (o).

explicit relation. A relation whose properties exist in an org tree due to the presence of an invoking association.

FDS. Association subcategory name.

FGS. Association subcategory name.

force management. An organizing construct of processes, policies, organizational information, and tools that informs senior leader decision making on the global joint sourcing of the defense strategy.

force structure. The composition of DoD organizations that comprise and support U.S. defense forces as specified in the current National Defense Authorization Act (NDAA) and defines the organizational hierarchy through which leadership authority is exercised. This includes military end strength, military equipment procured by programs, and DoD civilian personnel to execute programs as funded by the current and applicable previous years NDAA's, and as organized

under the Services' responsibilities as enumerated in Reference (f), Reference (j), title 5, U.S.C. (Reference (y)), title 14, U.S.C. (Reference (z)), and title 50, U.S.C. (Reference (aa)).

FTE. Defined in Reference (g).

FUCS. Association category name.

garrison force OE. An OE created for the purpose of operating an installation and managing the assets assigned to accomplish the installation mission.

GFM. Defined in Reference (l).

GFM DI. The effort within the DoD to formulate a strategy for organizing data to better support the GFM process. GFM DI was established by the Strategic Planning Guidance FY 2006-2011 (Reference (ab)).

GFM XSD. An XML document that defines a schema supported by the Web services of the GFM OS.

GS. Defined in Reference (h).

habitual. An OFSC term applied to crew assignment when the composition of a crew is explicitly represented in the manpower authorizations.

HAD. An OFSC composition association explicitly represented in the GFM XSD that invokes the ADMIN relation to denote the administrative chain of command.

ILC. A subcategory of leadership association that denotes a contingency leadership responsibility has been pre-designated. The actual command relationship, typically OPCON, must be activated by higher authority, usually the Secretary of Defense.

ILD. A subcategory of leadership association that links a doctrinal OE serving as a root node of a unit to the billet OE that, by default, leads the unit. It is used to denote leadership at any echelon in either the administrative or operational chain of command.

implied relation. A relation whose properties exist in an org tree as an inherent aspect of another relation without being invoked. See OFSC Rule 10 in Appendix 1 of Enclosure 3.

internal node. A node within a tree graph with a parent and at least one child.

inventory OE. An OE with associated authorization inventory, either manpower or equipment.

is-led-by. Association category name for leadership associations.

leadership. The authority exercised over subordinates by virtue of grade or assignment within the DoD.

leadership associations. The links within an OFSC tree graph that represent leadership at any level within the structure of an organization, in both military and civilian hierarchies, by denoting which billet OE is in charge of which doctrinal OE(s). Leadership associations are never used to directly connect billet OEs, yet filtering them to conceal doctrinal OEs and display only linkages between billets derives the reporting associations that reveal the COC. The two types of leadership associations are default and command conditional. Also called an is-led-by link or is-led-by association.

leadership relationship. An OFSC term used to denote the exercise of authority, administrative or operational, at any level within a DoD organization, military or civilian.

leadership structure. The organizational hierarchy, military and civilian, through which leadership authority is exercised throughout the DoD, whether administrative or operational in nature. A set of composition associations that define a unit. Used synonymously with command structure by the OFSC.

leaf node. A node within a tree graph that has no child.

link. A connector between nodes in a tree graph.

manpower. Defined in Reference (g).

military end strength. Defined in Reference (g).

multi-hatted positions. A billet OE that has leadership responsibility in more than one chain of command or command structure. In the OFSC, multi-hatted positions are implemented using multiple leadership “is-led-by” associations.

mutually exclusive. A situation is mutually exclusive if it involves two or more events or possibilities in which the occurrence of one precludes the occurrence of the other.

node. The aggregation points of a tree graph that are connected by links in accordance with the tree property.

non-habitual. An OFSC term applied to crew assignment when the composition of a crew is not explicitly represented in the manpower authorizations, and therefore, crew composition is represented via roles. To make a crew OE operationally viable, roles must be replaced with associations to OEs of the type specified to fill the role (e.g., a billet OE). This representation is used when crew composition is ad hoc. See also role.

OE. Any of five types of aggregation points (nodes) within a graph (unit) that has a designated leader documented by an OFSC association (link). See also association; billet OE; crew OE; doctrinal OE; garrison force OE; inventory OE; relation; unit.

OFSC. Defined in Reference (a).

OFSC organization. An aggregation point with a leader to which arbitrary entities can be associated and that may be used to unite other organizations.

OPCON. Defined in Reference (h).

operational chain of command. One of the two branches of the chain of command described, though not named as such, by Reference (e).

operational relationship. An OFSC subcategory of leadership relationship that denotes the exercise of authority in the operational branch of the chain of command, per Reference (e), at all levels in the military and civilian organizational hierarchies of the DoD. Its subtypes are COCOM, OPCON, TACON, and support.

organization. An OFSC term that denotes an aggregation point to which arbitrary entities can be associated and that may be used to unite other organizations. As a node in a tree graph, it is also called an OE.

org tree. In OFSC, a tree structure composed of connected nodes (organizations) and links (command relationships), used to represent the military command structure, of which the primary function is to define aggregation (or decomposition) of units.

OS. A Web-enabled service that provides access to organizational data that abide by the representational precepts of the OFSC and is available, at a minimum, in a format defined by the GFM community of interest. The term “server” is used in its original meaning a software application program that accepts connections based upon a request and/or response paradigm. In this usage, it does not mean a physical computer system.

parent node. A node within a tree graph with links to subordinate nodes.

path. In a tree graph, a sequence of nodes whereby each node has a link to the next.

platform. In the OFSC, a vehicle that transports people on land, sea, or in the air.

preemption. The cessation of a propagating relation by an invoked relation of the same type, or the cessation of an implied relation by an explicit relation, either invoked or propagating.

propagation. The transfer by a default relation (ADMIN or C2DEF) of the properties of a different explicit relation. The ADMIN, COCOM, and support relations cannot be propagated.

reassign. The transfer of previously assigned forces to a different joint force either permanently or for a lengthy duration, enacted in the OFSC by the COCOM and ADMIN relations.

relation. In an OFSC organization tree, a predefined transitive property that exists between a sequence of associations between two OEs where one OE is a descendant of the other.

reporting associations. The class of associations within an OFSC tree graph that remain after the filtering of doctrinal OEs reveals the direct supervisory responsibilities between billet OEs, thus formally representing the chain of command.

role. A specification for an association between a parent OE and an undetermined child OE, which typically serves an operational function required to make the parent OE viable or usable.

root node. The uppermost node of a tree graph.

SCC. Defined in Reference (e).

suspension. The termination of a propagating operational relation by an association specific to that purpose. See OFSC Rule 12 (for the COCOM relation) and Rule 13 (for the OPCON and TACON relations).

server. A request and/or response interface. See OS.

stationary data. Data that is relatively invariant over its lifetime, with a known or expected periodicity of significant duration, such as authorization data.

TACON. Defined in Reference (e).

tree property. The characteristics of tree graph theory that mandate that every node must have a link to it and that a node can only have one parent, maintained by the OFSC in accordance with Rules 1, 4, and 5 (see Appendix 1 to Enclosure 3).

tree traversal. The action of moving from node to node along the links of a graph (or from OE to OE along the associations).

unit. A unit is an instance of an OFSC organization tree composed of a set of OEs and a corresponding set of associations that are based upon time, command relationships, or security classification level. Doctrinally defined in Reference (h).

unity of command. Unity of command means all forces operate under a single commander with the requisite authority to direct all forces employed in pursuit of a common purpose. Unity of command requires that two commanders may not exercise the same command relationship over the same force at any one time. See OFSC Rules 4 and 5 in Appendix 1 to Enclosure 3.

willet. Workload equivalent. A civilian billet in the OFSC. Civilian billet OEs are based upon workload equivalent, a measure in work-hours required to execute a program. A willet is categorized as either a Government employee or a non-government employee (usually contractors).