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BASIC FUNCTIONA', CAPABILITIES FOR A
MILITARY MESSAGE PROCESSING SERVICE

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This report describes the functional capabilities necessary
to support an advanced military message processing service.
The functions described are meant to be incorporated as part
of a larger, more comprehensive effort which addresses the
total needs of the military message processing community.

The functions discussed include those for message creation,
coordination, transmission, delivery, reception, and archival.
With respect to these functions, specific needs of a potential
military user group are addressed.

Ronald Tugender
Donald R. Oestreicher

Basic Functional Capabilities for a Militar
Message Processing Servi

This document is one of a series describing an experimental message service being developed for the Advanced Research Projects Agency of the Department of Defense, part of a larger effort directed at the problems of the military message processing community. The goal of this larger effort is to design and prove the efficacy of a system for automated message handling. This document should provide the basis for discussion and refinement of the concept with representatives of several military message environments.

The message service described herein has been designed to be part of a new military command and control capability. This work is a fresh look at these problems, independent of the constraints of current command and control systems, although interim use will require interfacing to existing systems, including AUTODIN and the ARPANET message protocol.

The main goal of this document is to describe the functional capabilities necessary to support military message processing (details of implementation are addressed elsewhere, and are considered beyond the scope of this description). This document is not directed at any particular military service, command, or office; rather, it describes a general set of functions which can be pared down or specialized to meet the needs of a particular environment.

An operational interactive message service needs many capabilities and amenities in addition to the basic functional capabilities discussed below. These include macro-commands, synonyms, abbreviations, conferencing, screen control and peripheral I/O, and on-line assistance and tutorials. These will be discussed in succeeding Service Specification Documents. This document does not intend to address any of these user presentation issues, which are aggregated as the "user interface" or "user's agent." In fact, all examples, vocabulary, and commands used herein are illustrative examples only, not intended as serious suggestions relative to user interaction protocols.

In several places throughout this document, references are made to features to be implemented in a more advanced service. The service described within represents a base from which more sophisticated and powerful services may be designed. It is expected that, as users become more familiar with an automated service, they will likewise become more knowledgeable about their needs. This feedback can be used to incorporate new features which better serve the user community.

Since *A Plan for Consolidation and Automation of Military Telecommunications on Oahu** was written in the spring of 1973, ISI has been examining military message processing. This has led us to the conclusion that current ARPANET services will not properly serve this user community for two reasons: the military has a very formal structure for "record communications" which is not reflected in current ARPANET message processing services, and the current services are not suited to the computer-naive military users.

This document is divided into three introductory sections, followed by the actual functional specifications. Because the area is quite complex, we ask your patience if all terms are not defined immediately and simultaneously. The introductory sections are: 1) a short description of current military operations, 2) a brief overview of an automated service, and 3) definitions of the primitive data items manipulated by the message service.

The summary of current military record communication (Section 2) briefly outlines the flow of message traffic through a typical military installation. In Section 3, the flow of a hypothetical formal message is traced through the automated message service. These two sections illustrate that the automated service provides all the facilities required to support military message processing while serving to motivate the enhanced capabilities supported by the automated service.

The remaining sections deal with the specifications of the automated service's functional capabilities. Section 4 defines the basic items of data manipulated by the service. These items describe the contents of the various fields of a message (which is itself described as a data item). Section 5 then describes the functions of the message service, divided into three categories: preparation phases, post-preparation phases, and administrative functions.

Section 6 on preparation phases attempts to capture the essence of the complex interactions between the users involved by describing them along two dimensions, temporal and individual. Some redundancy in description is employed to allow the reader to gain insight into these interrelations. The various capabilities and facilities of

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* USC/Information Sciences Institute, ISI/RR-73-12, May 1973.

the service are motivated and introduced. The post-preparation phases are then discussed, again motivating the inclusion of the described functions. The final section outlines the basis for administrative facilities.

2. CURRENT MILITARY RECORD COMMUNICATION SUMMARY

Current military message processing embodies three important considerations: to provide protocols to ensure that relevant personnel are informed of pertinent message traffic; to allow officers to delegate responsibility to subordinates without losing control or accountability; to provide the means by which messages may be categorized (by such criteria as priority and special handling information) and treated specially when the situation warrants. All of these global considerations are required to provide smooth operation. In order to meet these goals, each message goes through six distinct phases:

1. **CREATION**

   The appropriate "action officer" (decision making official) is assigned the action on a particular subject which requires a response from his organization. He draws up a draft of an appropriate response.

2. **COORDINATION**

   The action officer now "coordinates" (staffs) the response with the other appropriate action officers, which both maintains the integrity of the organization position on this subject and guarantees the completeness of the response. In this phase, other action officers signify accord by "chopping" (signing) the draft copy which is filed in the action officer's files.

3. **RELEASING**

   When the response is complete, the action officer acquires the appropriate signatures to release the response. This often includes some of the coordination signers, but always includes the "releasing authority" (formal sender of the message). However, the releasing authority signature may be signed by an appropriate action officer. To paraphrase one of the CINCPAC* action officers: "You don't resubmit it to the CINC, saying 'Please sign again, I made the changes you told me to.'"

   This example demonstrates that the procedures are not rigid, and can be bent for expediency. The service assumes that all users will behave honorably with respect to their delegated authority, and trust is implicit, though audit trails maintain accountability. The service below has many of the same flexibilities.

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* Commander-in-Chief, Pacific.

4.   ROUTING

The routing process performs two tasks. Outgoing routing interfaces with AUTODIN* and provides the proper AUTODIN addresses. Incoming routing attempts to provide copies to all appropriate action officers. This includes reading part of the message for key words.

5.   READ BOARDS

On the basis of the incoming routing and sender-specified security and priority, "read boards" (folders for received messages) are put together for the action officers. Examples include routine, secret, info[rmation] (cog[nition]) boards and flash top secret action boards. Info boards are for information only and are usually very thick and widely circulated. Action boards are particular to each action officer.

6.   ARCHIVE

All record communication is maintained by the communications center for about three years. Individual action officers might keep copies longer.

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* Automatic Data Information Network.

3. OVERVIEW OF AUTOMATED MILITARY MESSAGE SERVICE

The remainder cf this document describes the new Automated Military Message Service. Before describing the functional aspects of the message service in detail, it is instructive to follow the path of a sample formal message from inception through eventual archival. This will illustrate the types of operations and transitions which the message fields (i.e. logical sub-parts) typically undergo. It is not intended to define critical path relations. Note that several terms are introduced in this Overview; they will be defined in succeeding sections.

Creation

At the time a user states his desire to create a message, the service establishes a unique Creation Identifier for that message. The service expects the user to supply values for required fields. It provides applicable default values for those fields which are necessary at creation but which the user has not specified explicitly.

The author now supplies the fields relevant to the message. These include a body, probably one or more recipients, perhaps some preface comments to the coordinators and reference citations. As this message is a formal one, he will also supply a releasing authority list and probably a coordination list. He may examine and modify any of the fields until he is sufficiently satisfied with the message and ready to submit it for coordination.

Coordination

When a message enters the coordination phase, the service routes the message to the coordinators in either an author-specified or coordinator-directed order. Each coordinator may examine the message and the previous coordinators' comments, suggested changes, and the dispositions (such as OK, NoGood). He may also suggest revisions of his own (to the body or coordination list, for example), add comments, and finally give his own disposition.

When all active coordinators furnish their present review of the message, the service notifies the author. At any time during this phase, the author may examine the status of the message, learn which coordinators have reviewed it, what comments and proposed changes they have made, and decide which changes, if any, to incorporate into the message. The message continues to be coordinated until the author is satisfied with its progress. At that point he marks it for release.

Release

When a message is to be released, the release list becomes active. Each of the releasing authorities sees the message, and may inspect any of the fields, especially the dispositions given by the coordinators. Each releasing authority may also comment on the message and decide whether or not he wishes it to be released. If not, he may return the message to the author with comments. He may ask that the message be again coordinated, or perhaps just revised to be resubmitted for release. If not all the releasing authorities approve the message (either personally or by proxy), it is returned to the author with their comments. It is then the author's responsibility to modify the message so as to gain approval from all release authorities. This may require the author to resubmit the message for coordination. Thus, the author-modification, coordination, release cycle may iterate several times before the message gains final approval by all necessary authorities. After this occurs, the message is ready to be transmitted.

Transmission

The service will not allow a message to be transmitted unless all releasing authorities have given an OK signoff. If so, routing to destination addresses begins.

The service establishes a message-sending protocol with each of the destination sites. This protocol would include specifications of all necessary transmission parameters, and positive acknowledgment of message reception by each site for each recipient. If positive acknowledgment is not received, the origin site can either retry or queue the message for later transmission. Such decisions would be made on the basis of message priority and special handling criteria, as would the order of transmission to recipients. At this time, the service also consigns the final version of all formal messages to the permanent message archive. In the archive only the identifiers can be used to identify and thus access a message. Once the message is retrieved from the archive, the other fields can be examined.

In a more advanced service, there will be an on-line file containing citations for archived messages. This will allow users to access messages by their subject, recipient lists, and priority. Citations might also include the first paragraph of the message for content searches.

Delivery

The delivery phase is marked at a particular destination site by the establishment of an origin-destination message transmission protocol. The destination site, once having positive delivery of a message, signals acknowledgment to the origin. Once the entire protocol has been completed, the destination site processes the message for incoming routing. The receiving service places just the message's Transmission Identifier in its permanent archive, as a record that the delivery has taken place.

If the message contains a specific addressee (person), the service routes the message to the incoming message folder of the appropriate addressee. If the recipient is more general (e.g., an organization or title), the service searches appropriate message fields (Subject, Body) for keywords, and consults routing tables to determine which User-ID is specified to receive the message. Should no user be specifically designated to receive the message with such content, or if no match is found in the content search, then the service routes the message to a default destination. Here a human screening (based on installation-dependent criteria) will determine the ultimate destination. Once the message has reached its designated recipient, the delivery phase is finished.

Reception

The reception phase begins when the user's incoming messages are scanned. Particular attention is given to the following fields: Type; From; Action, Information or Distribution; Subject; Body; Priority; Security. Assignment of the message to a particular "message folder" is made by pre-specified receiver personal requirements. When the user requests a particular folder he is notified of receipt of the message, along with any others received since his last such request. The user can then view the messages in any message folder belonging to him. He may see entire messages, or only specified fields. Also, he may retrieve cited references and query the status of the message relative to other recipients. He can specify context or content searching on any or all parts of the message. He can then also decide on a disposition for the message: delete, assign to a record file, redistribute to other interested parties (if allowed by special handling field), produce a hardcopy version, etc. The service records the status of the message for each recipient. It is reported to special file, which can be queried to determine the global status of any message.

Archival

The archival phase is not, strictly speaking, a phase, but rather represents the permanent record of all formal traffic. Messages may be archived on- or off-line; they are not accessible except by a Message Identifier (discussed below). In order to examine a message in the archive, a user must be authorized to retrieve a copy, a privilege granted by some archive authority established at the installation. Once a user

retrieves a message copy from the archive, he may read any of its fields. However, he may not redistribute it unless permitted by the archive authority. When a user is finished with his copy of an archived message, the copy is destroyed.

4. AUTOMATED MILITARY MESSAGE SERVICE DEFINITIONS

A message is a collection of message fields, each of which contains information of a particular type. The contents of all of these message fields are defined in this section. Each field, at one time or another, is processed by the message service. The definitions are divided into two groups: the primitive definitions, and the compound definitions, which are composed from the primitive types. A message is an example of a compound definition.

PRIMITIVE DEFINITIONS

There are twelve primitive definitions. They are:
1) Text Item
2) Date
3) Time
4) Name
5) Title
6) Organization
7) Priority
8) Security Classification
9) Special Handling
10) Message Type
11) Signoff
12) Version Number

Text Item

A text item is a string of ASCII* characters. These characters are grouped into words and the words grouped into paragraphs. In more advanced services, the text items would also contain formatting information. This message processing service does have limited formatting capability (paragraphs and words) that can be overridden in order to allow user-formatted tabular information. Except in a few special situations, the text is uninterpreted and considered to be free of service-intelligible semantic content. However, whenever a user can view a text item, he can activate a context

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* American Standard Code for Information Interchange.

search on that item. Automatic context searches are used by the incoming routing routines and the folder placement routines associated with the reception phase.

Example:

This is an example of a text item. It contains 38 words and two paragraphs. It is also automatically formatted (justified) by the service.

The user could search this text item for the possible keywords "paragraph" and "automatic".

Date

A date is descriptor for a day. The output format is standard throughout the service (JAN 17, 1974). Many in it forms are recognized by the service. The forms can be divided into two groups. The first group consists of variations on the calendar date (e.g., 6/18/74, 18 June 1974, Jun 18). The second group are relative dates (e.g., tomorrow, yesterday, next Tuesday). A more advanced service might also recognize Labor Day 1976, or the third Tuesday of this month.

Time

A time is a descriptor for a time of day. The output format is either local time or Greenwich time (7:04:32 PST or 16:04:32 GMT). Approximate times are available in input (e.g., morning, afternoon). Again, as with date, both clock time (11:50, 1:30 PM, noon) and relative time (two hours from now, 45 minutes ago) are permissible input forms.

Name

A name identifies a particular individual. The standard output is the user's message service identification name together with his organization (see below). This is unique throughout the entire message service, or even throughout a network of many services. The service knows an individual's full name, organization, mailing address, rank, and current title(s). In order to identify an individual, the user need not know the exact identification used. Any sufficient information that uniquely identifies the user (e.g., initials and organization) is adequate.

Examples: SMITH, JONES, GEORGE

Title

A title (position) is independent of particular individuals. At any particular instant in time there is an individual associated with each title in the service. Titles represent an alternate way to address people. Titles provide continuity and make it unnecessary to inform everyone of all changes in the organizational structure. A particular individual may have several titles. In a more advanced message processing service, several individuals may have the same title (such as the Ad Hoc Committee).

Examples: CINC, J6124, Director of ARPA-IPTO

Organization

An organization is a logical collection of message service subscribers, such as CINCPAC, ARPA-IPTO. An organization must be distinguished from two other terms, both of which refer to computer configurations: host and site. A host is a particular physical processor, while a site is a collection of such hosts (although perhaps only one) operating as a single entity.

A site might service and support several organizations, although an organization must be serviced by only one site. For example, each base on Oahu would be an organization, while Oahu, after consolidation, would be served by one site. In a more advanced service, the incoming routing routines at a particular organization might route messages to individuals at other sites who are logically part of that organization and temporarily or permanently stationed elsewhere.

Priority

The priority is the degree of urgency which the sender associates with the delivery of a communication. These are used on all inter-user interactions in the message processing service. Included in these interactions are coordination, release, transmission, and reception. These priorities determine both the scheduling of communication resources and the method of delivery to the user. These descriptions are discussed in more detail below; the priorities are listed in order of increasing transmission priority.

Priorities:

Routine	Put in appropriate routine input folder
Priority	Put in appropriate priority input folder
Immediate	Interrupt user upon reception
Flash	Interrupt user; if user not available try alternate or on-duty officer
Flash Override	High-priority Flash

Security Classification

This is the security level of the message. The handling procedures are defined by the Defense Communications Agency and National Security Agency.

The levels are:
Unclassified, Encrypt For Transmission Only (unclassified), Confidential, Secret, Top Secret, etc.

The current technology handles only unclassified traffic. However, a non-NSA-approved encryption facility is available for purposes of privacy. This facility is only applicable to the message body; it also will severely limit the effectiveness of the incoming routing routines, as the encrypted text cannot be searched for keywords. However, it is only expected to be used for eyes-only messages. A more advanced service will handle a larger class of security levels.

Special Handling

This data item affects how the message is handled at certain points. The information it provides directs the service in treatment of particular messages, such as limit the receivers' capabilities. Examples include eyes-only (directive to incoming routing routines), and no forwarding (directive to reception routines).

Message Type

The message type may be formal or informal. A formal message is a normal military record communication and is archived and maintained by the message processing service. An informal message is off-the-record and copies are guaranteed not to be maintained by the service.

A digression on informali y. There is a significant difference in treatment of formal and informal messages by t e service. In particular, for informal messages, formal release procedures are not required (i.e., the author may send the message with no further approval), while a formal message must be approved by its releasers (formal sender and Release list). A particular organization might also wish not to allow formal messages to be sent without the approval of at least one of a special list of Release Authorities, who control all ou oing formal message traffic.

In addition, there are tw further criteria which control message release, both of which are outside the message service domain. First, anyone who releases a message is responsible for its contents and coordination. People are expected to exercise proper judgment before releasing a document. Second, on reception, the releasing authority is on the message. It is expected that a message released by Captain Smith to Major Jones will carry less weight and be more open to question than one from General Black to Major Jones.

The service endeavors to be flexible and friendly. Its main responsibility is to guarentee accountability for formal messages. There are no anonymous messages, and, to that extent, the releaser is accountable for either formal or informal traffic.

Signoff

There are many ways for a coordinator or releaser to signify his disposition of a message. These are discussed in much detail below under coordination. The possibilities are listed here with brief comment.

OK	Unconditional approval
OK?	Conditional approval - generally positive
OK-	Conditional approval - generally negative
XIP	No decision - X (something) in progress
Read	No comment
Not Read	No action at all.

As stated before, these will be discussed in detail below; however, it is important to note that not all of them are available in every situation.

Version Number

A version number is used to allow users to quickly tell whether an in-progress message has been changed since they last looked at it. There is no version number stored with the archive copy of the message.

The version number is composed of two numbers separated by a semicolon. The first (left) number is the major version number and is automatically changed by the service each time the author modifies the message. The second number is the minor version number and is changed whenever editing suggestions are made by the coordinators.

COMPOUND DEFINITIONS

The compound definitions are built up from the basic definitions. They are defined to be concatenations of the basic definitions. The * is used as the concatenation operator. There are seven compound definitions:

1) User-ID
2) Reviewer
3) Address
4) Recipient
5) Date-Time
6) Message-ID
7) Message

User-ID

Name*Organization or Title*Organization

> A User-ID identifies a unique individual within the service or services. It is desirable to allow the same name or title to exist in different organizations (to allow more natural name/title conventions). The restriction that all names and titles are distinct within a single organization allows the pairs Name*Organization and Title*Organization to be unique. These names identify individuals and are used to identify parties responsible for the transmission of a message (compare with Address).

Reviewer

User-ID*Priority*Special Handling*Signoff*Text Item

> These people are listed on the coordination list and release list. A reviewer specification not only identifies the responsible individual, but also describes how the service should deliver the in-progress message to him for his action. The current service only allows reviewers within the same organization. A more advanced message processing service would allow reviewers to be at any organization and/or any site. Once again we are still talking about individuals, and not activating the incoming routing routines (compare with Recipient below).

> The priority and special handling subfields allow for a different priority and special handling code for each reviewer. It is possible, using this model, to design a service which has one priority and/or one special handling code, which is associated with an entire list of reviewers, or with all reviewers. The same considerations are also true for the recipient definitions discussed below.

> The signoff field lets the coordinator signify agreement or disagreement with the message in its current state. The text item field is for comments back to the author; these comments are automatically deleted when the message is transmitted.

Address

User-ID or Organization

> An address is the target for a message. It may be an individual, in which case the User-ID is used, or it may be an organization, in which case the incoming routing routine for that organization would examine the message and determine which individuals should see it.

Recipient

Address*Priority*Special Handling

> A recipient specification is similar to a reviewer specification in that it describes where and how to send a communication. It is more flexible, as it uses an address and may go to any organization. These addresses are used to define where the message is actually transmitted: the action list, information list, and distribution list.

Date-Time

Date*Time

> The Date-time type describes a point in time. It is output on either local time or Greenwich time. Certain inputs will allow the date to be defaulted, such as 17 hours from now. Also, the date is adjusted when converting between local time and Greenwich where appropriate.

Message-ID

Organization*Date-Time*(Name or Title)

> A Message-ID is a unique handle on a message. The service assigns one Message ID to each message at creation and another at transmission. Both the Creation Identifier and Transmission Identifier may be used to reference a message.

> Though the organization and date-time uniquely identify the message, the Author is appended to the Creation Identifier and the From (primary releasing authority) is appended to the Transmission Identifier. If the user wishes to access a message and does not know the exact identifier, he may request to see all messages from a particular User-ID on, say, last May 7th or 3th.

> Message-IDs are also used to identify other messages within a given message. These references (as shown below) are grouped in a specific field in a message, and serve to point users to other sources of information.

> Examples:

> > CINCPAC/Jun 6, 1974-17:47:05 by J6124
> > ARPA-IPTO/Jul 7, 1974-11:13:08 from KAHN

Message

A message is a collection of fields, each of which is composed of an instantiation of a basic or compound data item as defined above, and represents a unit of traffic through the message processing service. Messages might be formal or informal as determined by the message type field. Only Type, From, Author, Body, Security and either Action or Information list are required for the transmission of a message.

In Table 1 are the allowable fields for a message, along with the name of the data item used to specify to field and the default value for the field. The meanings of these fields will be discussed in detail below. During the active lifetime of any message, the various fields undergo creation, revision, verification, and inspection by both the user and the service. In fact, the various phases of the message service may be characterized by which fields take an active part in the processing of that phase. Table 2 below is an attempt to display the status of the fields as the message passes from one phase to the next.

The ordering of the phases in Table 2 is relevant, although it is not meant to imply strictly one-way serial transition. A message may pass back and forth several times between the coordination and release phases, and the reception and archival phases. However, the status of the fields for a particular phase is independent of the path through which a message has already traveled.

TABLE 1
MESSAGE FIELD TYPES AND DEFAULTS

FIELD	DATA TYPE	DEFAULT VALUE
Type	Message type	INFORMAL
From	Reviewer	author *ROUTINE* null *NOT-READ* null [User-ID*Priority*Spec handling* Signoff *Comment]
Author	User-ID	Creating user*Creating site
Action list	Recipient(s)	null *ROUTINE* null [Address*Priority*Spec. handling]
Information list	Recipient(s)	null *ROUTINE* null [Address*Priority*Spec. handling]
Distribution list	Recipient(s)	Release and coordination list
Coordination list	Reviewer(s)	null *ROUTINE* null *NOT-READ* null [User-ID*Priority*Spec handling* Signoff *Comment]
Release list	Reviewer(s)	null *ROUTINE* null *NOT-READ* null [User-ID*Priority*Spec handling* Signoff *Comment]
Preface comments	Text	null
Subject	Text	null
Body	Text	null
Creation identifier	Message-ID	(supplied by service at creation)
Transmission identifier	Message-ID	(supplied by the service at transmission)
Reference list	Message-ID(s)	null
Security	Security classification	UNCLASSIFIED
Version	Version number	1,0 (maintained by service)

TABLE 2
MESSAGE FIELD TRANSITIONS

	Creation	Coord.	Release	Transmit	Delivery	Reception	Archive
Type	P	P	P	AF	PF	AF	AF
From	P	P	P	PF	PF	AF	U
Author	A	A	A	PF	PF	PF	U
Action list	P	P	P	AF	AF	AF	U
Information list	P	P	P	AF	AF	AF	U
Distribution list	P	P	P	AF	AF	AF	U
Coordination	P	A	P	FF	PF	PF	U
Release list	P	P	A	PF	PF	PF	U
Subject	P	P	P	PF	AF	AF	U
Preface comment	P	P	P	X	X	X	X
Body	P	P	P	PF	AF	AF	U
Creation ID	AF	AF	AF	AF	AF	AF	AF
Transmission ID	X	X	X	AF	AF	AF	AF
Reference list	A	A	A	PF	PF	AF	U
Security	A	A	A	AF	AF	AF	AF
Version	A	A	A	X	X	X	X

KEY:

P: passive
   field not needed by service, but open for user examination or modification   - may
   be empty.

FF: passive frozen
   field open for examination, but not modification

A: active
   field must be nonempty if it is an essential one; service varifies field for
   completeness and authanticity; still open for modification

AF: active frozen
   contents of field are verified, but may not be modified

U: unavailable
   field cannot be accessed

X: nonexistent
   field does not exist during this phase.

5. MILITARY MESSAGE SERVICE FUNCTIONAL SPECIFICATIONS

The proposed message service can be logically divided into two parts. The first, called preparation, is concerned with the creation of a message and the feedback necessary to render it acceptable. The remainder, called post-preparation, involves the transmission and dissemination of completed messages to their intended recipients.

PREPARATION PHASES

During the preparation phases of the message service (creation, coordination, release), many individuals may come into contact with a given message, for purposes of composition, transcription, review, modification, comment, or approval. These users will make varied demands on the service and will be provided certain types of access and control rights to messages. This section enumerates the individuals who may be involved with a message during the preparation phases and which actions appropriate to preparation are allowed each participant.

Dramatis Personae

The people who come into contact with a message during the preparation phases fall into four classes: author, advisor, reader, and releaser (the latter three will collectively be referred to as *reviewers*). Briefly, their general functions during the preparation phases are:

AUTHOR
> The author is the primary individual responsible for the creation of a message. He has total control over the message until release.

ADVISOR
> The advisor is a coordinator who can give extensive advice to the author through the process of "editing" suggestions into the draft message.

READER
> The reader is a restricted coordinator who can only make comments on the draft message.

RELEASER
> The releaser signs off the message and by his authority approves the message's transmission.

The author(s) and the designated advisors, readers, and releasers will be referred to as *actors*. Each of these actors, when fulfilling his role for a particular message, may in turn select a *ghost*. A ghost will normally serve transcription purposes (i.e., a secretary), and in general will have equivalent capabilities to those of the appointing actor. In effect, the rights to act on a given message (hereafter referred to as *domain*) assigned to a user (actor) may be transferred to a substitute, although the actor may decide to discharge his function personally. However, an actor's domain may be in the hands of only one user at a time. Thus, there must be only one ghost allowed any actor on a given message; should the actor, after assigning the domain to a ghost, wish to act personally on the message or assign it to another ghost, he must first reacquire the rights to the message (which is always allowed). The use of ghosts is not recorded with the transmitted or archived copies of a message, and the interaction between actors and ghosts is assumed to be outside the message service.

Ghosts. The assignment of ghosts can be set up within the service in a large number of ways. However, when capabilities are assigned to a ghost, the ghost's actions remain the direct responsibility of the user whose name the ghost is using. Ghost assignment can be restricted to just the coordination or creation of a single message, through receiving incoming traffic, up to and including all message service interactions. This last item is equivalent to giving the ghost the actor's password and terminal.

This document mostly addresses the issues of one-shot, single- assignment ghosts. In these cases, the actor informs the service of which of his capabilities he wish to transfer to whom. This might be "allow Miss Jones to coordinate message XYZ and then sign off with an OK."

However, several more permanent, less restrictive ghost assignments could be made possible within the message processing service. The user could assign all incoming traffic of a certain type to be delegated to a certain ghost. For example, an action officer might specify that all routine messages be assigned to his secretary for preliminary screening. It is worth mentioning that the routing algorithm will do this in an official recorded way, such that not only the work is moved, but also the responsibility. A ghost is designed to be an assistant and not a co-worker. Another possible ghost assignment would be to allow the ghost all rights except signoff. The possibilities for ghost assignment are very large, and it will require discussions with specific end-users to resolve how they would use this feature of the service. This is also true because ghost assignment has more to do with interactions with the support staff than with the message service.

During the preparation phases, there is a complex set of interactions involving the phase in progress, the roles of the users (author, advisor, etc.), and the range of capabilities available during preparation.   To best illustrate these interdependencies without introducing too much circularity in description, the preparation phases will be discussed   along   two   different   dimensions: available   capabilities   and   user characterizations.   While duplicating some information, this method of presentation allows the most insight into the nature of the conduct of the preparation phases.

Available Capabilities

Each of the users who comes into contact with a draft message has certain capabilities with respect to that message. Following is a list of all capabilities relevant to a message; the next section discusses the subset of these capabilities allowed each actor.

View.   Viewing is the ability to inspect all message fields, and is granted all actors and ghosts. While viewing, the user has the ability to see all previous comments and edits (hereafter called *annotations*) incorporated into the message fields (either marked to delimit changes or unmarked); with or without identification of the users who made them.   In viewing, the user may choose in which manner he wishes to view the various annotations, and the service will provide reasonable defaults for those left unspecified. There are five classes of annotations. They are listed below with their associated viewing options.

General Comments
> These are contained in the comment text item subfields of each reviewer entry.

> OPTIONS:
> Show (authors' default)
> Don't Show (reviewers' default)

In-Field Comments
> These comments are within any message field. They can only be created by advisors and authors.

> OPTIONS:
> Show (authors' default)
> Don't Show (advisors' default)
> Show and Identify Advisor(s)

Additions
> These are additions to any message field. Again, only advisors and authors can do this.

OPTIONS:
> Show (reviewers' default)
> Show Marked (authors' default)
> Show Marked and Identify Advisor(s)

Deletions
> Similiar to additions.

OPTIONS:
> Don't Show (reviewers' default)
> Show Marked (authors' default)
> Show Marked and Identify Advisor(s)

Replace
> These are paired additions and deletions.   Again, only advisors and authors
> might make these annotations.

OPTIONS:
> Show New Version (reviewers' default)
> Show Both Marked (authors' default)
> Show Both Marked and Identify Advisor

Readers and releasers can only make general comments. The reviewers' viewing default is to see the current state of the message. The authors' default is to see all changes. This is to enable and encourage the author to pass judgment on the suggested changes which only the author can do.

Edit.   Editing is the process wherein a user (author or advisor) proposes changes to a draft message. The user may add to or delete from message fields, or he may replace sections of fields with new information. In making his changes, he has access to all the changes and comments made by the previous reviewers. All the viewing options are available during editing to facilitate making changes. The editing history of the message is thus available. Each time a coordinator edits a message the minor version is incremented by one.

It is important to note that *none* of the changes made during editing are actually made to the original message. The service records the changes made during each edit, and they are incorporated during later viewings or editings to show the message as currently modified. Actual changing of the message is accomplished during a process called "modify" which is described below. Thus, the changes made during editing serve as suggestions to the author, who may incorporate editing changes or not, at his choosing.

The actual interactive dialogue used to evoke the edit functions will be compatible with the Editor's general format. A discussion of this format is beyond the scope of this document.

Modify. The author of a message, after having reviewed the annotations by coordinators and releasers, may wish to update the message to reflect the comments and suggested changes he has received. This process, called modification, is reserved entirely for the author (or author's ghost). The author may employ any of the viewing options to display the message and annotations, and may modify any of the fields with the exception of the various reviewers' signoffs. Once he has made modifications, the message exists as the new, updated version, and future views or edits of the message will apply to the modified version. Each time the author modifies the message the major version number is incremented by one and the minor version number is set to zero.

In making modifications, the author may be guided by the suggested edits and comments of the reviewers, and may in fact decide to update the message by incorporating the edits as specified by the advisors. He is not, however, bound to heed any of the suggestions, as the author alone is responsible for the content of the message during preparation. Failure to incorporate suggested changes (or making changes other than those suggested) may have effects on the signoff given by reviewers, and this will be discussed under the section on signoff, below.

Message State Control. While a message is in the preparatory phases, it is undergoing review and modification by a potentially large group of users. Each of these users has some amount of control over the disposition of the message, depending upon his role in the preparation process.

The service allows the author total control over the message at all times. He decides when a message is to be distributed for advising, reading, and release, and may recall the message during any stage of those processes. For example, the author may send a message out for reading, and be informed that an urgent situation requires immediate release. He can rescind the reading order, possibly interrupting readers in progress, and route the message to the release authorities immediately. The control capabilities granted the author are also assignable to an author ghost.

The service additionally allows individual reviewers control capabilities only with respect to their designated ghosts. That is, once a reviewer has actively begun discharging his function for a message, and assigns his domain to a ghost, he may revoke that domain at any time and handle the message personally, or assign it to another ghost. A realistic example might occur if an advisor assigned a secretary to

enter a lengthy list of changes and comments to a draft message, and the secretary was later required to perform another, more pressing task. The advisor, upon learning this, could remove the message from the secretary's task list and reassign the duties to a substitute.

Comment. It is often helpful to accompany a document with a set of general or specific comments (none of which is permanently recorded) which are more informal than edits and can possibly provide more insight into the reviewers' perceptions of the document. The message service will support an extensive repertoire of commenting facilities, designed to provide the users in the preparatory phases with as much feedback capability as possible.

For the author, who writes the draft message, comments would be most useful as preface comments, which could give a more general explanation of the author's aims, or perhaps to point out parts of the message worthy of special attention. These preface comments are directed to the reviewers and, as with all comments, are not part of the final message.

Advisors are permitted to comment anywhere in the message. This allows them to explain reasons for proposed changes, or discuss why a prior change is incorrect or inappropriate. They may also make general comments which apply to the message as a whole.

Readers and releasers are allowed to make general comments only. The reasons for this are explained in the sections dealing with readers and releasers below.

While reading a message, a user has the capability to see the author's preface comments, and normally all of the previous reviewers' comments. For reasons of privacy, the service does allow reviewers to make private comments, viewable by the author only. Authors, of course, can see all comments, and delete any or all of them at will. Once a message is released, all comments are deleted, and are never recorded in the permanent message archive.

Signoff. A primary function of reviewers is to acknowledge their reading of a message, and maybe an overall mark indicating their relative degree of concurrence and approval. The message service allows reviewers a wide spectrum of marks or "signoffs", designed to provide latitude for the reviewers, while giving the author and releasers maximal information on which to base their actions.

Table 3 lists the available signoff codes, the reviewers authorized to use them, any status changes the codes may undergo during the preparatory phases, and the final signoffs as recorded in the archive.

TABLE 3[*]
SIGNOFF STATUS CHART

| Signoff Code | Applicable Reviewer(s) | Status at Release | | Becomes Archive Status |
		If Message Same	If Message Changed	
OK	Adv,Rdr,Rel	OK final ---------------->		OK final
			OK prelim --->	OK prelim
OK?	Adv,Rdr	OK final ---------------->		OK final
			Read prelim ->	Read prelim
OK-	Adv,Rdr,Rel	CK final ---------------->		OK final
			NG prelim --->	NG prelim
Read	Adv,Rdr	Read final --------------->		Read final
			Read prelim ->	Read prelim
NG	Adv,Rdr,Rel	NG final ---------------->		NG final
			NG prelim --->	NG prelim
Not read	Adv,Rdr	Not read	Not read ---->	Entry deleted
CIP,GCIP	Adv,Rdr	CIP,GCIP	CIP,GCIP ---->	Entry deleted
RIP,GRIP	Rel	RIP,GRIP	RIP,GRIP ---->	Message not transmitted

* See key to Table 3 on the following pages.

KEY:

Applicable reviewers
Reviewers who may use this signoff code (Adv=advisor, Rdr=reader, Rel=releaser)

Status at release
A reviewer's signoff may be altered depending on whether the message has changed since he signed it off. The two columns under "Status at release" ("if message same," "if message changed") represent the possible transformation of a signoff for particular situations. In this case, "changed" means the message does not exist exactly as it did when the reviewer signed it off, including his changes. This could be because the author did not incorporate the reviewer's (and previous reviewers') suggested changes, the author incorporated changes made by succeeding reviewers, or the author made changes of his own.

final, prelim
Service-generated status which records whether or not the signoff made by a reviewer refers to the final message (i.e., the message has not been further modified, in the sense above), or a preliminary version (i.e., the message has since been modified). Note that changes in comments or signoffs do not constitute a change to the message.

Signoff Codes.

OK Reviewer is satisfied with message, even if modified. Reviewer does not wish to review message again unless substantial changes are made. The service will not change this signoff status if the message is changed.

OK? Reviewer is generally satisfied with message but only if it does not further change after his signoff. Would probably want to see message again if changed further. If the message is changed in any way, the service will change the signoff to a Read signoff.

OK- Reviewer is generally unsatisfied with message, but will accept only if indicated changes are made. Would definitely want to see message again if it were further changed. If the message is changed in any way, the service will change this signoff to NoGood.

Read Reviewer has read message, but is generally uncommitted in his opinion. Would probably not want to see message again. If the message is changed, this signoff will stay intact.

NG   NoGood. Reviewer disapproves of message, because either he fundamentally disagrees with it or believes it to need extensive revision to become acceptable (comment to determine which). Wishes to see message again if he believes revision needed. Only the reviewer can change this signoff.

Not Read   Reviewer has not yet had a chance to review message.

CIP   Coordination-in-progress, Reviewer has begun

GCIP   Ghost coordination-in-progress review, but has not yet finished. Wishes to finish review.

RIP   Release-in-progress, releaser has begun review, but

GRIP   Ghost release-in-progress, has not yet finished. Wishes to finish review.

This service allows conditional signoffs (OK?, OK-). Note that these conditional signoffs are transitory *only*; they never appear in the final version of a message. Their transmutation to non-OK signoffs depends on whether or not the message is modified after they are made. This includes any changes to the text of the message or any of the message fields. Changes to comments or signoffs are not considered. [In a more advanced service, there might be other types of conditional signoffs, such as "if certain fields don't change," or "if someone else signs."]

Note that the 'not read' and 'coordination-in-progress' signoffs are not recorded in the archive, nor are their corresponding reviewers. The 'release-in-progress' signoffs are not allowed to be on a transmitted message, as explained in the section on releasers, below. Also note that there are only three archive signoffs: OK, NoGood, and Read.

Once a reviewer is designated by the author, he is given a default 'not read' signoff, which will remain until the reviewer explicitly orders it to be changed. Reviewers may change only their own signoffs, and the author may not change any.

If a reviewer has made a signoff which indicates he wishes to see the message again, it is up to the author to route the message back to the reviewer. However, the author is not bound to do so. Clearly, the author should advise a reviewer if the author modifies a message to the point where it no longer carries the same meaning. An example would be when a reviewer signs off 'OK' (unconditional), after which the author modifies the message so that it no longer contains the same substance as when it was

approved. While the author should be obligated to send the message back to the reviewer, enforcement is outside the scope of the message service. However, the automatic changes shown in the signoff chart are designed to protect the users.

A digression on expedition. Now that we've defined the reader and advisor functions and also the signoff codes, it is proper to discuss ways to expedite messages through the service. In a leisurely transmission, the authors might send a message for advisor coordination, repeatedly viewing and incorporating suggestions and making compromises until all the coordinators give an OK signoff. The message is then sent to the releasers, who were probably all coordinators, for an easy release, and finally the From person gets the final approved message for final transmission signoff. This process can be quite extravagant in the use of elapsed real-time.

Several mechanisms are provided within this design to expedite this process. First, the preface comment field, and the fact that the author may specify the coordination order, allows the transmission of off-the-record comments and careful ordering to affect the behavior of recalcitrant coordinators.

Second, the edit capabilities of an advisor both encourage the advisors to be (possibly overly) thorough, and also forces the process to be sequential (i.e., only one advisor may edit a message at a time). For these reasons, the reader coordination was developed. Readers may not edit; they may only sign off and make comments with their signoff. This is intended to force the comments to a more global level. The other pleasant side-effect is that many readers might operate in parallel.

The signoffs have been structured to reduce the number of times a document is seen by a reviewer. The OK signoff allows the reviewer to place trust in the author. He, in turn, is partially protected by the service, which records whether he saw the final version of the message. The in-progress signoffs allows a reviewer to free the document for another reviewer without finishing his review.

Finally, the Read signoff is available for coordinators, allowing a noncommittal signoff. In many cases it might be easier to get a Read than OK. It should be noted that transmission depends only on releasers, not coordinators. It is assumed that the releasers will base their judgment, in part, on the coordinators' signoff. Releasers might release a message in which some coordinators have given Read signoffs, while they would not if those signoffs were NoGoods.

So, by using all these features, the author can send off-the-record comments to a large number of readers in parallel. Using the Read signoff, they can review quickly. If this signoff is accepted by the releasing authority, a message can be prepared and coordinated with minimum expenditure of real-time.

User Characterizations During Preparation

This section attempts to delineate the functions performed by the various users during the preparatory phases. It will explain the specific duties, options, and capabilities of the users, and describe the nature of the interaction between them.

Author. The author is the central figure in the message service. He has final responsibility (until release) of the draft message and ultimate control of the message throughout the preparatory phases. He decides what the content of the message will be, who the recipients will be, and who will serve as coordinators and release authorities. Typically, the author will not be equally active through the different preparatory phases, although he is capable of taking active part at any time.

A digression on authority. Until a message is released and transmitted, the service recognizes the author as the primary source of true information. The author has total control of the life, and possible death, of the in-progress message. At this point the author is superior to the designated From (primary releasing authority) with regard to the message.

The author can add and delete coordinators and releasers at will. He can delete any reviewer comment, and the reviewers themselves, if he pleases. In fact any author can put himself in the From field and release the message. The service recognizes no control over the author. This is to make the author's job as easy and flexible as possible. If some of the author rights seem overly powerful or arbitrary, it is important to realize that the author still works within a structure of responsibility. An irresponsible author will be chastised outside the message service domain. The flexibility and power is meant to be wisely used. The service assumes reasonable users, i.e., users who will not anger other users.

A message may have several authors (each of whom may have his own ghost). At any time only one author might be editing or modifying the message. However, this restriction is not enough to prevent the authors from working at cross-purposes. No automatic aids have been designed in this service to solve this problem. Authors are expected to work out areas of responsibility among themselves. Any of the authors might request notification of message status changes. They are viewed as equals by the service. The currently active author or the next active author is the author who is relevant to most of the discussion below.

The range of actions the author may perform depends on the current phase of the message. The applicable author functions are discussed below relative to the various preparatory phases.

Creation. During this phase, the original draft of a message is prepared. Frequently the volume of information to be entered into the service is large, and the author may wish to assign a ghost (i.e., secretary) to perform the entry. Since this assignment would not be in service-readable format, the ghost in this situation would be acting with no service-checked authority. The ghost may thus prepare any draft message without formal service notification of the eventual author. In this case, the ghost serves as the primary author while the message is being entered. The ghost-author (a ghost, acting as author during initial entering of a message into the service) is listed as the author of the message and has all author rights. He may read or modify any of the message fields (except signoff), and may initiate or terminate any of the other preparatory phases. In addition to entries of new information, the ghost-author (or real authors) may incorporate text from other messages or files into the draft message. This facility will be especially useful when several authors work on different parts of a message in parallel. Once the ghost-author has finished his task, he transfers authorship to the real author (as specified in the Author field of the message). This transfer gives the real author all the associated control capabilities, until and unless he subsequently further reassigns authorship. This procedure allows secretaries to create messages without the actual author becoming involved with the service until necessary.

The transfer of author status to the real author allows him to determine the further processing of the message. He may edit or modify the message, initiate advisor or reader coordination, or initiate release. He may also assign a ghost any of these capabilities.

It is important to note here that the various reviewer and recipient lists, while established during the creation phase, may be subsequently modified by the author (or ghost) as he feels (or is advised) appropriate. The service, as an aid to the author, will immediately notify him should any of the designated reviewer or or recipient entries be invalid, and defer activation of a dependent phase (coordination, release, transmission) until the proper corrections are made. This insures that the service will not have to terminate processing because it encountered invalid addressee specifications while in the middle of a phase.

To expedite the preparation of repetitious or fixed-format ("canned") messages, the service will also provide a facility whereby an author can prepare a template of a message, possibly with certain fields left unspecified, which can be completed and transmitted very rapidly. Sending such a message would involve only the retrieval of the template, filling in (and possibly slightly altering) any necessary information, and marking the message for the next applicable phase (release, coordination, etc.).

Coordination.   The author's involvement in the coordination phase begins by his initiation of the phase. In doing so, he has several options. He must first decide whether to initiate advisor or reader coordination, since the two may not occur simultaneously, as explained below in the section on reviewers. Should the author wish to specify a particular routing order, he may do so. He may activate any subset of the coordination list and change these activations at will. The author may wish to initiate coordination and not further involve himself until all coordinators have finished. By explicitly marking each coordinator as an advisor or reader, the service will route the message in the appropriate way.

At any time during coordination, the author may interrogate or modify the status of the message. He can determine which coordinators have acted upon the message, and whether any coordinators are currently working on it. He may examine the nature of their edits and comments. Should he deem it appropriate, he can remove the message from either coordination state (advise, read), the service automatically notifying any coordinators in progress. Or, he may ask the service to alert him when all active coordinators have finished. Once having retrieved the message, he may modify the coordination list, change the coordination state, or terminate coordination entirely and mark the message for release. If, after processing the message in some way, the author decides to resubmit the message for coordination, he may choose to continue at the interrupted point, or specify some different routing.

In order to optimize use of the author's own time, he may request the service to delegate any of the above capabilities to a ghost, who may then execute the desired actions.

Release.   The author's options during the release phase are analogous to those during coordination. He may initiate or terminate release, modify the release list or other message fields, and resubmit the message to coordination and release phases. In addition, if the message has been signed off acceptably (OK) by all release authorities, the author may mark the message to be transmitted.

It is important to point out that phase or state changes (e.g., between release and coordination, or between advise and read) do not alter existing signoffs. Only modification of the message or explicit direction of the individual reviewers affects signoff changes.

Transmission.   When the author is satisfied with the progress of a message, he may request the service to transmit it. The service immediately notifies the author if not all releasers' signoffs are OK, and defers transmission until such is the case. Once the message has been accepted for transmission, the author loses control of the

message, which becomes service property. All fields are closed to further modification, and the preparatory phase is ended.

Reviewers.   The interaction of reviewers with a draft message is more limited than that of the author. In addition to having fewer capabilities for affecting the content of a message, they have less direct control over a message even when they are actively working on it.

During the preparatory phases, the reviewers can have one of three possible statuses: inactive, potentially active, and active. When a reviewer is inactive, either the message is currently in a different phase, or the reviewer has already completed his work on the message and signed it off. Giving an in-progress signoff will not make a reviewer inactive.

When the author activates a given phase, the service notifies all the designated reviewers that they have been made potentially active, excluding those users who have made unconditional OK signoffs indicating they do not need to see the message again. The interaction with each of the users here depends on 1) the current activity of that user, 2) the service actions the user has chosen regarding pending tasks, and 3) the priority of the message relative to that reviewer. If the user is not currently logged on, the service will remember, and notify the user when he next logs in, if he is still potentially active at that time. If the user is on the service, the action taken by the service depends on the user's current task, and the priority and special handling fields of the message designated for the user. A typical set of default service actions when a user is made potentially active, but is involved in another task, based on message priority, might be:

routine   notify user by adding message to user's task list

priority   notify user by adding message to user's priority task list

immediate   interrupt user - he may process message immediately, or defer it, in which case message is added to immediate task list

flash   interrupt user unless he is processing a flash message now - flash messages should be processed before other business

flash override   interrupt user - he must process the message before returning to any other tasks, including flash messages.

Should a user not act upon a message at his first opportunity, he will remain potentially active (unless the author changes the phase), and the service will wait for a reviewer to request access to the message. A reviewer, when finally ready to process a message, may find the message inaccessible. This could be caused by the author's changing the phase or coordination state of the message, making the reviewer inactive, or by another reviewer actively processing the message. In the former case, the reviewer will be informed anew should the author reactivate the appropriate phase. In the latter case, the reviewer has more explicit control. He can instruct the service to do one of the following:

- Nothing. The user will explicitly ask later about the status of the message, and request access if free.

- Notify the user when the message is available. The user may then decide whether or not to process the message (a reasonable default).

- Gain control of the message when available, and interrupt the user from his current task.

Once a reviewer has gained access to a message, he is considered active. He will remain active until one of two events occur. If the reviewer signs the message off, he relinquishes control, and is made either potentially active or inactive, depending upon his signoff. On the other hand, if the author revokes control from the reviewer, he is made potentially active or inactive on the basis of the author's succeeding directions.

It is now appropriate to discuss the functions and capabilities of the three types of reviewers: advisors, readers and releasers.

Advisors. Advisors are provided the most feedback capability of the reviewers. They furnish the author with his primary source of suggestions and comments.

A prospective advisor is notified of his role at the time he is made potentially active (by the author's activating advise coordination). His options at this point are immediate action on the message, or deferral until some later time. Naturally, his decision will be affected by the message's priority and special handling. His deferral can be permanent (in other words, never acting on the message). In such a case, if the message reaches the transmission phase, the advisor's User-ID will be deleted from the coordination list.

When an advisor wishes to act on messages, he may first query his task list. The service maintains lists of all pending tasks for each user, which can be sorted in any user-specified fashion. Once having selected a message, the advisor notifies the

service of his intention to review the message. Access to that message may be denied him, as described in the previous section, so he might proceed by choosing another pending message.

Should he be granted access to a message, all other reviewers are denied access until he is finished. While he has access, he may do any of the following:

- View the message, using any of the viewing options. He may see any edits or comments from previous reviewers.

- Edit the message. His cnanges will be recorded and available to all succeeding reviewers and the author.

- Make appropriate comments anywhere within the message.

- Sign off the message with his disposition. (The signoff may be accompanied by a comment as well.)

Any signoff except CIP (coordination-in-progress) indicates that the advisor has finished with the message in its current form. CIP is useful when the advisor has not finished his review, but must stop because of other business. By signing off CIP, the advisor allows other reviewers to process the message.

An advisor may assign transcription of his annotations to a ghost. The ghost then acts as the advisor in all ways except for signoff. The advisor, when assigning a message to a ghost, has the following options regarding signoff:

- The ghost may not sign off for advisor. When the ghost is done, he returns the message .) the advisor, who subsequently signs off.

- The ghost may sign off with any allowable code.

- The ghost must sign off with one of a specific set of codes (possibly only one).

If a ghost must interrupt processing of a message, he may sign it off GCIP. Any other signoff will be recorded with the message as if the advisor signed off, possibly constrained by the third option above.

At any time during ghost processing, the advisor may reacquire the message (force a GCIP signoff) and either continue processing personally or reassign it to another ghost.

Readers.   There are many occasions during message preparation when detailed comments and changes by reviewers are either unnecessary or undesirable.   For example, an author might find further edits 1) unnecessary once he has received enough suggestions to correct any deficiencies in the draft message or 2) undesirable if speedy processing through the remainder of the coordination list is essential.   he message service provides for such situations by the reader coordination mode.

In general, a reader has the same capabilities as an advisor, with the exception of editing and detailed comments (per message field). These limitations provide several useful effects. Since the readers may not make detailed annotations, they may review the message more quickly, knowing that only their general impressions are needed. Also recall that the author activates readers and advisors separately, so that the two groups are never potentially active at the same time. This, coupled with the fact that readers are not permitted to edit the message, allows more than one reader to review the message simultaneously. Thus, the use of readers during the coordination phase can greatly expedite processing of a draft message.

Readers have the same options regarding ghosts and signoffs as advisors. In the final version of a message, readers are not distinguished from advisors.

During the coordination phase, additional temporary additions to coordination list entries exist, identifying the statuses of readers and advisors. The possible statuses are:

AR   active reader (currently processing message)

PR   potentially active reader

IR   inactive reader - has signed off (code not CIP or GCIP)

AA   active advisor

PA   potentially active advisor

IA   inactive advisor - has signed off

I   inactive coordinator - not active or potentially active

At release, all statuses go to I (inactive). This field disappears at message transmission.

Releasers.   While the author of a message is responsible for its content, the releasers represent the authority which causes a message to be transmitted. In particular, the user identified in the From field of a message is a releaser, in addition to any other users specifically entered in the release list. No message may be transmitted unless it is approved (via OK signoffs) by all releasers. The releaser may be the author, who may transmit the message with no outside approval. However, messages important enough to require the mention of high officials as being in accord should include those officials as releasers. This insures that such messages must be approved by all relevant authorities before transmission.

It is possible that certain user groups will require restrictions on the users authorized to release messages. The message service will allow enforcement of such restrictions, so that all transmitted formal messages must have the approval of one or more of a specific set of designated authorities. The restrictions would be involved with transmission only; nonauthorized users could still create and coordinate formal messages.

Releasers have capabilities and options similar to readers. When the release phase is activated by the author, releasers are notified of their status. Since releasers may not edit a message, several releasers may be active simultaneously. If any releaser signs off a message with a code other than OK, the author is notified, and transmission of the message is delayed until all releasers sign off with OK.

A releaser may appear as a coordinator. If so, when he is activated as a coordinator, the releaser may, when signing off, notify the service that his coordination signoff will serve as his release signoff as well. This may obviate the need to re-route the message to the releaser later. Naturally, if a releaser gives a conditional signoff (OK?, OK-) and the message is subsequently changed, the releaser must see the message again and approve it before it can be transmitted.

POST-PREPARATION PHASES

This section discusses the post-preparation phases: transmission, delivery, reception, and archival.

Transmission

The transmission phase is initiated by author request. The service immediately checks the message for approval of all releasers, and notifies the author if there are any releasers who have not signed off with OK. If so, the author must get the necessary approvals. Otherwise, the message is readied for transmission.

Readying a message for transmission involves assignment of a permanent Transmission Identifier (if it is a formal message), removal of those fields necessary only during preparation (e.g. comments, version number), deletion of the User-ID's of coordinators who did not review the message, and finalization of all signoffs (transforming any conditional signoffs, adding 'final' or 'prelim' to signoffs as appropriate). Once these have been accomplished, the message is in its final form, and will not be further modified.

At this point, the message is routed to its destination addressees. It is not appropriate in this document to be any more specific about the actual transmission procedure than outlined above in the Overview, but an additional note is relevant regarding the proposed service's interface to existing message services. While the model proposed is assuming a homogeneous network of message sites, each running the service, it is highly unlikely that such a situation would exist in practice. The service would have to interface to other message services, both manual and automated. While discussion of such interfaces is beyond the scope of this document, any more detailed specifications for specific user groups would include such considerations.

Delivery

After completion of the message transfer protocol between two sites, the delivery phase begins. Delivery performs all the incoming routing necessary to get the message to the proper destination and provides copies to various additional users or titles as required.

The most important function of delivery is determining the appropriate destination for an incoming message. The service provides a flexible, dynamic means of providing such routing, by means of routing tables.

Routing tables are established by service administrators and individual users, through an interactive dialogue with the service. During this dialogue, the administrator or user specifies how routing is to take place under foreseeable circumstances, and what actions are to be taken in exceptional, unforeseen cases. The criteria used to determine routing would probably use the Priority, Special handling, Subject and Body of incoming messages.

The priority of a message would normally determine the service's insistence on finding an on-line user as the destination. Low priority messages would receive little treatment unless specifically requested by the addressee. High priority messages, however, which need immediate attention, would always be routed to an active user. If the desired addressee were not available, the service would first try any

addressee-specified alternates, and 'inally a known active user (such as the active duty officer).

The existence of a special han. ing field would probably determine the allowable limits of forwarding. For example, an eyes-only message would never be forwarded, regardless of priority. Other ty~~ of special handling could additionally widen or narrow the service's forwarding attempts.

The Subject and Body fields, where the content of a message lies, provide keywords which the service can use to determine routing. The service can be instructed to send Action or Info copies to certain users if certain keywords are found. A reasonable default would be to send Info copies to all users named on all lists associated with matched keywords, but, since action is usually sent to one user, to use a first-match or majority-match algorithm to determine the recipient of the Action copy. A more advanced version of the message service would allow arbitrary Boolean expressions as the routing criteria.

The specific routing algorithm employed also depends on the type of addressee: User-ID, Title, or Organization. Messages addressed to a user would normally not be forwarded unless specifically requested by the user or unless the priority of the message required immediate attention. Title addressees are usually designated for one of three main reasons:

- The sender wishes to reach the holder of a particular position, regardless of the individual filling it (e.g., communications officer).

- The sender does not know the most suitable recipient, so addresses the message to the section title high enough in the (assumed) hierarchy to be sure of including the appropriate recipient.

- The sender wishes to officially address a prestigiou⁻ title (to underscore the importance of a message), even though the message will be handled at a lower level.

When messages are addressed to a Title, the service will consult a routing table, which is either unique for that title, shared between several titles, or a default. A normal default would be no forwarding performed unless for priority reasons.

Organizations, like titles, are not associated with specific users, and would also have routing performed by routing tables. The main difference between organization and title routing is that the routing tables for an organization will be specified by a specific administrator, whereas the current holder of a title will be responsible for the routing for that title.

An optional service performed during delivery will be referential d...t 'bution. This would provide information copies of any incoming message to members of the distribution lists of any previous messages referenced in the incoming message.

Reception

Reception is the phase during which a user categorizes, acts upon, and determines the eventual disposition of his messages. Each of the above actions will be discussed individually.

Message Categorization. As described above in Delivery, incoming messages are added to the incoming message list of each user. In addition, each user is notified of messages pending for all titles for which he is responsible. The user may specify whether he wishes to process messages sent to him personally, or to a title within his responsibility. Each user chooses how these messages are to be further processed for his maximum effectiveness. Although each user is best equipped to determine what is optimal for him, the primary tools he can use are content folders, sorting, and abstracting.

A user can determine classes of messages in which he is interested, and instruct the service to append incoming messages which fall into these classes into groups called folders. The criteria will be the content of fields of interest to the user. Examples of such criteria are contents of Subject, Body, From, Priority, and Security fields, and whether the user is in the Action, Info, or Distribution list of a message. When matches to user-specified keywords are found, the service places the message in the appropriate folder, with the user deciding the folder in case of conflict or duplication of keyword matches, or failure to match. These actions are performed for the user when he logs on to the service, and he can choose to be informed at log-in of the status of any or all of his folders, and any new messages received since his last transaction with the service. During the time he is active on the service, he can choose how (or if) he is to be notified when messages are received while he is active.

A user can examine any fields of messages in any of h.s folders, on the basis of which he may change folder assignments. He may also designate off-line folders, the contents of which will be placed in the user's personal archive after a specified interval.

In addition to the capabilities provided above in folders, the message service will also provide the user the ability to sort his messages independent of folder assignments. Useful examples of desirable sorting criteria are date of reception, alphabetical by From field, and decreasing priority. The sort capability will provide additional flexibility that might not be easily available with content-folders.

Users will also need methods to scan quickly through their messages in order to determine their content and importance. This is provided by the abstracting facility. Using criteria specified by the user, the service can display selected fields or part of fields, pick out key words in context, and provide indices. This facility will allow the user to process larger volumes of message traffic effectively.

Action. When an action officer is assigned the action on a particular message, he is expected to do one of three things: act immediately, transfer the action, or suspend the action. He is not expected to ignore an action message, though the service cannot force him to look at it.

Immediate Action

If the action officer chooses to act immediately, he may compose an answering message which refers to the original action message. This will cause the service to put an indication into the original action message's status file saying words to the effect "action taken and recorded in QAFB/JUN 7,1974/ 10:45:11 from Major Gross." If the action required is totally outside the service, the action officer might just inform the service that the proper action has been taken. In this case the status file indication would be more like "action taken by Major Gross of QAFB on JUN 7,1974 10:45." In either immediate action situation the message is removed from the action officer's action folder.

Transferring the Action

This is a case where the action officer feels that a different action officer should be assigned action on a particular message. He notifies the service of this, which then informs the other action officer. If the second officer agrees, the transfer will be made, and an indication will be placed in the status file recording this transfer ("selling") of the action.

Suspending the Action

If the action officer wishes, he may suspend the action on a particular action message. He does this by informing the service when he expects to have taken action on the message. He should also tell the system if and when he wishes the service to remind him of this suspended task. In addition to the indication in the status file ("action suspended ..."), this message will be placed in the action officer's suspense file. The suspense file is used by the service to generate schedules and reminders to the action officers.

Information, Distribution, etc. If the message recipient is not the action officer for the message in question, than his responsibility with respect to the message is not

as clear as above. The copy has basically been sent for the recipient's information. He has many options with regard to these information messages. They break down into four classes: destroy, distribute, keep off-line, keep on-line.

Destroy

If the action officer wants no more to do with a message, he may delete it from his purview. If it is a formal message, there will always be an archive copy. In the informal case, other recipients might have copies. Other variations on this theme involve removing message copies from one message folder, but leaving copies in other folders.

Distribute

If the action officer wishes and the Special handling field allows, he may request the service to forward copies of the message to others. This would cause a indication in the status file to the effect "Major Jones forwarded message to x,y, and z on JUN ..." A variation here includes a joint forward and delete operation, which is very similiar to selling the action as described above. However, the interaction in this case is much simpler as no one is considered to be in a position to refuse information.

Keep Off-line

If the recipient and the Special handling agree, the service will generate a hardcopy of the message.

Keep On-line

The action officer can move the message from some to-be-processed (suspense) folder to a record-keeping folder. Messages may be kept for a long period of time in user folders. Actually, if a message is not accessed in some period the folder entry will be reduced from the message to just a Message-ID into the archive. Any informal message which is not in a folder of some user is purged from the service. Any formal message which is not in a folder of some user and is older than a given age (defined by each installation) is purged from the archive.

The status file for each transmitted message is maintained by the service and readily accessible to each person related to the message. When a message is finally settled, the status file is appropriately pruned and merged with the archive message copy. In summary, the receiver can have his incoming traffic sorted, then he can take the appropriate action relative to action messages or information messages. Finally he disposes of the message and it moves to the archive. During this entire process the service is maintaining status information on the message to enable other parties to track its progress.

Archival

Archival occurs at the origin and destination sites for all formal message traffic. The procedures will be straightforward, providing off-line retention of all messages for a specified period. [A more advanced message service will provide an on-line index to relevant fields of all archived messages, to provide quick reference to past formal traffic.]

Figure 1 is an example of the possible printout of message CAFB/ Jun 17,1974/ 10:55:17 as retrieved from the archive. This is to show what information is kept with an archived message.

ADMINISTRATIVE FUNCTIONS

In addition to the user capabilities described above, the service will provide several administrative functions as well. These will be primarily record-keeping services, such as type and volume of message traffic, service utilization, archive status, etc. Privileged administrators will also be allowed to set service parameters, add or delete users, and perform necessary housekeeping operations. As the nature of these services is highly installation-dependent, detailed specification will be deferred until user requirements are known.

Message Type:	Formal
Transmit ID:	QAFB/JUN 17,1974/10:55:17 from General Smith
Create ID:	QAFB/JUN 17,1974/7:13:11 by Major Jones
References:	XAFB/APR 12,1974/11:21:17 from Logistics YAFB/MAY 11,1974/15:13:11 by Logistics ZAFB/JAN 5,1974/17:34:16 by Logistics
From:	General Smith of QAFB [OK final]
By:	Major Jones
Security:	SECRET
Action List:	All Immediate Priority: Logistics at XAFB, Logistics at YAFB, Logistics at ZAFB.
Info List:	All Routine Priority: Commander at XAFB, Commander at YAFB, Commander at ZAFB.
Distribution:	Capt. Green, Capt. Black
Coordination:	Capt. Alpha Read Preliminary Capt. Beta NG Preliminary Capt. Gamma OK Final Major Hart OK Final
Release:	Major Heart OK Preliminary Major Hart OK Final Major Harte OK Final
Subject:	Shortage of bearings at QAFB
Body:	If you can please ship 10,000 type QRST bearings immediately, we would appreciate it muchly.

Figure 1. An example of an archival message

Discussions with representatives of an eventual COTCO user group have identified some additional needs and constraints to be incorporated into the COTCO Military Message Service. These modifications, which alter or limit the specifications of the service as presented, are specified below.

The COTCO community has expressed concern that the message service be implemented as basically and simply as possible. It is thought that a multitude of available options and capabilities may hamper effectiveness by 1) confusing the novice user with a host of unfamiliar choices, 2) providing a more knowledgeable user with unnecessary options, and 3) degrading response time with additional processing of increased services.

The various modules of the User's Agent (part of the message service) have in fact been designed to cope with precisely the above considerations. By maintaining a profile for each user, the service can tailor its appearance to each user to be consistent with that user's expertise. The ubiquitous presence of a help/tutor facility provides the user with information and/or instruction where he is unsure of what to do or what he has done, and the existence of an "experimental" mode and a universal "undo" function attempts to insulate the user from the effects of potentially damaging errors. In addition, the real-time monitoring modules of the service attempt at all times to provide smooth, consistent response from the service.

The desired consequence of these facilities will be to provide a service which, while powerful, will present its capabilities in a natural, expandable form, at each user's own pace. Therefore, restrictions to the capabilities of the message service should be made on the basis of inessentiality or inapplicability, rather than the concern that increased power must be paid for by impaired user performance.

In light of the above considerations, some capabilities of the message service were deemed unnecessary for COTCO requirements. These consisted primarily of restriction of alternatives where the increased number of choices would not provide more meaningful information for the users. These include:

1) The release list is not needed, as the formal sender (From) constitutes the single releasing authority for a given message. All other reviewing needs are satisfied by designating other users as coordinators.

2) The only signoff codes required are "OK" and "NG," since more codes would only encourage quibbling, rather than provide flexibility.

3) A question was raised as to the very general ghost structure and whether such generality was required. It is felt that the ghost issue is not yet well-understood enough to make a definitive decision on whether (and how) it should be restricted.

The remainder of the COTCO requirements deal with minor tuning of existing capabilities. The affected areas are listed below:

1) In the COTCO environment, the formal sender of a message **(From)** must have the ability to modify a draft message and control its progress, in the same way that an author can. Thus, the sending authority will have full author rights: he can create and modify a message, route it for coordination (or recall it), and transmit the message at his discretion. The author and releaser share the responsibility for the preparation phases of a message.

2) COTCO would find it useful to further delineate distinctions between formal and informal messages. The following chart lists the currently desirable distinctions:

FORMAL	*INFORMAL*
From field is a title	**From** field is a name
Releasers limited to restricted subset of users	May be released by any user
Subject to incoming routing procedures	Never routed unless directed specifically by recipient
May be any priority	May be **Routine** priority only
Placed in permanent message archive	Not saved except by individual users

In addition, COTCO would like to see some immediately recognizable physical distinction between formal and informal messages. Suggestions for such distinctions include: displaying the messages in different fonts, or black on white versus white on black.

COTCO expressed a desire for transaction iogs and administrative facilities, but as yet the specifics of such requirements are vague. Further interaction with the end-users and administrative officials will define those needs.

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