-06NOV70 DCE 5219

Requirements for higher-level interactive pocesses

These notes were distributed in semi-legible, handwritten form at an ARC meeting, 1400 Tues 3 Nov 70: DCE WSD JCN WLB for go-round on requirements and possibilities; WHP CHI for coordintion of Software and User Feature Activities; WKE for general coordination in Service-System Deveopment Activity. 1

In both ARC and NIC, the trends in our everyday activity are producing increasingly urgent needs for interactive services operating at a higher-level than those now provided by NLS/TODAS. Some approach is needed for the development of these services. What seems most feasible is the further development of our Executable-Text features, together with those of the Collector-Sorter and Analyzer-Formater processes. 1a

To assess the trouble, cost limits, range of possibilities etc. that may be considered, I felt that an outline such as follows would provide a useful framework. 1b

Dialogue subsequent to that meeting has already appeared in the Journal. 1c

Note: An "unskilld" user refers to people reatively new to the NLS/TODAS environment, such as new/temporary clerical help, the NIC Agents, etc. A "Skilled" user is one who is very much at home wth NLS/TODAS, who can use the range of basic ET-CAFS (Executable-Text Collector Analyzer Formatter Sorter) features with a reasonable degree of facility -- not necessarily a software engineer. 1d

Application requirements for higher-level interactive processors: 2

Aiding an unskilled user to do such as 2a

Get message 2a1

Send message. 2a2

Get Journal file. 2a3

Get query, make collection. 2a4

Produce standard indices of collections. 2a5

Enter Journal item. 2a6

Supporting ARC/NIC clerical procedures. 2b

Requirements for higher-level interactive pocesses

Journal management. 2b1

Catalog management. 2b2

Special Collections 2b3

NIC, Site A, Site B, ... 2b3a

JRNL, Message, Baseline, ... 2b3b

NAS, Languages, Systems, Products, ... 2b3c

Correspondence, Mail, Listings, ... 2b3d

???Indea gmpt????? 2b4

Mailing list maintenance. 2b5

Mailing label generator. 2b6

Distribution-printout process (JRNL, NIC, Message, ...) 2b7

Baseline summary generator. 2b8

Baseline updating. 2b9

Examples of other valuable applications for higher-level interactive processors: 3

Initial set manipulation, limited but valuable 3a

A number of "Output-Processor" type of features. 3b

For multi-file reports. 3b1

Automatic generation of Table of Contents. 3b1a

Automatic "publication" processes -- printing out a succession of files, with appropriate page sequence, page numbering, etc. 3b1b

Index generation? 3b1c

Automatic access processes, to cataloged items: 3c

E.g., Sb? JL bails????, have an ET program that can help you access the item, wherever it is stored. 3c1

Automatic user services that call for, and coordinate, computer-operator and/or clerical support. 3d

Basic new requirements seen for ET-CAFS toolkit to bring them up to power for these applications: 4

Better debugging. 4a

Complete control of user-terminal output during ??collection?? (e.g., no spurious "feedback"). 4b

Ability to write interpreter processes that can: 4c

Execute processes specified in NLS-file statements, in adequately clean and usable syntax. 4c1

Get execution data from NLS-file statements, as arranged in form oriented for user specification, study, and maintenance. 4c2

E.g., lists of files to be queried; lists of links to branches (files) to be processed; lists of people to send copies to; etc. 4c2a

Execute file management operations, e.g., to allow: 4d

Updating operation on a master file. 4d1

Getting a copy of a file out of KDF for analysis, then deleting it from scratch. 4d2

Supporting a Journal entry file pickup process. 4d3

Supporting a message entry process, into an NLS message-accumulation file. 4d4

Supporting special access processes to cataloged items that may not be in scratch space. 4d5

Specific possibilities. 5

Regarding the "interpretive processes". 5a

I see adequate and rich possibilities from the following: 5a1

ET-AF intercommunication. 5a1a

Get P2 P3. 5a1a1

ET control equivalent to P1. 5a1a2

ET setting of Pi at SF:XX. 5a1a3

AF Call, designating procedure and pointer (or statement) dl AF interprets on P1 is adequate. 5a1a4

During USER-Get call from AF program, a bombout-return due to the user hitting a CD might leave a special print character at the end of the user-entry string. 5a1b

I can imagine a likely ET-AF programming trick being to call for user entry as part of a Replace-Statement operation, thus getting the entry initially into a temporary-use "buffer statement," 5a1b1

Then, before acting upon that entry, the ET program calls on a special "response-processor" AF procedure to operate upon it, Before returning to the ET program, the AF procedure could do many useful bits of analysis (for user goofs, for translation of abbreviations, etc.), and can reformat the contents of the buffer statement before the ET program is to incorporate itexecue it, or can move the ET-ececuto's control pointer a bit to switch te ET program under response-analysis guidance, etc.possibly corrcting an AF program analysis by before it is incorporated (or before it affects te further course of) the ET program. into a buffer statement for analysis by an AF procedure). CD inserted as print character. 5a1b2

If this sort of thing is a relatively common approach, then, if tne Command-Delete action by the user was indicated by presence of the special character at the end of that buffer statement, the AF response-processor procedure could do flexible and interesting things about CD actions, too. 5a1b3

Incremented compiling. 5a1c

E.g., Quite often, a particular higher-level ineractive (ET-based) process would initially compile a general AF program for supporting its various subprocesses. Then during subsequent processes, it might want alternately to: 5a1c1

Use these AF processes to create the source code for special AF procedures, as depenent upon

"directions and parameters" found in NLS-file text. 5alc1a

Then compile,these special procedures to do particular intermediate tasks -- searching or reformatting as directed by te user-provided material which the over-all ET program is "executing" for him. E.g., for specified-content filtering in a query-merge operation. 5alc1b

But, if there is alternate calling upon these the one AF program for creating a temporary second AF program, the compiling and executing the latter, then executing the first again, etc., the successive re-compilation of the larger, general-support AF program for each such cycle would be a real drag.. 5alc2

Orientation 6

What's feasible? 6a

What's valuable .... how? 6b

Costs of ...., dangers. 6c

Cost/value ..... plan. 6d

(trial designs....) 6e

':5219', 11/09/70 1110:36 MEJ ; .DPR=1; ':JRNLA', 11/06/70 1639:00 DGE ;
.DPR=0;

ARPA Memo #2, DCE, 7 Dec 69, 1545

Memo #2, for Larry Roberts and Al Blue, regarding relevance of our proposed work to DOD activities or problems. 1

1a

An evolving document. Observed to be sketchier and rougher toward the end. 1b

Succeeding versions: 1c

(sent to Al Blue)
First: 6:30 a.m. pickup on Sunday Morning
Second: 2:00 p.m. pickup Sunday afternoon. 1c1

(Hand carried by Bill English, for Larry Roberts)
Third: a few additions and changes from the Second. 1c2

CONTENTS: 2

3

I -- FIVE ITEMS IMPORTANT TO THE RELEVANCY QUESTION (I don't have much material to expand the three not marked with asterisks): 4

*The goals of the project, in a substantive sense; 4a

Developed by citng specific components of our planned whole-system development 4a1

Parts II, III, and IV describe them in some detail. 4a2

(Forthcoming?) See also the list of scenarios portraying representative application of these techniques. 4a3

The likely degree of our success toward these goals; 4b

Perhaps citing recent Electronics article, or the reception at IBM Watson Lab of ASIS movie, reception of our presentations at FJCC and ASIS conferences ... would help give confidence here? 4b1

*The likelihood of there being DOD activities and problems to which our products could be directly relevant. 4c

Consider the range of applications listed under Item V below, DOD-Relevant Application Possibilities. 4c1

The potential value from each application -- and further, the potential value from multiple-area utilization, if greater than the sum of the parts. 4d

How judge? Larry and Al maybe suggest way of dealing with this? 4d1

The likelihood of the resulting techniques being put into service toward these DOD ends. 4e

RADC proposal to AFSC. 4e1

Our firm intention to establish a healthy "System Developers Interface Activity" (SYDIA). 4e2

II -- GENERAL USER CAPABILITIES 5

FAST EDITING AND PUBLICATION 5a

Our already fast editing techniques will naturally continue to evolve, and we plan early to concentrate upon automatic production, from our on-line files, of hard copy having a very flexible composition of text, diagrams, tables, equations, footnotes and indices -- all related directly to the way in which the associated file material can be studied and manipulated on-line. 5a1

SUPER-DOCUMENTS 5b

Pertaining to the development and production of very large, very complex documents containing many details that are highly cross-dependent -- where much is involved in the way of special indices, footnotes, reader-supportive comments, specific cross references, etc. 5c

We currently have quite powerful techniques for aiding an individual or small report-writing team to produce documents of the usual research-report size and complexity. 5c1

But in our approach toward team augmentation, we consider it an essential task to expand upon these techniques in the direction cited above. 5c2

A team tackling a complex system-development project must provide itself with the highest possible visibility over its working environment -- i.e. over its 5c3

Planning: plans, contingency alternatives, resource commitments, status, criticisms, 5c3a

Designing: designs, design principles, constraints, estimates, analyses, supportive data, relevant needs and possibilities, 5c3b

Operating: roles, task definitions, assignments, policies, operational procedures and conventions, 5c3c

We intend to develop and keep up-to-date a large, detailed, highly cross-referenced and well-indexed "super-document" that contains just such a description of our own project-team activity. Our techniques to facilitate its modification and re-publication will be under constant evolutionary pressure. 5c4

DIALOGUE BETWEEN ON-LINE COLLABORATORS 5d

On-line access by collaborators to each other's files, as

provided by a number of today's time-sharing systems, leaves much to be desired in supporting effective dialogue. 5d1

An effective dialogue-support system is essential to team augmentation -- hand in hand with the above "super-document" facility (which enables complex issues to be dealt with) must go some such ability as the following: 5d2

Any team member at a display console can study swiftly any portion of the super-document's structured files (for which process our current system does fairly well, but for dialogue study it is only "part-way there"). 5d3

Whenever he wishes -- as though he were pencil-marking his private draft with marginal comments, underlines, encircled passages, arrows, etc. -- he can introduce comments that are freely sprinkled with explicit references to any specific item (e.g. any character, word, line, curve, box, or expression) within anybody's prior entry. 5d4

And this must be managed by the computer so that it doesn't matter if other people are simultaneously scanning the same material or affixing comment references to the same items. 5d4a

His study techniques should enable him to selectively be made aware of various sets of the comments that might be referencing a passage he is inspecting -- i.e. he wants to be shown that an unseen comment references this term of this equation, or this label on this diagram, or this citation). 5d5

He quite likely doesn't want to see all such reference indicators for all prior comments, so he needs a flexible ability to specify which are to be visible, as specified by such as author, creation time (relative or absolute), specified-content analysis, prior-assigned comment-set memberships, author-affixed category designations on the comment or its reference links, etc. 5d5a

Also, whenever he sees indication that an interesting type of comment referencing is associated with some item in the studied passage, he needs considerable flexibility for quickly designating how he wants to be shown such selected comments relative to their referenced material -- e.g. left-half and right-half of screen, flip-frame, or embedded and boxed. 5d5b

When creating one of his own comment entries, he needs flexible aids and methods for arranging interspersed or concurrent display of his various referenced passages relative to the content of his comment, for designating the explicit entities he wishes to reference, and even for having the current comment-creation state preserved temporarily while he checks on some related material. 5d5c

Provisions need developing for setting up little "annunciator calls" to various people, or sets of people, to request their special attention (at some level of priority) to a given comment. This may call for such as: 5d6

an approval signoff, 5d6a

or some special kind of a vote -- automatically tallied, and recorded on the annunciator spec in that comment, 5d6b

or a need to observe a"point of order" in the special methodology the team has adopted -- e.g. "I protest this decision and call for a review, citing Policy XX, relative to Budget Item YYY and Design Principle ZZZ." 5d6c

All of the interactive-dialogue entries immediately become part of the super-document, super-posing a potentially very complex comment network ("network" because comments can refer to comments in indefinite extension) 5d7

It will be hard to keep track of the relationships among these comments and the substantive records about which the dialogue is swirling 5d7a

-- their relationships need never be ambiguous, but consider the problem of trying to study such a structure to determine where we now stand in our developments and discussion, especially when it is the record of a complex system design and the interactive dialogue among probably very active people who have immense mobility and visibility. 5d7a1

This is about the toughest central challenge in effectively augmenting a team -- that of developing computer aids, working methods, etc. to allow a skilled person to be highly effective in digesting the content and implications of such a record, and to develop a substantive next-stage design or plan that integrates the dialogue contributions. 5d7b

Essentially similar techniques are required to augment any individual's central intellectual capability for synthesizing the next stage of development in plan or design -- and to the extent that we are successful with this, we should be able to offer strong guidance for capability augmentation over wide ranges of individual and team activities. 5d7b1

DISTRIBUTED DIALOGUE 5e

We deem it important for people other than the central, highly-trained, display-equipped team to participate in such dialogue, as well as possible: over a fairly wide range of sophistication in the computer, communication, and terminal facilities available, and in the special training of the individuals; and with as much independence as possible of geographical location. 5e1

As a first step, the organization and formatting conventions for presenting the super-document on other than the selective-view displays presents an important problem. We intend to work on this problem for: 5e2

It is assumed that for significant participation via this type of coupling, the person would need comprehensively indexed hard-copy reference material that is republished relatively often (e.g. weekly, even daily). 5e2a

The typewriter link could provide him with computer aid in locating items and following cross-reference citations. 5e2c

higher-quality hard copy, as described above under Editing and Publishing, for both paper and microform (probably microfiche); 5e2c

remote printing devices, such as teletypewriters, line printers, and hopefully the high-speed, high-quality, scan-driven types of hard-copy devices now appearing on the market. 5e2d

We are under way with arrangements to provide this reference material in the form of microfiche. Our publication techniques are aimed to provide automatic publication into this media, to make experimentally feasible a frequent-republication service to quite a few remote participants. 5e3

When a manual microfiche reader is used together with an on-lin typewriter, retrieval, indexing, cross-referencing et. can be guided by typed-out directives from the computer. 5e3a

A next step (already started) is to enable direct, on-line, dialogue participation over a common time-sharing type of typewriter link -- we are giving this special emphasis to provide for early Network access to the Network Information Center. 5e4

We are also pursuing actively an extremely promising possibility associated with an emerging line of electronically-driven fiche readers -- where jumping to any frame of a fiche, or for most of them to any fiche within a cartridge, or even for some to any cartridge within a carriage, may be accomplished in from a fraction of a second within a given cartridge to only a few seconds between cartridges. 5f

Such a reader, loaded with updated cartridges from us, where the reader and a typewriter both connect to a normal typewriter link through the Network to our computer, can provide a person with some very powerful help in his super-document studying 5f1

in some respects this can nearly be competitive with our high-response, on-line display consoles, certainly far and away better than with a manual reader. 5f1a

He can follow links, indicate where he wants to aim a comment reference (via typewriter entry of his comment), jump to an index and from there to selected points, jump successively to the candidate selection produced by a retrieval query -- all via quick directions on the typewriter, abbreviated by cues that he sees on the screen (which the computer knows about). 5f1b

CONFERENCE DIALOGUE 5g

(Quick treatment. . . .) When people are gathered together to be presented with a proposal or argument, or to collaborate actively on a problem, there are quite a few techniques to be evolved to make this work more effectively. 5g1

We already have experimented with using NLS by one person, where all can see the display, for giving both new power in

presenting material and answering questions, and for providing a very flexible blackboard for the record of the discussion to evolve upon. 5g2

There is both need and possibility aplenty for using multi-access capability and allowing more people to be getting independent aid from the computer. 5g3

Each person having his private NLS console (smaller, quieter, etc.??) is one step -- whereby the above described dialogue techniques can be applied. 5g3a

But techniques need be evolved to integrate the unskilled (perhaps give them each a "chauffer"?), and to aid in the new dimension of being present, seeing, hearing, feeling, etc. We have ideas -- next edition maybe cite them. 5g4

VOICE DIALOGUE 5h

(Quick treatment. . . .) We hope to experiment with a possibility that Glenn Culler's techniques (and computer) will provide. That is, to fix NLS so that each "statement" can contain not only the present text and/or graphic material, but also a digital representation of a speech string. 5h1

Then we would expect to add techniques for breaking long speech strings into snorter ones (like we can break text statements now), hierarchically organize them (falls out immediately, as soon as we can tie the voice string to a statement), and provide text-link cross-referencing to any given voice string. 5h2

This would let us integrate actual speech dialogue into the above dialogue techniques -- which would make an extremely powerful addition to our team-augmentation techniques. 5h3

It would also help a lot of remote participation, where people's phoned-in voice comments could be integrated. 5h4

And for the conferencing, where all the comments, and comments on comments, etc., could be managed, and where trained secretarial help could be adding notes, doing selected transcriptions into text, etc. 5h5

And the gradual ddevelopment of speech-processing

techniques could add ever-more-powerful benefit from this voice-dialogue approach. 5h6

RETRIEVAL 5i

(bare treatment. . . .) Our team must have very quick and comprehensive retrieval techniques over the data base of its complex working records (see above), 5i1

This will also be true for its use of its "intelligence" data base (see below). 5i2

Also will be keeping up a correlated data base containing such as characteristics of externally obtained system elements, reference material on externally developed techniques and data, intelligence on progress of related work by other groups, 5i3

TECHNICAL INTELLIGENCE 5j

For our own needs, as a research team, we have been developing for some years a corpus of "intelligence" (bibliographic) data about the activities and products of the outside world. We intend to have this be shaped up as an effective activity, and hope to begin offering portions of it (properly indexed, etc.) to NIC users. 5j1

DATA ANALYSIS 5k

III -- SPECIAL MANAGEMENT TECHNIQUES 6

WORKING-RECORD MANAGEMENT 6a

The serious, longer-range goal behind the super-document and dialogue techniques is to ultimately develop the appropriate on-line aids and associated special working methodology to enable the "super-document" files tooinclude for each team member his own scratch work, self notes, current-state in-process drafts of plans, designs, memos, etc. 6a1

The team's goals and plans would appropriately include a place for each of his task assignments; under each of these would be his goals and plans for executing that assignment; and within these his various current activities would be associated with creating or modifying files. 6a2

The monolithic-record notion seems basic to derive effective coordination of a team's human resources. In addition, there is much to learn about the appropriate "rules of order" for keeping the process as orderly as is necessary, and for providing a working environment that harnesses structured concepts and frees the humans' actions from the rigid compartmentalization stemming from very limited communication capability. 6a3

PLAN-DEVELOPMENT METHODOLOGY 6b

TASK NEGOTIATION AND REVIEW 6c

RESOURCE ALLOCATION, ACCOUNTING AND REVIEW 6d

OPERATIONAL PROCEDURES, DEFINITION, REPRESENTATION, MONITORING 6e

CONFLICT RESOLUTION 6f

ROLES, THEIR VARIETY AND INTERDEPENDENCE 6g

It is becoming quite evident that the working environment opening up to the augmented team will permit very considerable experimentation with organizational matters. 6g1

When any individual has inertialess transportation, highly automated locating and navigating aids, and possesses a viewing instrument that gives quick, flexibly adjusted analytic views at the terrain -- and each can reach into that terrain with powerful aids to alter it -- then the ways in which people can develop teamwork become much enrichened. 6g1a

Consider a simple-seeming capability like the virtually instant convening of a meeting to deal with a complex issue which may be all of two minutes old and already has been assailed from many sides by many people with many different considerations and talents. 6g2

Depending upon the nature of the event, and because they can instantly assemble with the appropriate tools and material, do the job, and split away back to other role participations so quickly, the team might easily have a different role distribution here from the one they last approached together -- i.e. it would be like the carpentry supervisor holds the stake for the framing

carpenter when they are part of the team making a quick check of alignment with a surveyor's transit. 6g2a

IV -- SPECIAL SYSTEM-BUILDING TECHNIQUES 7

SOFTWARE-ARCHITECTURE PRINCIPLES FOR INTERACTIVE SYSTEMS 7a

compile-compiler 7a1

We've published about our Tree-Meta development, and its use to generate our special-purpose system-design languages. 7a1a

special format and conventions in source-code languages 7a2

A very important feature about these special languages is that their format and structuring conventions are adapted to fit our augmentation-system usage environment. This provides a degree of facility for composing, studying, and modifying source code that is very rewarding and powerful. 7a2a

The super-document approach stems from a belief that all levels of design and analysis thinking and data should rightly be integrated into one compatible system of files over which the designers, supervisors, later maintenance people, colleagues, etc., can freely and adroitly roam. 7a2b

The dialogue-support techniques have an important contribution to make at every level, and they require an integrated approach to recording, documenting. 7a2b1

To organize the conceptualization of a system design into appropriate levels and areas, and to develop effective representations of the design specifications and principles at each such area, seems necessary. 7a2c

Our software architecture approach stresses these things, and promises to make useful headway in evolving conventions, procedures, and aids that could help other people approach and operate on the architecture of complex computer systems. 7a2d

special system architecture for evolutionary development by augmented team 7a3

distributed resources 7a3a

network, front ends 7a3a1

ids front end 7a3a2

modular, expandable 7a3a2a

conceptual partitioning, with spls, 7a3b

for design clarity 7a3b1

for easier transfer 7a3b2

for easier modular growth and modification 7a3b3

special bookkeeping, documentation, etc. 7a4

ANALYSIS AND DESIGN PRINCIPLES FOR ON-LINE USER SERVICES. 7b

Designing a whole augmentation system involves a balanced consideration of many re-designable features: e.g. the concepts (way of viewing things), ways of representing and recording the concepts, methods of developing the concepts and products associated with a task, the computer aids and utilization procedures to get maximum help in carrying out the working methods, and the ways in which a user negotiates each given service transaction in each different context. 7b1

There is no existing design discipline encompassing this range of inter-dependent system factors -- but one really must evolve if any large-scale benefit is ever to be derived from the computer services that are plainly seen to be coming. 7b2

Consider the tremendous increase in speed, capacity, and economic availability, and then add the promise of forthcoming increases in the quality of that service as the artificial-intelligence techniques become ever more powerful. 7b3

It would be sad to think of all this power possibly being harnessed by society in ways that leave these helpers remote and uninvolved from our minute-by-minute human activity. 7b4

We need to learn how to do our thinking and working so that quick little bits of their service can be harnessed on our own terms within our own way of working. 7b4a

The system should have these computer services matching to the human perceptual, mental, and motor mechanism in a way optimum for our purposes, and these matching ways will certainly be far different from those with which we have harnessed our primitive past tools." 7b4b

The design of the repertoire of user services provided by the computer-communication-terminal facility is a process requiring the kind of design discipline associated with every complex system design. 7b5

I consider it VERY IMPORTANT to get about the development of an AUGMENTATION-SYSTEM DESIGN DISCIPLINE. 7b6

USER TRAINING AND REFERENCE-AIDS 7c

V -- APPLICATION POSSIBILITIES RELEVANT TO DOD ACTIVITIES AND PROBLEMS. 8

Different types of application, that may utilize different portions of our whole system. 8a

Special application of isolated components from our whole system of techniques -- all of which will be significantly improved during this next contract period. 8a1

General application of the augmented-team system. 8a2

Design of other than computer systems. 8a2a

Planning team 8a2b

Special application of the augmented-team system, for computer-system-development teams. 8a3

Organizations that could utilize augmentation techniques to improve their internal effectiveness in ways that could have very considerable and direct relevance to future DOD activities and problems: 8b

DOD organizations. (See AIMEM) 8b1

Other Government agencies and departments whose effectiveness affects DOD operations; 8b2

DOD-sponsored research activities, where augmentation techniques could produce new knowledge and new techniques of higher quality and at a faster rate. 8b3

The defense industry, where augmentation techniques could do such as significantly reduce new system lead times, speed up and make more effective a contract's negotiation and monitoring processes, etc. 8b4

The computer-systems-development teams that provide these organizations with effective computer systems -- in particular, WITH TEAM-AUGMENTATION SYSTEMS. 8b5

(NOTE: This is the utilization target that we most specifically can serve, which we think has special merit as a strategic consideration.) 8b5a

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10NOV70 DCE 5221

NLS NP: Snapshots of Portrayal-Generator Output as NLS Pictures

INTRODUCTION 1

The Possibility: Enabling the user to capture any of our system's computer-generated portrayals as a "picture" attached to an NLS-file statement -- not only "snapshots" of NLS and TODAS portrayal generation, but also of any of the other subsystems we use. 1a

The Need: As our repertoire of tools and techniques expands, the task of documenting them (to teach, or merely to provide detailed description for system analysis and comparison) will become harder by some power greater than 1. We have found screen photographs to be very valuable for this purpose, but tedious and expensive and limited in use to hard-copy documents. 1b

Followup Action Expected: I'd like to have this possibility become one of the seriously considered items in our Baseline planning. It should be kept in mind during development of the NLS Picture Package -- it would likely be that the NP for providin this snapshot feature, and its subsequent portrayal-generator processes will interact with the PP designs (data-storage form, accessing and maniplation programs, etc.), 1c

May I have specific consideration and comments regarding this snapshot feature, its feasibility etc., from BLP, CHI, WHP? 1c1

FURTHER DISCUSSION. 2

Viewing and printing of the snapshot pictures. 2a

I assume that a general design goal for the PG (Portrayal Generator) will be a freedom for the user to scale an NLS-held picture into almost an arbitrary-sized area, and to position that area where he wishes on page or display frame. 2a1

This can be useful even to small scaling sizes where the technology of the medium (printer, viewer, display, projector) can't produce enough resolution to allow full-detail reading of the snapshot picture. I'd like to see us work toward a general processing capability in the PG for an arbitrary scale-down factor of NLS pictures (in either displaying them or printing them). If our first moves in this direction are limited to a reduction factor of 1:5 or so, I'd be satisfied. 2a1a

Scaling up, beyond full frame, implies a "scissoring" capability. I see more need for this stemming from other-source NLS pictures, so I'll defer weighting the value until we consider them. For instance, large tables, large Gant Charts, large Flow Diagrams, etc (We might find value-possibility interest in one form of scissoring, for smaller pictures. In the "cutout" feature below, would often need some means of selective viewing, one means of which is area scissoring.) 2a2

Captions and Labels 2b

Affixing captions (that are not part of the original snapshot picture) is an obvious need. At the outset we could do quite well with assuming the text part of the picture statement to be the caption, and formatting it accordingly. 2b1

For these compter-generated, snapshot pictures, the labels and arrow vectors used for identifying special entities and features of the picture will want to be fully manipulatable by the user -- superposed over the picture entities or not. So we'll need a means of ignoring (and protecting) the snapshot part of the picturing when executing these kinds of manipulations. 2b2

Cutouts 2c

One kind of modification of the original form of a computer-generated snapshot picture that is likely to be desired would be to make cuts and eliminate parts. For instance, some labelling may be better composed in a clear area, and so an area where the picture detail wasn't relevant might want to be "cut away". 2c1

Or, suppose that a succession of such snapshot illustrations is to snow action on a display frame in which only a portion of the frame is changing; so a full view might want to be shown on a first picture, with a box drawn around the region of special interest -- with the successive illustrative pictures showing only the action occuring in the "cutout areas" from the succession of original full-frame snapshots (perhaps blown up in size). 2c2

We could likely have a choice in handling the development of these picture-cutting features: 2c3

Retaining the full picture, carrying the "cutting geometry" specs along, and blotting out the cutaway portions in the PG process. 2c3a

This is nice -- it lets people try things and then change their minds. It also lets a reviewer look to see if a cutaway area really is O.K. to leave out. 2c3a1

The other way -- to actually trim the picture in its stored form -- has a certain economic appeal, but I would prefer the first way (pernaps both, with user choice?). 2c3b

If one uses a cut to isolate a portion of a snapshot, he may well want it scaled up. Since I'm assuming that the user establishes the cut boundaries, blowing up such cutouts needn't involve automatic scissoring just to give them a bigger area in an "illustrated frame" (page). 2c4

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':522|', |1/10/70 |233:44 MEJ ; .DPR=|; :JRNLB, |1/10/70 |230:55 DCE ;
(Copies to BLP, CHI, WHP, WKE,  JCN);
.HED="                                                    |0NOV70 DCE 522|

NLS NP: Snapshots of Portrayal-Generator Output as NLS Pictures";

 .SNF=72; .MCH=65; .DLS=1; .PGN=0; .PST=1; .SCR=2; .COD[21B]=114B; .DIR=0;
.SNF=72;.SCR=2;.COD[21B]=114B;.MCH=65;.PGN=0;.SNB=0;.DPR=0;.PES;
```

Mail File

MSC $5222.1 WHP 11/09/70 1818:41 SINCE YOU ARE WORKIN \G ON QUICKPRINT FOR THE 10 HOW ABOUT NOT DELETING BLANKS AT FRONT OF THE STATEMENT AND FINDING THE BG\UG THAT IS SCREWING UP THE PAGINATION WHEN HAVE A STATEMENT WITH A LOT OF CR'S AT THE END OF THE PAGE THNX ALSO THERE IS A FILE (PAX,DOCSL,) DESCRIBING L10 THAT YOU MIGHT LOOK AT AND COMMENT ON PLEASE $ 1

WSD $5222.2 MEJ 11/10/70 1351:22 NLS's :JRNLP5215 is now J5215. You scare me to death when you put a file to b journallized under NLS, how about use DUVALL next time. Thanks.$ 2

DCE $5222.3 MEJ 11/10/70 1353:50 Your :JRNLB is now J5221.$ 3

JCN $5222.4 KEV 11/10/70 1749:53 THIS IS A TEST MESSAGE TO SEE WHAT HAPPENS IN SENDING NLS TYPE FILES VIA OUTPUT SEQUENTIAL TO THE MAIL SYSTEM$ 4

ARG BER BLP CHI DOC DIA DCE DVN EKV HAL JMY JBN JCN JDH JMH JNL JTM JRX KEV LSL MGC MEH MEJ MET MSC NDM VRB VDB WHP WKE WLB WSD CXP $5222.5 KEV 11/10/70 1811:48 THIS THURSDAY (11/12/70), FROM 1600 TO 1800, A KDF DUMP WILL BE MADE. AFTER THE DUMP, THE APPENDED LIST OF USERS WILL HAVE ALL THEIR KDF FILES DELETED. THESE USERS WILL THEN BE RENAMED X1FILES, X2FILES,...X8FILES. FOR THE SUCCEEDING WEEK OR SO, WHILE THE DISK IS MOVING BACK AND FORTH BETWEEN THE TEN AND THE 940, A KDF DUMP WILL BE TAKEN EACH TIME THE DISK MOVES FROM THE 940 TO THE TEN, BUT ONLY USERS X1FILES TO X8FILES WILL BE DUMPED. THUS ANY WORK YOU WANT SAVED DURING THIS TIME SHOULD BE PLACED IN ONE OF THOSE KDF SPACES. ALSO, ANY FILES THAT YOU WILL WISH TO WORK ON SHOULD BE MOVED FROM THE KDF SPACES OF THE APPENDED LIST OF USERS TO SOMEPLACE ELSE. KDF USERS TO BE DELETED: PILOT 5

ARG BER BLP CHI DOC DIA DCE DVN EKV HAL JMY JBN JCN JDH JMH JNL JTM JRX KEV LSL MGC MEH MEJ MET MSC NDM VRB VDB WHP WKE WLB WSD CXP $5222.6 KEV 11/10/70 1832:28 EVERYBODY SEE ME BEFORE 1200 THURSDAY (11/12/70) ABOUT KDF CHANGES AND LOSS OF FILES$ 6

DCE $5222.7 DCE 11/10/70 2204:52 NP(AF MODES) SEEMS LIKELY THAT WE COULD MAKE GOOD USE OF THE "MODE" SETTINGS THAT NLS PROVIDES FOR IN ITS CHARACTER STRINS. E.G. SUPPOSE THAT AF PROVIDES MEANS FOR SETTING THE MODE, BETWEEN GIVEN POINTERS, TO SUCH AS FLICKER, BOLD FACE, ETX. SUPPOSE ALSO THAT THERE WAS A WAY OF SPECIFYING THAT IN A SCAN, THE MODE OF A CHARACTER WAS PART OF THE TEST SPECIFICATION. OR, SUPPOSE THAT IN COPYING STRINGS FROM A STATEMENT INTO THE NEW "REPACING" STRING WHEN MAKING UP A NEW STATEMENT, THAT IN AF THERE WAS A WAY TO PASS OR BLOCK THE COPYING OF CHARACTERS IN THE INDICATED STRINGS ACCORDING TO THEIR MODE SETTING. WOULD ALLOW US TO DOCTOR UP A

BUNCH OF TEXT (BY SETTING MODES IN SUB STRINGS), THEN IN ONE TRANSFER OPERATION, MASK OUT (DELETE) THESE SUBSTRINGS. $ 7

DVN $5222.8 WKE 11/11/70 1113:13 I HAVE PUT THE FOLLOWING FILES IN YOUR KDF SPACE TODAY TIM AND APTIM -- VOLUMES ONE AND TWO OF TODAS MANUAL BIBL -- ARC BIBLIOGRAPHY NO AND N6 -- TWO SECTIONS OF NEW NLS USERS GUIDE NRADC -- PART ONE OF 1968 RADC FINAL REPORT THESE WERE OLD CASSERES FILES -- GOOD LUCK $ 8

DVN $5222.9 WKE 11/11/70 1149:31 PLEASE ADD THE FOLLOWING TO THAT LIST OF FILES N3 AND N12 -- MORE OF NLS USERS GUIDE BLURB -- ONE PAGE DESCRIPTION OF ARC $ 9

DIA HAL $5222.10 WKE 11/11/70 1237:13 I HAVE TODAY MOVED THE FOLLOWING FILES FROM PRINCE KDF SPACE TO LEHTMAN KDF SPACE: TMR, OLTMR, AND GRTMR PASSWORD WRITE ACCESS IS DIA AS BEFORE I WAS UNABLE TO SAVE TMRPR. IF YOU NEED IT YOU WILL HAVE TO GO TO OLD KDF DUMP TAPE$ 10

WKE $5222.11 DVN 11/11/70 1328:40 Thanks $ 11

JCN $5222.12 MEJ 11/12/70 0902:50 Your file (CATALOG):JRNL1 is now J5223.$ 12

JCN $5222.13 MEJ 11/12/70 1017:02
Your file (MSR):JRNL1 is now J5224.$
13

DCE JCN WLB WSD $5222.14 DCE 11/12/70 1025:16 NP(NIC MESSAGE) JIM AND WALT: IT WOULD BE VERY USEFUL TO HAVE A WAY FOR US TO USE OUR MESSAGE SYSTEM FOR COMMUNICATING OVER THE NET-DIALOGUE SYSTEM. WOULD YOU TWO COME UP WITH PROCEDURES: A) FOR USING CURRENT MESSAGE SYSTEM AS CONVENIENT LOG; B) FOR SEPARATE-MESSAGE-SYSTEM PROPOSAL, JUST FOR NDS (AS WORKED OUT WITH WSD), THAT IS A SIMPLE ADAPTATION OF EXISTING MESSAGE SYSTEM; AND C) ALSO WITH WSD, GET SOME NOTIONS GOING ABOUT WHAT SORT OF MESSAGE SYSTEM WOULD BE DESIREABLE/FEASIBLE FOR FUTURE. DOUG$ 14

DCE JCN WLB WSD $5222.15 DCE 11/12/70 1051:28 np(nic message), cf(5222,14) Regarding use of current message system for NIC-messages; Suppose we (at ARC) send an "NDS message" by just entering a message, to "NIC", and place the sendee's name at start of message (spelled out in full). Then we can extract and send a printout of the message to sendee via his AGENT. If a Net participant sends a message (via Agent, through NIC), we transcribe into Message System and handle it in the same way.

Can provide Site-Collections later with pages of (filtered-out) NIC-dialogue messages. doug $ 15

JCN WLB $5222.16 DCE 11/12/70 1104:53 I want to send some messages to Net people (e.g., Len Kleinrock, Dave Harris, Steve Crocker). Let me know soon (repeat, soon) if it is all right by you if I go ahead and use the scheme presented in (5222,15). Doug$ 16

WSD $5222.17 DCE 11/12/70 1121:10 Does it have to be that upperLower case doesn't go through the Message System? I noticed that: two cases go o.k. from NLS, via ODQ to a QED file still keeping both cases (as read, in QED, on display); but, after going from there into and out of the Message System, only lower case remains. Cf(5222,16) -- and (5222,14) and (5222,15) -- I'd like to have messages printed out with both cases, if it's easy enough to provide. I'D LIKE TO COMPOSE THEM IN NLS, AND THEREFORE I GUESS THAT I'D GET THEM INTO MESSAGE SYSTEM VIA QED ETC. SUGGESTIONS? COMMENTS? WHAT'S THE COST OF PROVIDING THROUGHPUT FOR BOTH CASES? DOUG$ 17

ARG BER BLP CHI DOC DIA DCE DVN EKV HAL JMY JBN JCN JDH JMH JNL JTM JRX KEV LSL MGC MEH MEJ MET MSC NDM VRB VDB WHP WKE WLB WSD CXP $5222.18 KEV 11/13/70 1303:09 IF ANYONE SAVES ANY FILES IN KDF SPACE FOR USERS X1FILES,..., X8FILES, THIS SUNDAY (11/15/70), BETWEEN 7AM AND 4PM (ONLY TIME THE 940 WILL BE UP) PLEASE CALL ME AT HOME (964-9870) SO I WILL KNOW TO MAKE A KDF DUMP. THANK YOU.$ 18

WSD $5222.19 MEJ 11/18/70 0904:53 Where is last :MAIL file? I have tried to load copies of your KDF files NXAIL aND XAILF and both times they were bad files. Your KDF file MAIL is aN OLD MAIL file that has already been processed. $ 19

DCE $5222.20 MEJ 11/18/70 0630:58 Your file :JRNLA (:ELLIOTT) is now J5225.$ 20

DCE JCN BLP $5222.21 WKE 11/23/70 1011:57 I talked to Gene Gribble of Friday (11/20) about a better copy of the NASA Report. They will not publish in a low number series for wide distribution unless we supply a good original. From discussion with Gene I think our best line printer copy will still be lacking. I told him that we are trying to get an FR-80 (III machine) process going that should give us good quality. In any case, I promised that in two weeks (by Dec 4) we will send him a complete report on the best of FR-80 or Dura. -- I will follow up getting this produced. Note: I did not discuss with him the

possibility of printing statement numbers. Doug, if you want todo this please see me. $ 21

$5222.22 WKE 11/23/70 1012:01 Please get in touch with Mac McKinley of BB&N sometime before the paging box arrives (due about 12/2) for details on grounding of pager, main frame and memories.$ 22

WSD $5222.23 WKE 11/23/70 1014:57 I THINK ROGER'S INITIALS (RDB) ARE NOT IN THE SYSTEM YET$ 23

ARG BER BLP CHI DOC DIA DCE DVN EKV HAL JMY JBN JCN JDH JMH JNL JTM JRX KEV LSL MGC MEH MEJ MET MSC NDM VRB VDB WHP WKE WLB WSD CXP $5222.24 KEV 11/23/70 1034:30 PLEASE JOURNAL FILE 5226 REGARDING A PROPOSAL FOR NEW KDF PROCEDURES$ 24

ARG BER BLP CHI DOC DIA DCE DVN EKV HAL JMY JBN JCN JDH JMH JNL JTM JRX KEV LSL MGC MEH MEJ MET MSC NDM VRB VDB WHP WKE WLB WSD CXP $5222.25 KEV 11/23/70 1036:14 PLEASE SEE JOURNAL FILE 5226 REGARDING A PROPOSAL FOR NEW KDF PROCEDURES$ 25

KEV $5222.26 WLB 11/23/70 1055:28 I DISSENT FROM THE PROPOSED KDF PROCEDURES. I THINK THERE IS TOO MUCH CHANCE O MUCH CHANCE OF GETTING SCROD BY FORGETTING WHAT'S HAPPENING WHEN.$ 26

KEV $5222.27 JCN 11/23/70 1118:13 YOUR FILE JRNL123 IS NOW 5226 $ 27

WLB $5222.28 JCN 11/23/70 1156:43 YOUR FILE JRNL1 IS NOW IN JOURNAL AS: 5227$ 28

JCN $5222.29 JCN 11/23/70 1158:46 YOUR FILE JRNL1 IS NOW: 5228$ 29

ARG BER BLP CHI DOC DIA DCE DVN EKV HAL JMY JBN JCN JDH JMH JNL JTM JRX KEV LSL MGC MEH MEJ MET MSC NDM VRB VDB WHP WKE WLB WSD CXP $5222.30 KEV 11/23/70 1640:52 PLEASE MAKE A COPY OF ALL YOUR XFILE KDF FILES IN YOUR OWN KDF AREA BY 1630 ON WEDS., SO THAT AFTER THE FULL KDF DUMP, WEDS. (11/25/70) 1700-1900, THE XFILES CAN BE INITIALIZED. IF YOU HAVE QUESTIONS, PLEASE SEE ME.$ 30

WSD $5222.31 DVN 11/24/70 1035:03 .$ 31

WSD $5222.32 DVN 11/24/70 1042:26 Please note that a really brief, really short rough draft of your part of the report to RADC is due. See my KDF file RPLAN for more-or-less current outline and schedule.$ 32

DCE JTM $5222.33 WKE 11/24/70 1042:45 I talked to Dan Bobrow today about net protocol. He assured me that he will have his protocol running on TENEX by about the middle of December. There may even be a preliminary version in the system that Dan Murphey will bring out for us on Dec 7. The protocol he is designing will be a small subset of the official version. He will send documentation as soon as possible. He also tells me that their hardware interface will be in operation sometime next week and that we may be able to use their PDP-10 over the net soon. $ 33

WSD $5222.34 WKE 11/24/70 1710:06 PLEASE CALL ME TO TALK ABOUT THE IMLAC $ 34

WSD $5222.35 WKE 11/25/70 1054:16 PLEASE CALL ME CONCERNING PROGRAMMING FOR IMLAC $ 35

DCE $5222.36 JCN 11/25/70 1516:13 YOUR FILE JRNL1 IS NOW :5229 IN ARC JURNL (LETTER TO MR. EDWARDS, CCH,INC.$ 36

WLB $5222.37 JCN 11/25/70 1555:56 YOUR JRNLP5192 IS NOW IN THE JOURNAL AS :5192$ 37

WSD $5222.38 JCN 11/29/70 1745:21 DIDN'T IT RAIN? HOPE YER BETTER ETC$ 38

WSD $5222.39 DVN 11/30/70 1038:07 When I inadvertently type "b" in TODAS it initiates a command "branch to". What does "branch to" do? What is it's full syntax? no one seems to know.$ 39

ARG BER BLP CHI DOC DIA DCE DVN EKV HAL JMY JBN JCN JDH JMH JNL JTM JRX KEV LSL MGC MEH MEJ MET MSC NDM VRB VDB WHP WKE WLB WSD CXP $5222.40 WKE 11/30/70 1543:54 ALL DATASET NUMBERS WILL CHANGE ON DECEMBER 10. FOR DETAILS ON THIS AND OTHER TELETYPE CHANGES RELATIVE TO THE PDP-10 SEE MY FILE "TELETYPES" $ 40

WKE $5222.41 JCN 12/01/70 0832:51 YOUR FILE :JRNL1 IS NOW :5230 IN THE JOURNAL$ 41

DVN $5222.42 JCN 12/01/70 0833:18 YOUR FILE :JRNL1 IS NOW :5231 IN THE JOURNAL $ 42

WLB $5222.43 JCN 12/01/70 0834:00 YOUR FILE :JRNLP5420 IS NOW IN THE JOOURNAL AS :5420$ 43

WLB $5222.44 JCN 12/01/70 0913:31 YOUR FILE :JRNLP4989 IS NOW :4989 IN THE JOURNAL$ 44

WLB $5222.45 JCN 12/01/70 0914:39 YOUR FILE :JRNLP5142 IS NOW :5142 IN THE JOURNALS$ 45

KEV $5222.46 WSD 12/01/70 1359:57 PLEASE CHANGE SYSTEM INI(TIALISE TO LOAD SUBSYSTEM IMLAC FROM (X1)STIML, AND FILE ():OPIM FROM (X1)IMLCO..THANX$ 46

':5222', 12/02/70 1553:39 JCN ; .DPR=1; ':MAIL', 12/01/70 1422:03 WSD ;
.DPR=0;

DATA ELEMENTS AND CODES FOR ARC MASTER CATALOG
11 Nov 70 JBN-JCN

Codes in order of access and entry into the master catalog	1
*a1 First author	1a
#1 job title	1a1
#2 corporate affiliation	1a2
#3 suborganization	1a3
#4 street address	1a4
#5 city, state zip	1a5
*a2 Second author	1b
#1 job title	1b1
#2 corporate affiliation	1b2
#3 suborganization	1b3
#4 street address	1b4
#5 city, state zip	1b5
*a3 Third author	1c
#1 job title	1c1
#2 corporate affiliation	1c2
#3 suborganization	1c3
#4 street address	1c4
#5 city, state zip	1c5
*a4 Fourth author	1d
*a5 Fifth author	1e
*b1 Editor	1f
#1 job title	1f1

DATA ELEMENTS AND CODES FOR ARC MASTER CATALOG
11 Nov 70 JBN-JCN

#2 corporate affiliation	1f2
#3 suborganization	1f3
#4 street address	1f4
#5 city, state zip	1f5
*b2 First Organization	1g
#3 suborganization	1g1
#4 street address	1g2
#5 city, state zip	1g3
*b3 Second Organization	1h
#3 suborganization	1h1
#4 street address	1h2
#5 city, state zip	1h3
*b4 Publisher	1i
#3 suborganization	1i1
#4 street address	1i2
#5 city, state zip	1i3
*b5 First addressee of letter or memo	1j
#1 job title	1j1
#2 corporate affiliation	1j2
#3 suborganization	1j3
#4 street address	1j4
#5 city, state zip	1j5

DATA ELEMENTS AND CODES FOR ARC MASTER CATALOG
11 Nov 70 JBN-JCN

#6 pages

		1j6
*b6	Second addressee of letter or memo	1k
*b7	Third addressee of letter or memo	1l
*b8	Fourth addressee of letter or memo	1m
*b9	ARC Document number of addressee list	1n

DATA ELEMENTS AND CODES FOR ARC MASTER CATALOG
11 Nov 70 JBN-JCN

	1o
*c1 Title of item	1p
#1 subtitle	1p1
#6 pages	1p2
*c2 Title of more inclusive document	1q
#1 subtitle	1q1
#2 volume and number	1q2
#6 pages	1q3
*d1 Day and/or Month and/or Year Published	1r
*d2 Date written or submitted	1s
*d3 Period covered	1t
*d4 Date of conference or meeting	1u
*d5 Date(s) revised, superceded, deleted by issuer	1v
*f1 Form of Item	1w
a article	1w1
b book	1w2
c film	1w3
d draft	1w4
f foto	1w5
g proceedings	1w6
i abstract	1w7
l letter	1w8

DATA ELEMENTS AND CODES FOR ARC MASTER CATALOG
11 Nov 70 JBN-JCN

m memo	1w9
n newsletter	1w10
p paper	1w11
r report	1w12
s slide	1w13
t talk	1w14
u functional document	1w15
*f2 Media	1x
a carbon copy	1x1
c copy	1x2
e microfiche	1x3
f f film	1x4
m microfilm	1x5
o original	1x6
r machine readable	1x7
s slide	1x8
t paper tape	1x9
*m1 Name of sponsor of conference or meeting	1y
#1 name of meeting	1y1
#5 city, state of meeting	1y2
	1z
*n1 ARC number of item that includes this item	1a

DATA ELEMENTS AND CODES FOR ARC MASTER CATALOG
11 Nov 70 JBN-JCN

*n2	ARC number(s) of item(s) this item includes	laa
*n3	ARC number of document this supercedes	lab
*n4	ARC number(s) of ARC document(s) to which this refers	lac
*n5	ARC number of document this abstract describes	lad
		lae
*p1	Project name assigned by issuer	laf
*p2	Project number assigned by issuer	lag

DATA ELEMENTS AND CODES FOR ARC MASTER CATALOG
11 Nov 70 JBN-JCN

lah

lai

*r1 Serial or code number(s) assigned by issuer laj

*r2 Serial or code number(s) assigned by government agency lak

lal

*s1 Sponsoring agency lam

#3 suborganization lam1

#5 city, state zip lam2

#6 contract or grant number lam3

#7 project number lam4

#8 order number lam5

#9 other number lam6

*s2 Sponsoring agency lan

*s3 Sponsoring agency lao

*s4 Sponsoring agency lap

laq

lar

*w1 Date received at ARC las

*w2 Date cataloged at ARC lat

*w3 Initials of contributor lau

*w4 Source if different from b2 or w3 lav

law

*y1 Brief abstract or annotation lax

DATA ELEMENTS AND CODES FOR ARC MASTER CATALOG
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*y2	Keys to subject content	lay
		laz
*z1	NIC holdings: All, or sites by initials	lb
*z2	Subcollection;	lba
	e.g., NIC, NAS, JOU, DCE	lbal
*z3	ARC master catalog management descriptors	lbb
		lbc

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':5223', 11/11/70 1225:38 MEJ ; .DPR=1; ':DCODES', 11/11/70 0857:21 JCN ;
        .DPR=0;
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ARC Slide Catalog, June 1970

ARC Slide Catalog, June 1970

MSR	3a4c
calculator and charts	3a4c1
USR	3a4d
Working display (with feedback, etc.)	3b

SLIDES .DSN=1; .DPR=0;

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.CEN=1;SLIDE CATALOGUE.CEN=0; 4

(000S018) 5

(A00S018) 5a

(A02S018) S:3100 5a1

(A03S018) S:3100 5a2

(A05S018) S:3100 5a3

(A06S018) S:3100 5a4

(A08S018) S:3100 5a5

(A09S018) S:3100 5a6

(A11S018) S:3100 5a7

(A12S018) S:3100 5a8

(A14S018) S:3100 5a9

(A15S018) S:3100 diff. 5a10

(A17S018) S:3100 5a11

(A18S018) S:3100 5a12

(A20S018) S:3100 5a13

(A21S018) S:3100 5a14

(A23S018) S:3100 5a15

(A24S018) S:3100 5a16

(A26S018) S:3100 5a17

(A27S018) S:3100 5a18

(A29S018) S:3100 5a19

(A30S018) S:3100 5a20

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(A32S018)	S:3100	5a21
(A33S018)	S:3100	5a22
(A35S018)	S:3100	

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		5a23
(B00S018)		5b
(B09S018)	S:3100	5b1
(B14S018)	S:3100	5b2
(B15S018)	S:3100	5b3
(B16S018)	S:3100	5b4
(B18S018)	S:3100	5b5
(B19S018)	S:3100	5b6
(B21S018)	S:3100	5b7
(B22S018)	S:3100	5b8
(B24S018)	S:3100	5b9
(B25S018)	S:3100	5b10
(B27S018)	S:3100	5b11
(B28S018)	S:3100	5b12
(B30S018)	S:3100	5b13
(B32S018)	S:3100	5b14
(B33S018)	S:3100	5b15
(B34S018)	S:3100	5b16
(C00S018)		5c
(C29S018)	S:3100	5c1
(C30S018)	S:3100	5c2
(C31S018)	S:3100	5c3
(C32S018)	S:3100	

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		5c4
(000S038)		6
(A00S038)		6a
(A01S038)	DIA, JFR On line ARPA Conf. console.	6a1
(A02S038)	JFR 1 console	6a2
(A03S038)	JFR, DIA On line ARPA Conf. console.	6a3
(A04S038)	JFR 1 console keyboard	6a4
(A05S038)	JFR,DIA	6a5
(A06S038)	JFR,DIA	6a6
(A07S038)	JFR,DIA	6a7
(A08S038)	JFR,DIA	6a8
(A09S038)	JFR 1 console, keyboard	6a9
(A10S038)	Roger in computer room	6a10
(A11S038)	hardware in shop (Roger's thing)	6a11
(A12S038)	hardware in shop	6a12
(A13S038)	hardware in shop	6a13
(A16S038)	JFR + DIA at consoles; Steve Levine	6a14
(A17S038)	tasker for On-line	6a15
(A18S038)	DIA, JFR, Steve Levine TTY + consle	6a16
(A19S038)	tape drives	6a17
(A20S038)	Comp room Printer, dura, TTYs	6a18
(A21S038)	Comp room equipment	

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			6a19
(B00S038)			6b
(B02S038)	Steve Levine at Work Station		6b1
(B03S038)	Steve Levine at Work Station		6b2
(B04S038)	Steve Levine at Work Station		6b3
(B05S038)	Steve Levine at Work Station		6b4
(B06S038)	Steve Levine at Work Station		6b5
(B07S038)	Steve Levine at Work Station		6b6
(B08S038)	Steve Levine at Work Station		6b7
(B09S038)	Steve Levine at Work Station		6b8
(B10S038)	Steve Levine at Work Station		6b9
(B11S038)	Steve Levine at Work Station		6b10
(B12S038)	Steve Levine at Work Station		6b11
(B13S038)	Steve Levine at Work Station		6b12
(B14S038)	Steve Levine at Work Station	hand and screen	6b13
(B15S038)	Steve Levine at Work Station		6b14
(B16S038)	Steve Levine at Work Station		6b15
(B17S038)	Steve Levine at Work Station		6b16
(B18S038)	Steve Levine at Work Station		6b17
(B19S038)	Face side Steve Levine		6b18
(B20S038)	JFR, DIA comp room		6b19
(B21S038)	JFR, DIA comp room		

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		6b20
(C00S038)		6c
(C01S038)	S:3100	6c1
(C04S038)	S:3100	6c2
(C06S038)	S:3100	6c3
(C08S038)	S:3100	6c4
(C10S038)	S:3100	6c5
(C12S038)	S:3100	6c6
(C15S038)	S:3100	6c7
(C17S038)	S:3100	6c8
(C19S038)	S:3100	6c9
(C20S038)	S:3100	

6c10

(D00S038) Diagrams 6d

(D04S038) Basic organization of NLS, showing use of compilers and compiler-compiler for implementation. 6d1

(D05S038) A State chart portrayal of our Vert manipulation Control language. 6d2

(D08S038) Organization of our 940 on line system. 6d3

(D12S038) How the Meta II Translator serves to compile a new version of itself. 6d4

(D14S038) NLS 940 as on information processing system. 6d5

(D17S038) Overlay structure of NLS 940. 6d6

(D21S038) (in color) Meta Mol flow chart

ARC Slide Catalog, June 1970

		6d7
(000S048)		7
(A00S048)		7a
(A01S048)	ARPA on-line meeting, JFR, Dean Brown, Steve Levine	7a1
(A02S048)	EGS, Kipers?, someone else.	7a2
(A03S048)	Dean Bergstrom and ?	7a3
(A04S048)	?	7a4
(A05S048)	group shot	7a5
(A06S048)	group shot	7a6
(A07S048)	group shot with Doug	7a7
(A08S048)	Doug - at blackboard	7a8
(A09S048)	group shot	7a9
(A10S048)	Dave Hopper?, Elton Hag and Doug	7a10
(A11S048)	same as 10	7a11
(A12S048)	WKE	7a12
(A13S048)	small group shot	7a13
(A14S048)	Bob Taylor	7a14
(A15S048)	room shot	7a15
(A16S048)	group shot	7a16
(A17S048)	group shot	7a17
(A18S048)	Doug, etc.	7a18
(A19S048)	Doug, etc.	7a19
(A20S048)	Torben and ?	

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		7a20
(000S119)		8
(A00S119)		8a
(A19S119)	Display Equipment EVR, MEH	8a1
(A20S119)	Executive Hardware	8a2
(A21S119)	IMP/NET Terminal	8a3
(B00S119)		8b
(B01S119)	Blur	8b1
(B02S119)	Workspace with people milling	8b2
(B03S119)	Workspace with people milling	8b3
(B04S119)	Workspace with people milling	8b4
(B05S119)	Workspace with people milling	8b5
(B02S119)	Workspace with people milling	8b6
(B07S119)	Workspace with people milling	8b7
(B08S119)	Workspace with smaller group	8b8
(B09S119)	Workspace with smaller group	8b9
(B10S119)	3 consoles, WHP, JCN, WKE, GHB	8b10
(B11S119)	3 consoles, WHP, JCN, WKE, GHB	8b11
(B12S119)	2 consoles, WKE, JCN, GHB	8b12
(B13S119)	2 consoles, WKE, JCN, GHB	8b13
(B14S119)	2 consoles, WKE, JCN, GHB	8b14
(B15S119)	2 consoles, WKE, JCN, GHB	8b15
(B16S119)	2 consoles, WKE, JCN, GHB, WHP	8b16
(B17S119)	2 consoles, WKE, JCN, GHB, WHP	8b17

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(B18S119)	Yoga console, WSD, MSC, DCE	8b18
(B19S119)	Yoga console, WSD, MSC, DCE	8b19
(B20S119)	Yoga console, MSC, DCE	8b20
(B21S119)	Console use JCN	

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		8b21
(C00S119)		8c
(C01S119)	blur	8c1
(C02S119)	Yoga console, WSD	8c2
(C03S119)	Yoga console, WSD	8c3
(C04S119)	3 consoles, WHP, JCN, WSD	8c4
(C05S119)	1 console, JCN, WKE	8c5
(C06S119)	1 console, JCN, WKE	8c6
(C07S119)	1 console, gHB	8c7
(C08S119)	1 console, GHB	8c8
(C09S119)	1 console, GHB	8c9
(C10S119)	S: Network Map	8c10
(C11S119)	S: Network "black box," linked HOSTS	8c11
(C12S119)	S: Network remote user through to NIC	8c12
(C13S119)	S: Partial NIC: No Godas	8c13
(C14S119)	S: NIC chart (full)	8c14
(C15S119)	S: Network Map	8c15
(C16S119)	S: Network "black box," linked hosts	8c16
(C17S119)	S: Dialogue: one entry	8c17
(C18S119)	S: Dialogue: two entries	8c18
(C19S119)	S: Dialogue: six entries	8c19
(C20S119)	S: (missing from stack, check later)	8c20
(C21S119)	S: CML Procedure, BUGISPEC	

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		8c21
(D00S119)		8d
(D01S119)	Blur	8d1
(D02S119)	Blur	8d2
(D03S119)	Black	8d3
(D04S119)	S: Incomplete Bootstrap Chart	8d4
(D05S119)	S: Incomplete Bootstrap Chart	8d5
(D06S119)	S: Complete Bootstrap Chart	8d6
(D07S119)	S: AHIRC and Bootstrapping	8d7
(D08S119)	S: List of Augmentation System Components	8d8
(D09S119)	S: List of Major Service System Hardware	8d9
(D10S119)	S: List of System-Programmer Tools	8d10
(D11S119)	S: List of Special Compilers	8d11
(D12S119)	S: List of User Subsystems	8d12
(D13S119)	S: NLS-vehicle chart	8d13
(D14S119)	S: INFO SYS: INFO Management Components	8d14
(D15S119)	S: System, + System Development, SYS-DEV AIDS	8d15
(D16S119)	S: SYS + SYS Development, with Management Aids	8d16
(D17S119)	S: Diagram: Remote User through NET to NIC	8d17
(D18S119)	S: Schematic of Multi-terminal lab	8d18
(D19S119) SYS)	S: First Step Bootstrapping Sequence (INFO	8d19
(D20S119)	S: Second Step Bootstrap Sequence (AUG. SYS)	8d20
(D21S119)	S: Incomplete Bootstrap	

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		8d21
(E00S119)		8e
(E01S119)	DAE, MET, MSC informal in hall	8e1
(E02S119)	DAE, MET, MSC informal in hall	8e2
(E03S119)	WSD, MSC, MGC, MET pre-meeting informal	8e3
(E04S119)	WSD, MSC, MGC, MET pre-meeting informal	8e4
(E05S119)	8 people pre-meeting informal	8e5
(E06S119)	8 people pre-meeting informal	8e6
(E07S119)	8 people pre-meeting informal	8e7
(E08S119)	WSD, MSC, MGC, MET pre-meeting informal	8e8
(E09S119)	WSD, MSC, MGC, MET pre-meeting informal	8e9
(E10S119)	WSD, MSC, MGC, MET pre-meeting informal	8e10
(E11S119)	1:00 full group (12 people) coffee break	8e11
(E12S119)	1:00 full group (12 people) coffee break	8e12
(E13S119)	1:00 full group (12 people) coffee break	8e13
(E14S119)	1:00 full group (12 people) coffee break	8e14
(E15S119)	1:00 full group (12 people) coffee break	8e15
(E16S119)	1:00 sub-group coffee break	8e16
(E17S119)	1:00 sub-group coffee break	8e17
(E18S119)	1:00 sub-group coffee break	8e18
(E19S119)	5:00 full group coffee break (different from E11-E15)	8e19
(E20S119)	5:00 full group coffee break	

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8e20

(F00S119) 8f

(F01S119) 7:00 almost whole group meeting 8f1

(F02S119) 7:00 another goroup almost whole group meeting 8f2

(F03S119) 7:00 almost whole group meeting (same as F2) 8f3

(F04S119) 7:00 almost whole group meeting (same as F2) 8f4

(F05S119) 6:00 nalf group meeting 8f5

(F06S119) 6:00 half group meeting 8f6

(F07S119) 3:00 MSC and DCE 8f7

(F08S119) 3:00 MSC and DCE; MSC/smiling, ARG peeking 8f8

(F09S119) 3:00 MSC and DCE; MSC only grinning, handwork from DCE 8f9

(F10S119) 2:00 towards 11:00 7 people 8f10

(F11S119) 2:00 towards 9:00 several people 8f11

(F12S119) 2:00 towards 9:00 several people 8f12

(F13S119) 2:00 towards 11:00 8f13

(F14S119) 5:00 towards 8:00 eight people 8f14

(F15S119) 5:00 towards 8:00 eight people 8f15

(F16S119) 5:00 towards 8:00 eight people 8f16

(F17S119) 5:00 towards 8:00 WSD, DAE, WKE center of six people 8f17

(F18S119) 5:00 towards 8:00 WSD, DAE, WKE center of six people;
this is best of the three 8f18

(F19S119) 5:00 towards 8:00 WSD, DAE, WKE center of six people 8f19

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(F20S119) 5:00 towards 8:00 WSD, DAE, WKE center of six people,
including JAF

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		8f20
(G00S119)		8g
(G01S119)	DCE pointing finger	8g1
(G02S119)	DCE laughing	8g2
(G03S119)	WKE, WSD, JAF	8g3
(G04S119)	WKE, WSD, JAF	8g4
(G05S119)	7:00	8g5
(G06S119)	7:00	8g6
(G07S119)	7:00	8g7
(G08S119)	3:00 to 9:00	8g8
(G09S119)	3:00 to 9:00	8g9
(G10S119)	3:00 to 9:00	8g10
(G11S119)	Group around console WKE, WSD, WHP talking	8g11
(G11S119)	WKE, WSD, WHP around console talking	8g12
(G12S119)	WKE, WSD, WHP around console talking	8g13
(G13S119)	MSC Yoga console side view shows mouse	8g14
(G14S119)	MSC Yoga console side view shows mouse	8g15
(G15S119)	MSC Yoga console from back shows keyset	8g16
(G16S119)	ARG demonstrating to 3 friends, gesticulating	8g17
(G17S119)	ARG demonstrating to 3 friends, good gestures	8g18
(G18S119)	ARG demonstrating to 3 friends, shows mouse	8g19
(G19S119)	ARG demonstrating to friends, from back, view of screen	8g20
(G20S119)	ARG demonstrating to friends, from back, view	

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of screen

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		8g21
(H00S119)		8h
(H01S119)	missing	8h1
(H02S119)	Benford from back, at TTY with IMP with Board	8h2
(H03S119)	Benford from back, at TTY with IMP with Board	8h3
(H04S119)	MEH leaning over Benford's shoulder	8h4
(H05S119)	MEH leaning over Benford's shoulder	8h5
(H06S119)	Benford at IMP teletype	8h6
(H07S119)	MEH adjusting camera, with CRT	8h7
(H08S119)	MEH adjusting camera, with CRT	8h8
(H09S119)	MEH adjusting camera, with CRT	8h9
(H10S119)	MEH adjusting camera	8h10
(H11S119)	MEH adjusting camera	8h11
(H12S119)	MEH adjusting camera (good shot)	8h12
(H13S119)	MEH adjusting camera	8h13
(H14S119)	MEH adjusting camera, smiling	

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8h14

(I00S119) 8i

(I01S119) blur 8i1

(I02S119) JDH on floor in office talking with JMY 8i2

(I03S119) JDH on floor in office talking with JMY 8i3

(I04S119) JDH on floor in office talking with JMY 8i4

(I05S119) JDH on floor in office talking with JMY 8i5

(I06S119) DGC in office, view of Janis J. and other posters 8i6

(I07S119) DGC in office, view of posters 8i7

(I08S119) DGC in office, view of posters 8i8

(I09S119) unknown technician in shop soddering 8i9

(I10S119) unknown technician in shop soddering 8i10

(I11S119) Engineering lab: Vern, Jake; MEH adjusting TTY 8i11

(I12S119) MEH adjusting TTY, Vern in back 8i12

(I13S119) Vern with hand in tube; parts, tubes in background 8i13

(I14S119) Ed pushing Eidophor 8i14

(I15S119) Ed pulling Eidophor 8i15

(I16S119) Machine room: long shot of cameras on tubes; Jake in background 8i16

(I17S119) Machine room, long shot of cameras on tubes, Jake in background 8i17

(I18S119) Machine room: long shot of cameras on tubes; Jake in background 8i18

(I19S119) Jake and test monitor; adjusting equipment 8i19

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(I20S119) Jake and test monitor; (?) checking voltage levels 8i20

(I21S119) Jake and test monitor; cameras, etc. in background

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		8i21
(J00S119)		8j
(J01S119)	none	8j1
(J02S119)	WSD at TTY; side view; Todas?	8j2
(J03S119)	WSD at TTY; side view; in computer room	8j3
(J04S119)	WSD at TTY; side view with tape drives in background	8j4
(J05S119)	WSD at TTY; tape drives in background	8j5
(J06S119)	MEH in dark, oscilloscopes, etc.	8j6
(J07S119)	MEH in dark, oscilloscopes, etc.	8j7
(J08S119)	MEH in dark, oscilloscopes, etc.	8j8
(J09S119)	MEH in dark, oscilloscopes, etc.	8j9
(J10S119)	MEH in dark, oscilloscopes, etc.	8j10
(J11S119)	MEH in dark, oscilloscopes, etc.	8j11
(J12S119)	Dean looking at IMP board with wires	8j12
(J13S119)	Dean testing IMP board with wires (?)	8j13
(J14S119)	Dean testing IMP board with wires (?)	8j14
(J15S119)	GHB on console using mouse (shot from behind)	8j15
(J16S119)	GHB on console using mouse (shot from behind)	8j16
(J17S119)	DAE with hand on keyset	8j17
(J18S119)	DAE with hand on keyset	8j18
(J19S119)	DAE at console with mouse, screen, keyset showing	8j19
(J20S119)	RAC at console with ARG leaning over to help	

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8j20

(K00S119) 8k

(K01S119) JCN at Herman Miller console; shows shelves, mouse, keyset 8k1

(K02S119) JCN at Herman Miller Console, side view shows chair 8k2

(K03S119) JCN at Herman Miller console; view from above shows keyset, mouse, keyboard 8k3

(K04S119) JCN at Herman Miller console, view from above shows keyset, mouse, keyboard 8k4

(K05S119) Bruce and CHI at console 8k5

(K06S119) Bruce and CHI at console 8k6

(K07S119) Bruce and CHI at console 8k7

(K08S119) Long shot (facing south towards cave) of main work area with clusters of people 8k8

(K09S119) Long desk top shot of main workspace; clusters of people 8k9

(K10S119) Long shot of main workspace; clusters of people 8k10

(K11S119) Long shot of main workspace; clusters of people 8k11

(K12S119) Long shot of main workspace; clusters of people 8k12

(K13S119) Long shot of main workspace; clusters of people 8k13

(K14S119) Long shot of main workspace; clusters of people 8k14

(K15S119) Bruce and CHI looking at papers; console in background 8k15

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(K16S119) Bruce and CHI looking at papers; shot from behind, console in background 8k16

(K17S119) Bruce and Chuck from side; shows console, mouse, keyset 8k17

(K18S119) Bruce and Chuck from side; shows console, mouse, keyset 8k18

(K19S119) Bruce and Chuck from side; shows console, mouse, keyset 8k19

(K20S119) Bruce and CHI from side; shows console, mouse, keyset 8k20

(last six slides show pencils!)

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8k21

(L00S119) miscellaneous by cameraman 81

(L01S119) hand on keyboard 811

(L05S119) mouse 812

(L06S119) hand on mouse 813

(L07S119) hand on mouse 814

(L09S119) MGC closeup 815

(L12S119) CHI closeup 816

(L13S119) IMP panel with "Interface Message Processor" showing 817

(L15S119) TTY printout 818

(L19S119) TTY printout

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819

(M00S119) WHP M1-M11 and MSC M12-M21 8m

(M01S119) blur 8m1

(M02S119) S: TREE-META to create and transform parse tree: frame 1 8m2

(M03S119) S: TREE-META to create and transform parse tree: frame 2 8m3

(M04S119) S: input feedback SPL 8m4

(M05S119) S: Content Analysis and string constuction: SPL 8m5

(M06S119) S: example of MOL 8m6

(M07S119) S: overlay map 8m7

(M08S119) S: sequence showing keyword search using SYSGD: frame 1 8m8

(M09S119) S: sequence showing keyword search using SYSGD: frame 2 8m9

(M10S119) S: sequence showing keyword search using SYSGD: frame 3 8m10

(M11S119) S: sequence showing keyword search using SYSGD: frame 4 8m11

(M12S119) S: kinds of items we'd like to coordinate in NIC 8m12

(M13S119) S: interconnections of kinds of items we'd like to coordinate in NIC 8m13

(M14S119) S: first level of a NIC citation list showing names of documents and titles 8m14

(M15S119) S: first citation item expanded to all showing title and link to abstract, author, date, source 8m15

(M16S119) S: abstract jumped to from M15 8m16

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(M17S119) S: result of keyword select shows re-ordering of basic citation list: keywords used are SRI and UTAH 8m17

(M18S119) S: same list with smorgasboard statement frozen at top 8m18

(M19S119) S: same thing but better ("?" under feedback line) 8m19

(M20S119) S: execute Content Analyzer pattern "compiler" from smorgasboard statement 8m20

(M21S119) S: result of CONAN pattern applied to keyword selected list; this frame is cut off and N1 is a better copy

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8m21

(N00S119) MSC N1-N6 and DAE N7-N20 8n

(N01S119) S: result of CONAN pattern applied to keyword selected list 8n1

(N02S119) S: Illustrates how you can take clues from retrieved list to help you search again: copied word "language" from list in N1 into pattern frozen at top 8n2

(N03S119) S: Execute CONAN on /["compiler"]OR/["language"]; in frozen statement 8n3

(N04S119) S: result of new CONAN patteern on keyword selected list 8n4

(N05S119) S: abstract of first citation retrieved in N4 8n5

(N06S119) S: result of jump return 8n6

(N07S119) S: Sequence showing Hierarchal inter-file structure: frame 1 8n7

(N08S119) S: Sequence showing Hierarchal inter-file structure: frame 2 8n8

(N09S119) S: Sequence showing hierarchal inter-file structure: frame 3 8n9

(N10S119) S: Sequence showing hierarchal inter-file structure: frame 4 8n10

(N11S119) S: Sequence showing hierarchal inter-file structure: frame 5 8n11

(N12S119) S: Sequence showing hierarchal inter-file structure: frame 6 8n12

(N13S119) S: Sequence showing hierarchal inter-file structure: frame 7 8n13

(N14S119) S: Sequence showing hierarchal inter-file structure: frame 8 8n14

(N15S119) S: Sequence showing hierarchal inter-file structure: frame 9 8n15

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(N16S119) S: Example of link Sequence (feedback is only variation): frame 1 8n16

(N17S119) S: Example of link Sequence: frame 2 8n17

(N18S119) S: Top level outline "Scene 1 . . .Scene 5" 8n18

(N19S119) S: Example of link Sequence: frame 3 8n19

(N20S119) S: Example of link Sequence: frame 4

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8n20

(000S119) DAE 8o

(001S119) blur 8o1

(002S119) blur 8o2

(003S119) blur 8o3

(004S119) S: ? 8o4

(005S119) S: ? 8o5

(006S119) S: ? 8o6

(007S119) S: ? 8o7

(008S119) S: Jump to Item (Select: first Command Accept) 8o8

(009S119) S: Jump to Item (Select: second command accept) 8o9

(010S119) S: Result of 09 with statement numbers on 8o10

(011S119) S: Result of 09 with statement numbers off 8o11

(012S119) S: down a level with statement numbers off 8o12

(013S119) S: down another level with statement numbers on 8o13

(014S119) S: tail of same, up a level 8o14

(015S119) S: Select, down a level (viewspecs all and G) 8o15

(016S119) S: Result of 015 selection 8o16

(017S119) S: Delete word sequence: frame 1 8o17

(018S119) S: Delete word sequence: frame 2 8o18

(019S119) S: Delete word sequence: frame 3 8o19

(020S119) S: tree structure of file 8o20

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(021S119) S: move branch sequence: frame 1 8o21

(022S119) S: move branch sequence: frame 2

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8o22

(P00S119) DAE P1-P5 and WSD P6-P20 8p

(P01S119) S: 8p1

(P02S119) S: 8p2

(P03S119) S: 8p3

(P04S119) S: 8p4

(P05S119) S: 8p5

Description of WSD sequence: application of DDT as an on-line debugging tool. 8p6

Note: Some of the pictures in this sequence are cut off at the bottom, which is where what was happenning was happenning. 8p6a

consequently, many of the pictures show the same thing, and some steps are not shown. 8p6a1

A version of NLS is loaded with DDT, and a flag designating it as experimental is set. 8p6b

(P06S119) S: NLS and DDT being loaded for debugging. 8p6b1

(P07S119) S: NLS and DDT being loaded for debugging. 8p6b2

(P08S119) S: Examining the value of the variable exp, which is 1 if the system is experimental 8p6b3

(P09S119) S: Setting the contents of the variable exp to 1 8p6b4

NLS is started under the control of DDT, and an attempt is made to use the keyword facility, which causes NLS to crash. 8p6c

(P10S119) S: Starting up NLS in DDT at location 14000 8p6c1

(P11S119) S: Typing in initials and name to NLS 8p6c2

(P12S119) S: In NLS, about to load the checkpoint file which is a test file for keyword 8p6c3

(013S119) S: NLS with the test file loaded 8p6c4

(P14S119) S: Back in DDT after crash with attempt to use keyword (notice that k has been typed and is in the echo register). NLS is left on screen after crash 8p6c5

After the crash, we are back in DDT, and some exploration is made to see what went wrong 8p6d

(P15S119) S: Back in DDT after crash with attempt to use keyword (notice that k has been typed and is in the echo register). NLS is left on screen after crash 8p6d1

(P16S119) S: Back in DDT after crash with attempt to use keyword (notice that k has been typed and is in the echo register). NLS is left on screen after crash 8p6d2

(P17S119) S: Back in DDT after crash with attempt to use keyword (notice that k has been typed and is in the echo register). NLS is left on screen after crash. This is the best one because it shows the print-out indicating the cause of the crash (memory error on store at loaction mvbfbf + 14 8p6d3

(P18S119) S: Back in DDT after crash with attempt to use keyword (notice that k has been typed and is in the echo register). NLS is left on screen after crash. 8p6d4

(P19S119) S: Back in DDT after crash with attempt to use keyword (notice that k has been typed and is in the echo register). NLS is left on screen after crash. 8p6d5

(P20S119) S: Following the indirect store to the final location, which is in the page where keyword should be

8p6a6

(Q00S119) WSD Q1-Q16 and CHI Q17-Q21 8q

Description of WSD sequence: application of DDT as an on-line debugging tool (continued) 8q1

After the crash, we are back in DDT, and some exploration is made to see what went wrong 8q1a

(Q01S119) S: Looking at contents of resultant location of illegal store, and cell following. 8q1a1

(Q02S119) S: Looking at contents of resultant location of illegal store, and cell following. 8q1a2

(Q03S119) S: Looking at NLS relabelling at time of crach 8q1a3

(Q04S119) S: Looking at NLS relabelling at time of crach 8q1a4

(Q05S119) S: Looking at NLS relabelling at time of crach 8q1a5

We examine the crash, and find that the keyword overlay is marked as non-present. 8q1b

(Q06S119) S: Looking at overlay table entry for keyword overlay, and finding it marked non-present (65,4 is non-present, 65 would be present) 8q1b1

We find that there is another overlay with the same number in its place, which means that there was an error in initialization. 8q1c

(Q07S119) S: The execution of the search produces two entries with 65, the one other than keyword (vector edit 2) is present. This indicates an error in initialisation. 8q1c1

(Q08S119) S: The execution of the search produces two entries with 65, the one other than keyword (vector edit 2) is present. This indicates an error in initialisation. 8q1c2

We reset, and reload DDT and NLS, searching the

initialization overlay for all references to the keyword overlay. 8q1d

(Q09S119) S: Leave DDT and reset. 8q1d1

(Q10S119) S: Re-entering DDT/NLS and searching for references to keyword overlay table entry, finding two. 8q1d2

(Q11S119) S: Re-entering DDT/NLS and searching for references to keyword overlay table entry, finding two. 8q1d3

We find that it has been released at initialization to make room in the PMT for other overlays. 8q1e

(Q12S119) S: Finding that the second reference releases the overlay (brs 171). 8q1e1

This is fine for debugging, but not for a non-experimental system, so we put in a patch which causes it to not be releaed if the system is not experimental. 8q1f

(Q13S119) S: Using patch command in DDT to skip the brs 171 f the system is not experimental. 8q1f1

Finally, we test the experimental version, and find that it is ok. 8q1g

(Q14S119) S: Re-entering NLS after insertig patch to try it 8q1g1

(Q15S119) S: NLS with test file loaded 8q1g2

(Q16S119) S: Successfully using keyword command. 8q1g3

(Q17S119) S: Schematic: Compilation of NLS System and Compilers: frame 2 8q2

(Q18S119) S: Schematic: Compilation of NLS System and Compilers: frame 3 8q3

(Q19S119) S: Schematic: Compilation of NLS System and Compilers: frame 4 8q4

(Q20)S119 S: no good 8q5

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(Q21S119) S: Schematic: Compilation of NLS System and Compilers: frame 1

8q6

(R00S119) JCN 8r

(R01S119) S: ASIS presentation outline, level 1 8r1

(R02S119) S: ASIS presentation outline, financial data branch 8r2

(R03S119) S: Jump to calculator (picture of little man running) 8r3

(R04S119) S: Using calculator (feedback cut off) 8r4

(R05S119) S: Using calculator to add 8r5

(R06S119) S: Using calculator, shows insertion of data 8r6

(R07S119) S: Using calculator: selecting function 8r7

(R08S119) S: Using calculator: selecting function (feedback cut off) 8r8

(R09S119) S: Using calculator: Using function 8r9

(R10S119) S: Using calculator: Using function (feedback cut off) 8r10

(R11S119) S: Using calculator: Insert function result 8r11

(R12S119) S: Outline: financial data (link to FUNDS file) 8r12

(R13S119) S: FUNDS file (top level) good 8r13

(R14S119) S: Personnel sequence: frame 1 (JCN says this sequence is particularly good): ASIS outline, personnel branch 8r14

(R15S119) S: Personnel sequence: frame 2; Funds (personnel summary) 8r15

(R16S119) S: Personnel sequence: frame 3; Personnel Patterns 8r16

(R17S119) S: Personnel sequence: frame 4; Personnel list that matches pattern [*"programming"*]; 8r17

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(R18S119) S: ASIS outline (Status: other activities) 8r18

(R19S119) S: Support System Status Report 8r19

(R20S119) S: Status: other activities (like R18) 8r20

(R20S119) S: Time Sold Chart (related most closely to R13 and should follow it in sequence)

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8r21

(SOOS119) Slides from JCN party 11/7/69 8s

':5224', 11/12/70 0926:07 MEJ ; .DPR=1; :JRNL', 11/12/70 0916:25 MGC ;
11/14/69 1706:32 MGC (,4:xbbn); .DPR=0;

JBN

- 12NOV70 MGC 5224

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MSR	3a4c
calculator and charts	3a4c1
USR	3a4d
Working display (with feedback, etc.)	3b

SLIDES .DSN=1; .DPR=0;

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.CEN=1;SLIDE CATALOGUE.CEN=0; 4

(000S018) 5

(A00S018) 5a

(A02S018) S:3100 5a1

(A03S018) S:3100 5a2

(A05S018) S:3100 5a3

(A06S018) S:3100 5a4

(A08S018) S:3100 5a5

(A09S018) S:3100 5a6

(A11S018) S:3100 5a7

(A12S018) S:3100 5a8

(A14S018) S:3100 5a9

(A15S018) S:3100 diff. 5a10

(A17S018) S:3100 5a11

(A18S018) S:3100 5a12

(A20S018) S:3100 5a13

(A21S018) S:3100 5a14

(A23S018) S:3100 5a15

(A24S018) S:3100 5a16

(A26S018) S:3100 5a17

(A27S018) S:3100 5a18

(A29S018) S:3100 5a19

(A30S018) S:3100 5a20

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(A32S018)	S:3100	5a21
(A33S018)	S:3100	5a22
(A35S018)	S:3100	

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		5a23
(B00S018)		5b
(B09S018)	S:3100	5b1
(B14S018)	S:3100	5b2
(B15S018)	S:3100	5b3
(B16S018)	S:3100	5b4
(B18S018)	S:3100	5b5
(B19S018)	S:3100	5b6
(B21S018)	S:3100	5b7
(B22S018)	S:3100	5b8
(B24S018)	S:3100	5b9
(B25S018)	S:3100	5b10
(B27S018)	S:3100	5b11
(B28S018)	S:3100	5b12
(B30S018)	S:3100	5b13
(B32S018)	S:3100	5b14
(B33S018)	S:3100	5b15
(B34S018)	S:3100	5b16
(C00S018)		5c
(C29S018)	S:3100	5c1
(C30S018)	S:3100	5c2
(C31S018)	S:3100	5c3
(C32S018)	S:3100	

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		5c4
(000S038)		6
(A00S038)		6a
(A01S038)	DIA, JFR On line ARPA Conf. console.	6a1
(A02S038)	JFR 1 console	6a2
(A03S038)	JFR, DIA On line ARPA Conf. console.	6a3
(A04S038)	JFR 1 console keyboard	6a4
(A05S038)	JFR,DIA	6a5
(A06S038)	JFR,DIA	6a6
(A07S038)	JFR,DIA	6a7
(A08S038)	JFR,DIA	6a8
(A09S038)	JFR 1 console, keyboard	6a9
(A10S038)	Roger in computer room	6a10
(A11S038)	hardware in shop (Roger's thing)	6a11
(A12S038)	hardware in shop	6a12
(A13S038)	hardware in shop	6a13
(A16S038)	JFR + DIA at consoles; Steve Levine	6a14
(A17S038)	tasker for On-line	6a15
(A18S038)	DIA, JFR, Steve Levine TTY + consle	6a16
(A19S038)	tape drives	6a17
(A20S038)	Comp room Printer, dura, TTYs	6a18
(A21S038)	Comp room equipment	

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			6a19
(B00S038)			6b
(B02S038)	Steve Levine at Work Station		6b1
(B03S038)	Steve Levine at Work Station		6b2
(B04S038)	Steve Levine at Work Station		6b3
(B05S038)	Steve Levine at Work Station		6b4
(B06S038)	Steve Levine at Work Station		6b5
(B07S038)	Steve Levine at Work Station		6b6
(B08S038)	Steve Levine at Work Station		6b7
(B09S038)	Steve Levine at Work Station		6b8
(B10S038)	Steve Levine at Work Station		6b9
(B11S038)	Steve Levine at Work Station		6b10
(B12S038)	Steve Levine at Work Station		6b11
(B13S038)	Steve Levine at Work Station		6b12
(B14S038)	Steve Levine at Work Station	hand and screen	6b13
(B15S038)	Steve Levine at Work Station		6b14
(B16S038)	Steve Levine at Work Station		6b15
(B17S038)	Steve Levine at Work Station		6b16
(B18S038)	Steve Levine at Work Station		6b17
(B19S038)	Face side Steve Levine		6b18
(B20S038)	JFR, DIA comp room		6b19
(B21S038)	JFR, DIA comp room		

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		6b20
(C00S038)		6c
(C01S038)	S:3100	6c1
(C04S038)	S:3100	6c2
(C06S038)	S:3100	6c3
(C08S038)	S:3100	6c4
(C10S038)	S:3100	6c5
(C12S038)	S:3100	6c6
(C15S038)	S:3100	6c7
(C17S038)	S:3100	6c8
(C19S038)	S:3100	6c9
(C20S038)	S:3100	

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6c10

(D00S038) Diagrams 6d

(D04S038) Basic organization of NLS, showing use of compilers and compiler-compiler for implementation. 6d1

(D05S038) A State chart portrayal of our Vert manipulation Control language. 6d2

(D08S038) Organization of our 940 on line system. 6d3

(D12S038) How the Meta II Translator serves to compile a new version of itself. 6d4

(D14S038) NLS 940 as on information processing system. 6d5

(D17S038) Overlay structure of NLS 940. 6d6

(D21S038) (in color) Meta Mol flow chart

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6d7

(000S048) 7

(A00S048) 7a

(A01S048) ARPA on-line meeting, JFR, Dean Brown, Steve Levine 7a1

(A02S048) EGS, Kipers?, someone else. 7a2

(A03S048) Dean Bergstrom and ? 7a3

(A04S048) ? 7a4

(A05S048) group shot 7a5

(A06S048) group shot 7a6

(A07S048) group shot with Doug 7a7

(A08S048) Doug - at blackboard 7a8

(A09S048) group shot 7a9

(A10S048) Dave Hopper?, Elton Hag and Doug 7a10

(A11S048) same as 10 7a11

(A12S048) WKE 7a12

(A13S048) small group shot 7a13

(A14S048) Bob Taylor 7a14

(A15S048) room shot 7a15

(A16S048) group shot 7a16

(A17S048) group shot 7a17

(A18S048) Doug, etc. 7a18

(A19S048) Doug, etc. 7a19

(A20S048) Torben and ?

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		7a20
(000S119)		8
(A00S119)		8a
(A19S119)	Display Equipment EVR, MEH	8a1
(A20S119)	Executive Hardware	8a2
(A21S119)	IMP/NET Terminal	8a3
(B00S119)		8b
(B01S119)	Blur	8b1
(B02S119)	Workspace with people milling	8b2
(B03S119)	Workspace with people milling	8b3
(B04S119)	Workspace with people milling	8b4
(B05S119)	Workspace with people milling	8b5
(B02S119)	Workspace with people milling	8b6
(B07S119)	Workspace with people milling	8b7
(B08S119)	Workspace with smaller group	8b8
(B09S119)	Workspace with smaller group	8b9
(B10S119)	3 consoles, WHP, JCN, WKE, GHB	8b10
(B11S119)	3 consoles, WHP, JCN, WKE, GHB	8b11
(B12S119)	2 consoles, WKE, JCN, GHB	8b12
(B13S119)	2 consoles, WKE, JCN, GHB	8b13
(B14S119)	2 consoles, WKE, JCN, GHB	8b14
(B15S119)	2 consoles, WKE, JCN, GHB	8b15
(B16S119)	2 consoles, WKE, JCN, GHB, WHP	8b16
(B17S119)	2 consoles, WKE, JCN, GHB, WHP	8b17

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(B18S119)	Yoga console, WSD, MSC, DCE	8b18
(B19S119)	Yoga console, WSD, MSC, DCE	8b19
(B20S119)	Yoga console, MSC, DCE	8b20
(B21S119)	Console use JCN	

8b21

(C00S119) 8c

(C01S119) blur 8c1

(C02S119) Yoga console, WSD 8c2

(C03S119) Yoga console, WSD 8c3

(C04S119) 3 consoles, WHP, JCN, WSD 8c4

(C05S119) 1 console, JCN, WKE 8c5

(C06S119) 1 console, JCN, WKE 8c6

(C07S119) 1 console, gHB 8c7

(C08S119) 1 console, GHB 8c8

(C09S119) 1 console, GHB 8c9

(C10S119) S: Network Map 8c10

(C11S119) S: Network "black box," linked HOSTS 8c11

(C12S119) S: Network remote user through to NIC 8c12

(C13S119) S: Partial NIC: No Godas 8c13

(C14S119) S: NIC chart (full) 8c14

(C15S119) S: Network Map 8c15

(C16S119) S: Network "black box," linked hosts 8c16

(C17S119) S: Dialogue: one entry 8c17

(C18S119) S: Dialogue: two entries 8c18

(C19S119) S: Dialogue: six entries 8c19

(C20S119) S: (missing from stack, check later) 8c20

(C21S119) S: CML Procedure, BUGlSPEC

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		8c21
(D00S119)		8d
(D01S119)	Blur	8d1
(D02S119)	Blur	8d2
(D03S119)	Black	8d3
(D04S119)	S: Incomplete Bootstrap Chart	8d4
(D05S119)	S: Incomplete Bootstrap Chart	8d5
(D06S119)	S: Complete Bootstrap Chart	8d6
(D07S119)	S: AHIRC and Bootstrapping	8d7
(D08S119)	S: List of Augmentation System Components	8d8
(D09S119)	S: List of Major Service System Hardware	8d9
(D10S119)	S: List of System-Programmer Tools	8d10
(D11S119)	S: List of Special Compilers	8d11
(D12S119)	S: List of User Subsystems	8d12
(D13S119)	S: NLS-vehicle chart	8d13
(D14S119)	S: INFO SYS: INFO Management Components	8d14
(D15S119)	S: System, + System Development, SYS-DEV AIDS	8d15
(D16S119)	S: SYS + SYS Development, with Management Aids	8d16
(D17S119)	S: Diagram: Remote User through NET to NIC	8d17
(D18S119)	S: Schematic of Multi-terminal lab	8d18
(D19S119)	S: First Step Bootstrapping Sequence (INFO SYS)	8d19
(D20S119)	S: Second Step Bootstrap Sequence (AUG. SYS)	8d20
(D21S119)	S: Incomplete Bootstrap	

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		8d21
(E00S119)		8e
(E01S119)	DAE, MET, MSC informal in hall	8e1
(E02S119)	DAE, MET, MSC informal in hall	8e2
(E03S119)	WSD, MSC, MGC, MET pre-meeting informal	8e3
(E04S119)	WSD, MSC, MGC, MET pre-meeting informal	8e4
(E05S119)	8 people pre-meeting informal	8e5
(E06S119)	8 people pre-meeting informal	8e6
(E07S119)	8 people pre-meeting informal	8e7
(E08S119)	WSD, MSC, MGC, MET pre-meeting informal	8e8
(E09S119)	WSD, MSC, MGC, MET pre-meeting informal	8e9
(E10S119)	WSD, MSC, MGC, MET pre-meeting informal	8e10
(E11S119)	1:00 full group (12 people) coffee break	8e11
(E12S119)	1:00 full group (12 people) coffee break	8e12
(E13S119)	1:00 full group (12 people) coffee break	8e13
(E14S119)	1:00 full group (12 people) coffee break	8e14
(E15S119)	1:00 full group (12 people) coffee break	8e15
(E16S119)	1:00 sub-group coffee break	8e16
(E17S119)	1:00 sub-group coffee break	8e17
(E18S119)	1:00 sub-group coffee break	8e18
(E19S119)	5:00 full group coffee break (different from E11-E15)	8e19
(E20S119)	5:00 full group coffee break	

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8e20

(F00S119) 8f

(F01S119) 7:00 almost whole group meeting 8f1

(F02S119) 7:00 another goroup almost whole group meeting 8f2

(F03S119) 7:00 almost whole group meeting (same as F2) 8f3

(F04S119) 7:00 almost whole group meeting (same as F2) 8f4

(F05S119) 6:00 half group meeting 8f5

(F06S119) 6:00 half group meeting 8f6

(F07S119) 3:00 MSC and DCE 8f7

(F08S119) 3:00 MSC and DCE; MSC/smiling, ARG peeking 8f8

(F09S119) 3:00 MSC and DCE; MSC only grinning, handwork from DCE 8f9

(F10S119) 2:00 towards 11:00 7 people 8f10

(F11S119) 2:00 towards 9:00 several people 8f11

(F12S119) 2:00 towards 9:00 several people 8f12

(F13S119) 2:00 towards 11:00 8f13

(F14S119) 5:00 towards 8:00 eight people 8f14

(F15S119) 5:00 towards 8:00 eight people 8f15

(F16S119) 5:00 towards 8:00 eight people 8f16

(F17S119) 5:00 towards 8:00 WSD, DAE, WKE center of six people 8f17

(F18S119) 5:00 towards 8:00 WSD, DAE, WKE center of six people;
this is best of the three 8f18

(F19S119) 5:00 towards 8:00 WSD, DAE, WKE center of six people 8f19

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(F20S119) 5:00 towards 8:00 WSD, DAE, WKE center of six people,
including JAF

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		8f20
(G00S119)		8g
(G01S119)	DCE pointing finger	8g1
(G02S119)	DCE laughing	8g2
(G03S119)	WKE, WSD, JAF	8g3
(G04S119)	WKE, WSD, JAF	8g4
(G05S119)	7:00	8g5
(G06S119)	7:00	8g6
(G07S119)	7:00	8g7
(G08S119)	3:00 to 9:00	8g8
(G09S119)	3:00 to 9:00	8g9
(G10S119)	3:00 to 9:00	8g10
(G11S119)	Group around console WKE, WSD, WHP talking	8g11
(G11S119)	WKE, WSD, WHP around console talking	8g12
(G12S119)	WKE, WSD, WHP around console talking	8g13
(G13S119)	MSC Yoga console side view shows mouse	8g14
(G14S119)	MSC Yoga console side view shows mouse	8g15
(G15S119)	MSC Yoga console from back shows keyset	8g16
(G16S119)	ARG demonstrating to 3 friends, gesticulating	8g17
(G17S119)	ARG demonstrating to 3 friends, good gestures	8g18
(G18S119)	ARG demonstrating to 3 friends, shows mouse	8g19
(G19S119)	ARG demonstrating to friends, from back, view of screen	8g20
(G20S119)	ARG demonstrating to friends, from back, view	

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of screen

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		8g21
(H00S119)		8h
(H01S119)	missing	8h1
(H02S119)	Benford from back, at TTY with IMP with Board	8h2
(H03S119)	Benford from back, at TTY with IMP with Board	8h3
(H04S119)	MEH leaning over Benford's shoulder	8h4
(H05S119)	MEH leaning over Benford's shoulder	8h5
(H06S119)	Benford at IMP teletype	8h6
(H07S119)	MEH adjusting camera, with CRT	8h7
(H08S119)	MEH adjusting camera, with CRT	8h8
(H09S119)	MEH adjusting camera, with CRT	8h9
(H10S119)	MEH adjusting camera	8h10
(H11S119)	MEH adjusting camera	8h11
(H12S119)	MEH adjusting camera (good shot)	8h12
(H13S119)	MEH adjusting camera	8h13
(H14S119)	MEH adjusting camera, smiling	

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8h14

(I00S119) 8i

(I01S119) blur 8i1

(I02S119) JDH on floor in office talking with JMY 8i2

(I03S119) JDH on floor in office talking with JMY 8i3

(I04S119) JDH on floor in office talking with JMY 8i4

(I05S119) JDH on floor in office talking with JMY 8i5

(I06S119) DGC in office, view of Janis J. and other posters 8i6

(I07S119) DGC in office, view of posters 8i7

(I08S119) DGC in office, view of posters 8i8

(I09S119) unknown technician in shop soddering 8i9

(I10S119) unknown technician in shop soddering 8i10

(I11S119) Engineering lab: Vern, Jake; MEH adjusting TTY 8i11

(I12S119) MEH adjusting TTY, Vern in back 8i12

(I13S119) Vern with hand in tube; parts, tubes in background 8i13

(I14S119) Ed pushing Eidophor 8i14

(I15S119) Ed pulling Eidophor 8i15

(I16S119) Machine room: long shot of cameras on tubes; Jake in background 8i16

(I17S119) Machine room, long shot of cameras on tubes, Jake in background 8i17

(I18S119) Machine room: long shot of cameras on tubes; Jake in background 8i18

(I19S119) Jake and test monitor; adjusting equipment 8i19

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(I20S119) Jake and test monitor; (?) checking voltage levels 8i20

(I21S119) Jake and test monitor; cameras, etc. in background

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		8i21
(J00S119)		8j
(J01S119)	none	8j1
(J02S119)	WSD at TTY; side view; Todas?	8j2
(J03S119)	WSD at TTY; side view; in computer room	8j3
(J04S119)	WSD at TTY; side view with tape drives in background	8j4
(J05S119)	WSD at TTY; tape drives in background	8j5
(J06S119)	MEH in dark, oscilloscopes, etc.	8j6
(J07S119)	MEH in dark, oscilloscopes, etc.	8j7
(J08S119)	MEH in dark, oscilloscopes, etc.	8j8
(J09S119)	MEH in dark, oscilloscopes, etc.	8j9
(J10S119)	MEH in dark, oscilloscopes, etc.	8j10
(J11S119)	MEH in dark, oscilloscopes, etc.	8j11
(J12S119)	Dean looking at IMP board with wires	8j12
(J13S119)	Dean testing IMP board with wires (?)	8j13
(J14S119)	Dean testing IMP board with wires (?)	8j14
(J15S119)	GHB on console using mouse (shot from behind)	8j15
(J16S119)	GHB on console using mouse (shot from behind)	8j16
(J17S119)	DAE with hand on keyset	8j17
(J18S119)	DAE with hand on keyset	8j18
(J19S119)	DAE at console with mouse, screen, keyset showing	8j19
(J20S119)	RAC at console with ARG leaning over to help	

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8j20

(K00S119) 8k

(K01S119) JCN at Herman Miller console; shows shelves, mouse, keyset 8k1

(K02S119) JCN at Herman Miller Console, side view shows chair 8k2

(K03S119) JCN at Herman Miller console; view from above shows keyset, mouse, keyboard 8k3

(K04S119) JCN at Herman Miller console, view from above shows keyset, mouse, keyboard 8k4

(K05S119) Bruce and CHI at console 8k5

(K06S119) Bruce and CHI at console 8k6

(K07S119) Bruce and CHI at console 8k7

(K08S119) Long shot (facing south towards cave) of main work area with clusters of people 8k8

(K09S119) Long desk top shot of main workspace; clusters of people 8k9

(K10S119) Long shot of main workspace; clusters of people 8k10

(K11S119) Long shot of main workspace; clusters of people 8k11

(K12S119) Long shot of main workspace; clusters of people 8k12

(K13S119) Long shot of main workspace; clusters of people 8k13

(K14S119) Long shot of main workspace; clusters of people 8k14

(K15S119) Bruce and CHI looking at papers; console in background 8k15

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(K16S119) Bruce and CHI looking at papers; shot from behind, console in background 8k16

(K17S119) Bruce and Chuck from side; shows console, mouse, keyset 8k17

(K18S119) Bruce and Chuck from side; shows console, mouse, keyset 8k18

(K19S119) Bruce and Chuck from side; shows console, mouse, keyset 8k19

(K20S119) Bruce and CHI from side; shows console, mouse, keyset 8k20

(last six slides show pencils!)

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		8k21
(L00S119)	miscellaneous by cameraman	81
(L01S119)	hand on keyboard	811
(L05S119)	mouse	812
(L06S119)	hand on mouse	813
(L07S119)	hand on mouse	814
(L09S119)	MGC closeup	815
(L12S119)	CHI closeup	816
(L13S119)	IMP panel with "Interface Message Processor" showing	817
(L15S119)	TTY printout	818
(L19S119)	TTY printout	

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819

(M00S119) WHP M1-M11 and MSC M12-M21 8m

(M01S119) blur 8m1

(M02S119) S: TREE-META to create and transform parse tree: frame 1 8m2

(M03S119) S: TREE-META to create and transform parse tree: frame 2 8m3

(M04S119) S: input feedback SPL 8m4

(M05S119) S: Content Analysis and string constuction: SPL 8m5

(M06S119) S: example of MOL 8m6

(M07S119) S: overlay map 8m7

(M08S119) S: sequence showing keyword search using SYSGD: frame 1 8m8

(M09S119) S: sequence showing keyword search using SYSGD: frame 2 8m9

(M10S119) S: sequence showing keyword search using SYSGD: frame 3 8m10

(M11S119) S: sequence showing keyword search using SYSGD: frame 4 8m11

(M12S119) S: kinds of items we'd like to coordinate in NIC 8m12

(M13S119) S: interconnections of kinds of items we'd like to coordinate in NIC 8m13

(M14S119) S: first level of a NIC citation list showing names of documents and titles 8m14

(M15S119) S: first citation item expanded to all showing title and link to abstract, author, date, source 8m15

(M16S119) S: abstract jumped to from M15 8m16

(M17S119) S: result of keyword select shows re-ordering of basic citation list: keywords used are SRI and UTAH 8m17

(M18S119) S: same list with smorgasboard statement frozen at top 8m18

(M19S119) S: same thing but better ("?" under feedback line) 8m19

(M20S119) S: execute Content Analyzer pattern "compiler" from smorgasboard statement 8m20

(M21S119) S: result of CONAN pattern applied to keyword selected list; this frame is cut off and N1 is a better copy

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8m21

(NOOS119) MSC N1-N6 and DAE N7-N20 8n

(NO1S119) S: result of CONAN pattern applied to keyword selected list 8n1

(NO2S119) S: Illustrates how you can take clues from retrieved list to help you search again: copied word "language" from list in N1 into pattern frozen at top 8n2

(NO3S119) S: Execute CONAN on /["compiler"]OR/["language"]; in frozen statement 8n3

(NO4S119) S: result of new CONAN patteern on keyword selected list 8n4

(NO5S119) S: abstract of first citation retrieved in N4 8n5

(NO6S119) S: result of jump return 8n6

(NO7S119) S: Sequence showing Hierarchal inter-file structure: frame 1 8n7

(NO8S119) S: Sequence showing Hierarchal inter-file structure: frame 2 8n8

(NO9S119) S: Sequence showing hierarchal inter-file structure: frame 3 8n9

(N10S119) S: Sequence showing hierarchal inter-file structure: frame 4 8n10

(N11S119) S: Sequence showing hierarchal inter-file structure: frame 5 8n11

(N12S119) S: Sequence showing hierarchal inter-file structure: frame 6 8n12

(N13S119) S: Sequence showing hierarchal inter-file structure: frame 7 8n13

(N14S119) S: Sequence showing hierarchal inter-file structure: frame 8 8n14

(N15S119) S: Sequence showing hierarchal inter-file structure: frame 9 8n15

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(N16S119)	S:	Example of link Sequence (feedback is only variation): frame 1	8n16
(N17S119)	S:	Example of link Sequence: frame 2	8n17
(N18S119)	S:	Top level outline "Scene 1 . . .Scene 5"	8n18
(N19S119)	S:	Example of link Sequence: frame 3	8n19
(N20S119)	S:	Example of link Sequence: frame 4	

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8n20

(000S119) DAE 8o

(001S119) blur 8o1

(002S119) blur 8o2

(003S119) blur 8o3

(004S119) S: ? 8o4

(005S119) S: ? 8o5

(006S119) S: ? 8o6

(007S119) S: ? 8o7

(008S119) S: Jump to Item (Select: first Command Accept) 8o8

(009S119) S: Jump to Item (Select: second command accept) 8o9

(010S119) S: Result of 09 with statement numbers on 8o10

(011S119) S: Result of 09 with statement numbers off 8o11

(012S119) S: down a level with statement numbers off 8o12

(013S119) S: down another level with statement numbers on 8o13

(014S119) S: tail of same, up a level 8o14

(015S119) S: Select, down a level (viewspecs all and G) 8o15

(016S119) S: Result of 015 selection 8o16

(017S119) S: Delete word sequence: frame 1 8o17

(018S119) S: Delete word sequence: frame 2 8o18

(019S119) S: Delete word sequence: frame 3 8o19

(020S119) S: tree structure of file 8o20

(021S119) S: move branch sequence: frame 1 8021

(022S119) S: move branch sequence: frame 2

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8o22

(P00S119) DAE P1-P5 and WSD P6-P20 8p

(P01S119) S: 8p1

(P02S119) S: 8p2

(P03S119) S: 8p3

(P04S119) S: 8p4

(P05S119) S: 8p5

Description of WSD sequence: application of DDT as an on-line debugging tool. 8p6

Note: Some of the pictures in this sequence are cut off at the bottom, which is where what was happenning was happenning. 8p6a

consequently, many of the pictures show the same thing, and some steps are not shown. 8p6a1

A version of NLS is loaded with DDT, and a flag designating it as experimental is set. 8p6b

(P06S119) S: NLS and DDT being loaded for debugging. 8p6b1

(P07S119) S: NLS and DDT being loaded for debugging. 8p6b2

(P08S119) S: Examining the value of the variable exp, which is 1 if the system is experimental 8p6b3

(P09S119) S: Setting the contents of the variable exp to 1 8p6b4

NLS is started under the control of DDT, and an attempt is made to use the keyword facility, which causes NLS to crash. 8p6c

(P10S119) S: Starting up NLS in DDT at location 14000 8p6c1

(P11S119) S: Typing in initials and name to NLS 8p6c2

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(P12S119) S: In NLS, about to load the checkpoint file which is a test file for keyword 8p6c3

(013S119) S: NLS with the test file loaded 8p6c4

(P14S119) S: Back in DDT after crash with attempt to use keyword (notice that K has been typed and is in the echo register). NLS is left on screen after crash 8p6c5

After the crash, we are back in DDT, and some exploration is made to see what went wrong 8p6d

(P15S119) S: Back in DDT after crash with attempt to use keyword (notice that K has been typed and is in the echo register). NLS is left on screen after crash 8p6d1

(P16S119) S: Back in DDT after crash with attempt to use keyword (notice that K has been typed and is in the echo register). NLS is left on screen after crash 8p6d2

(P17S119) S: Back in DDT after crash with attempt to use keyword (notice that K has been typed and is in the echo register). NLS is left on screen after crash. This is the best one because it shows the print-out indicating the cause of the crash (memory error on store at loaction mvbfbf + 14 8p6d3

(P18S119) S: Back in DDT after crash with attempt to use keyword (notice that K has been typed and is in the echo register). NLS is left on screen after crash. 8p6d4

(P19S119) S: Back in DDT after crash with attempt to use keyword (notice that K has been typed and is in the echo register). NLS is left on screen after crash. 8p6d5

(P20S119) S: Following the indirect store to the final location, which is in the page where keyword should be

8p6d6

(Q00S119) WSD Q1-Q16 and CHI Q17-Q21 8q

Description of WSD sequence: application of DDT as an on-line debugging tool (continued) 8q1

After the crash, we are back in DDT, and some exploration is made to see what went wrong 8q1a

(Q01S119) S: Looking at contents of resultant location of illegal store, and cell following. 8q1a1

(Q02S119) S: Looking at contents of resultant location of illegal store, and cell following. 8q1a2

(Q03S119) S: Looking at NLS relabelling at time of crach 8q1a3

(Q04S119) S: Looking at NLS relabelling at time of crach 8q1a4

(Q05S119) S: Looking at NLS relabelling at time of crach 8q1a5

We examine the crash, and find that the keyword overlay is marked as non-present. 8q1b

(Q06S119) S: Looking at overlay table entry for keyword overlay, and finding it marked non-present (65,4 is non-present, 65 would be present) 8q1b1

We find that there is another overlay with the same number in its place, which means that there was an error in initialization. 8q1c

(Q07S119) S: The execution of the search produces two entries with 65, the one other than keyword (vector edit 2) is present. This indicates an error in initialisation. 8q1c1

(Q08S119) S: The execution of the search produces two entries with 65, the one other than keyword (vector edit 2) is present. This indicates an error in initialisation. 8q1c2

We reset, and reload DDT and NLS, searching the

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initialization overlay for all references to the keyword overlay. 8q1d

(Q09S119) S: Leave DDT and reset. 8q1d1

(Q10S119) S: Re-entering DDT/NLS and searching for references to keyword overlay table entry, finding two. 8q1d2

(Q11S119) S: Re-entering DDT/NLS and searching for references to keyword overlay table entry, finding two. 8q1d3

We find that it has been released at initialization to make room in the PMT for other overlays. 8q1e

(Q12S119) S: Finding that the second reference releases the overlay (brs 171). 8q1e1

This is fine for debugging, but not for a non-experimental system, so we put in a patch which causes it to not be releaed if the system is not experimental. 8q1f

(Q13S119) S: Using patch command in DDT to skip the brs 171 f the system is not experimental. 8q1f1

Finally, we test the experimental version, and find that it is ok. 8q1g

(Q14S119) S: Re-entering NLS after insertig patch to try it 8q1g1

(Q15S119) S: NLS with test file loaded 8q1g2

(Q16S119) S: Successfully using keyword command. 8q1g3

(Q17S119) S: Schematic: Compilation of NLS System and Compilers: frame 2 8q2

(Q18S119) S: Schematic: Compilation of NLS System and Compilers: frame 3 8q3

(Q19S119) S: Schematic: Compilation of NLS System and Compilers: frame 4 8q4

(Q20)S119 S: no good 8q5

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(Q21S119) S: Schematic: Compilation of NLS System and Compilers: frame 1

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8q6

(R00S119) JCN 8r

(R01S119) S: ASIS presentation outline, level 1 8r1

(R02S119) S: ASIS presentation outline, financial data branch 8r2

(R03S119) S: Jump to calculator (picture of little man running) 8r3

(R04S119) S: Using calculator (feedback cut off) 8r4

(R05S119) S: Using calculator to add 8r5

(R06S119) S: Using calculator, shows insertion of data 8r6

(R07S119) S: Using calculator: selecting function 8r7

(R08S119) S: Using calculator: selecting function (feedback cut off) 8r8

(R09S119) S: Using calculator: Using function 8r9

(R10S119) S: Using calculator: Using function (feedback cut off) 8r10

(R11S119) S: Using calculator: Insert function result 8r11

(R12S119) S: Outline: financial data (link to FUNDS file) 8r12

(R13S119) S: FUNDS file (top level) good 8r13

(R14S119) S: Personnel sequence: frame 1 (JCN says this sequence is particularly good): ASIS outline, personnel branch 8r14

(R15S119) S: Personnel sequence: frame 2; Funds (personnel summary) 8r15

(R16S119) S: Personnel sequence: frame 3; Personnel Patterns 8r16

(R17S119) S: Personnel sequence: frame 4; Personnel list that matches pattern /"programming"/; 8r17

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(R18S119) S: ASIS outline (Status: other activities) 8r18

(R19S119) S: Support System Status Report 8r19

(R20S119) S: Status: other activities (like R18) 8r20

(R20S119) S: Time Sold Chart (related most closely to R13 and should follow it in sequence)

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8r21

(S00S119) Slides from JCN party 11/7/69 8s

':5224', 11/12/70 0926:07 MEJ ; .DPR=1; :JRNL', 11/12/70 0916:25 MGC ;
11/14/69 1706:32 MGC (,4:xbbn); .DPR=0;

- 18NOV70 DCE 5225

Letter, DCE to Prof. William S. Elliott, Imperial College

Professor William S. Elliott
Professor of Computing
Centre for Computing and Automation
Imperial College of Science and Technology
School of Mines Building
Prince Consort Road
London SW 7
England

1

Dear Bill: 2

I have sent off (by air) a copy of our film and I am enclosing here a few slides that I think might add a bit to the material contained in the movie -- although the movie covers so many facets of our activity that there really aren't very many things that a slide can add without requiring a good bit of descriptive material with it. For the latter purpose, I would like you to be specific about requests for photographs or slides with respect to the subject you would like to have portrayed (after you have seen the movie). You can refer to items as "seen in the movie", or as "referencing one of our reports" to designate the topic of some slide-photograh, and we will see if we have something of the sort in stock. 3

With respect to the enclosed slides -- if you would like to have permanent copies, would you please have them made from these and return to us the originals? (I don't put a particularly nigh probability on these slides having very much value to you.) 4

Regarding the movie -- if you want to keep it for more than a month, please let us know. Also, we have had a bit of trouble in the past with the manner in which the films were returned to us, so I would appreciate it very much if you would observe the comments and suggestions on the enclosed memo (by Mil Jernigan). 5

Let me know if I can help you obtain any publications (see enclosed list) that you don't have. We are trying (in amongst our PDP-10 implementation struggles) to pproduce a technical report dealing with our special-purpose compilers and languages. If we are successful, we will be sure to send you a copy. Otherwise, it will probably be next April before our next regular progress report is available. 6

Letter, DCE to Prof. William S. Elliott, Imperial College

Regarding the general topic of transferring some of our compilers and processors into your computer system -- I would recommend that if we do proceed with such activity, you consider something like the following sequence: 7

1) Implement our TREE META compiler-compiler. We can give you listings and help in implementing its subroutine library, etc., in one of your computers. 7a

If you implement TREE META and decide to progress no further in transferring programs and techniques from our lab, I would guess that you would get very valuable return on the relatively modest manpower investment (e.g., 3 man months): it will not only be a tool very useful for computer-science instruction and experimentation, but it could provide you with a very powerful means for developing utility languages for your own research work. Further, you will have thus made a rather large step towards transferring much of our work. 7a1

2) Bootstrap our "system-programming language" into your machine. We have up-graded the language from MOL (mentioned in the reports you have) to what we are now calling L1O, into which we are now converting our system for the PDP-10. 7b

L1O is much less machine dependent than MOL, and is slanted particularly towards supporting the development of systems. For instance, it should be a perfectly adequate base for going into interactive graphics operations, handling the interaction, the display construction, etc. I would assume that you would want to adapt it to link with (assumedly FORTRAN) the programs you are using for the "heavy-weight" computations associated with your research. 7b1

(NOTE: The L1O compiler is described in the TREE META language, and compiles by the TREE META-compiler, so its implementation should be quite easy.) 7b1a

We are building into L1O useful "interactive-calculator" features (such as JOSS and BASIC), but I imagine that if you get into three-dimensional-surface processes you will want to stick with the computational languages that you have been using. 7b2

We plan for a continuing evolution of L1O -- a year from now perhaps we'll have a practical and powerful incremental compilation mode (to support interactive check-out and

debugging), plus a number of other useful and powerful features. This evolution should be such that once you have one of our working versions (plus TREE META, of course), you would find it quite easy to track with us. There may be slight syntactic changes, for a given upward step, requiring some modification of existing-program source code, but we would of course try to minimize such. 7b3

I would assume that, during Stage 1 above, you would have ample opportunity to examine the implemntation cost, the potential value for your uses, etc., and by the end of Stage 1 be able to decide whether or not to implement Stage 2. Again, your having Stage 2 would provide a good deal of potential value in your experimental environment, whether or not you proceed with the later stages. 7b4

3) The next step would be to implemeent our SPL's (Special Purpose Languages). Each of these is specifically designed for programming a particular level or module of our system. 7c

For instance, what we call the CML (Control META Language) was designed to write the interaction-dialogue parts of the on-line system -- the interactive interchanges between user and system leading up to the final "call for execution" for some data-changing and/or view-modification. Another SPL was especially written for the string-manipulation processes associated with some of these data operations. Another supported the file-structure manipulatons, etc. 7c1

In the past, these SPLs have been syntactically independent, and were treated as dialects of one "SPL compiler," which had a syntactic convention for switching from dialect to dialect (right within one statement, for instance). We are improving things in our next step, integrating all of these special SPL's under the one "continuous" L10 language. The SPL's will be syntactically consistent extensions of L10 -- no more dialect-switching required. I this case, your acquiring our SPL features will really mean extending L10 in these directions. 7c2

Again, you would not have to proceed beyond this step, with implementing our specific on-line systems, in order to derive value from this stage of implementation. The SPL's could be very useful to you in developing your own interactivve CRT systems -- by this time you would find it easy to extend or modify these languages to suit particular system-building applications. 7c3

4) As a final, optional stage, we talk about taking across our whole interactive system (NLS/TODAS) -- or, do it in upward-compatible pieces, or modify to your taste (you could do special things with relative ease, because the organization, structure, and processes will all be programmed in extended L10), 7d

In trasferring NLS, there will be machine-system things to worry about, having to do with your file-management and operating systems. This will be probably the main source of transfer labor. The interfaces to your particular terminal hardware will require special attention, of course, but we will plan by that time to have a specially partitioned terminal-interface (software) module, which should make this interfacing quite straightforward. 7d1

As for prior stages, there could be considerable advantage obtained by implementing to this point, even if you don't intend to make NLS/TODAS generally available, outside of a small group, for experimentation and utilization. What I am getting at here is that the value, for your own system-programming and system-developmeent activities, would be very high. 7d2

The operations that our on-line systems provide -- for composing, modifying, studying, and debugging source-code files (for either L10 programs, or programs written in the TREE-META compiler-writing language) -- provide a significant gain in programmer effectiveness; 7d2a

Furthermore, the ability to link documentation, specifications, etc., into source-code files is extremely helpful; 7d2b

The application of other features in our system -- scanning, cataloging, querying, project-managemnt, print-out formatting, analysis, etc. -- have a very considerable value in themselves for the general work of a system-development ppoject. 7d2c

If you implemented as much of our "whole" system as was useful to your system development work, I am sure that you would find the framework of languages and programs a very good base from which to develop towards any special system you wished to explore. 7d2d

I will await your further requests, suggestions, comments, etc.

Again, I might add that I would be much pleased with any sort of collaboration that would ensue between us. 8

My very best regards to you! 9

```
':5225', 00/00/00 |020:47 MEJ ; .DPR=|; :JRNLA,' ||/|8/70 |003:54 DCE ;
.DPR=|;
   .DSN=1;    .RTJ=0;    .DPR=0;        .DPR=0;
```

23NOV70 KEV 5226

PROPOSED NEW PROCEDURES FOR KDF DUMPS

Until Cybernex is finished with our drum and disk, we will continue operating as we have been for the past week, i.e., dumping the XFILES each night. 1

When Cybernex is done the following alternative to the once a week full KDF dump is proposed. I would appreciate any comments. 2

Each morning, from 8:30-9:00, a dump of the XFILES will be made. 2a

Every two weeks, a full KDF dump will be made 2b

After the full KDF dump, the KDF spaces for the XFILES will be INITIALIZED. 2c

Implications of this new prcedure are: 3

There will be a daily tape of any new work, and people should therefore never have to back-up more than one day if anything diasterous happens 3a

Prior to the full KDF dump, people will have to copy their work from the XFILES to their own KDF area if they wish to be able to continue work on their files 3b

```
:5226, 11/23/70 1053:11 JCN ; .DPR=1; ':NEWSAVEPRO', 11/23/70 1028:57
KEV ; .DPR=0;
```

ANALYSER-FORMATTER PROGRAMS FOR INITIAL CONVERSION
OF CATALOG ENTRIES TO NEW FORMAT

```
PROGRAM                                                                 1

   (waltl) PROCEDURE; % Control Procedure % :C > ↑P1 :                  1a

      +<fixblanks>                                                      1a1

         % Replace tabs and cr-s with blanks %                          1a1a

      +<offblanks>                                                      1a2

         % Delete excess blanks %                                       1a2a

      :C SE(P1) < /'*/ ↑P2 : IF NOT flag                                1a3

         THEN                                                           1a3a

            RETURN                                                      1a3a1

         ELSE                                                           1a3b

            :C " dlo " ↑P9 > : IF flag                                  1a3b1

               THEN                                                     1a3b1a

                  :C ST P1 ← SF(P1) P9, " Waltl *" :                    1a3b1a1

                     % Tag entry as having been processed by
                     "waltl" %                                          1a3b1a1a

               ELSE                                                     1a3b1b

                  :C > ;                                                1a3b1b1

                  ST P1 ← SF(P1) SE(P1), " Waltl *FORMAT* *" :          1a3b1b2

                  RETURN ENDF ENDF                                      1a3b1b3

      +<gettitle> % Check general format, and fix title % IF NOT
      flag                                                              1a4

         THEN                                                           1a4a

            :C ST P1 ← SF(P1) SE(P1), "TITLE* *" :                      1a4a1

            flag ← 1;                                                   1a4a2

            RETURN ENDF                                                 1a4a3
```

```
+<getauthors>                                                    1a5
   % Fix author fields %                                         1a5a
flag ← 1;                                                        1a6
RETURN END. %%                                                   1a7
```

```
(fixblanks) PROCEDURE; % Replace tabs and cr-s with blanks %          1b
   :C SF(P1) /TAB/CR/ ↑P2 ↑P1 ←P1 ←P1: IF flag                       1b1
      THEN                                                           1b1a
         :C ST P1 ← SF(P1) P1, " ", P2 SE(P2) :                      1b1a1
         GOTO fixblanks ENDF                                         1b1a2
   RETURN END. %%                                                    1b2
```

ANALYSER-FORMATTER PROGRAMS FOR INITIAL CONVERSION
OF CATALOG ENTRIES TO NEW FORMAT

```
(offblanks) PROCEDURE; % Delete excess blanks %                          1c
   :C SF(P1) /SP SP/ ↑P1 ←P1 ←P1 ←P1 : IF NOT flag                       1c1
      THEN                                                               1c1a
         flag ← 1 ;                                                      1c1a1
         RETURN                                                          1c1a2
      ELSE                                                               1c1b
         :C /PT/ ↑P2 ←P2 : IF flag                                       1c1b1
            THEN                                                         1c1b1a
               :C ST P1 ← SF(P1) P1, " ", P2 SE(P2) :                    1c1b1a1
               GOTO offblanks                                            1c1b1a2
            ELSE                                                         1c1b1b
               :C SE(P1) < /PT/ ↑P2 ←P2 > : IF flag                      1c1b1b1
                  THEN :C ST P1 ← SF(P1) P2:                             1c1b1b1a
                  ELSE :C ST P1 ← "" : flag ← 1 ENDF ENDF ENDF           1c1b1b1b
                                                                         1c1b1c
RETURN END. %%                                                           1c2
```

ANALYSER-FORMATTER PROGRAMS FOR INITIAL CONVERSION
OF CATALOG ENTRIES TO NEW FORMAT

```
(gettitle) PROCEDURE; % Check general format, and delimit
title %                                                          1d

   :C SF(P1) [']([ $D ') [']"] [PT] ↑P2 ←P2 ( [ ','" / '"', /
   ',' '" / '" ] / [',] ) [PT] ↑P4 ←P4 < [ '"', / ','" / '"'
   ', / '" / ', ] [PT] ↑P3 ←P3 P2 [']"] [PT] ↑P1 ←P1 :          1d1

   IF NOT flag                                                   1d2

      THEN                                                       1d2a

         RETURN                                                  1d2a1

      ELSE                                                       1d2b

         :C P1 '? [PT] ↑P1 ←P1 : IF flag                         1d2b1

            THEN                                                 1d2b1a

               :C P1 ', ↑P1 :                                    1d2b1a1

               :C SE(P1) [" 3z* "] > [" *z3"] ↑P9 :              1d2b1a2

               :C ST P1 ← SF(P1) P1, " *c1 ", P2 P3, " *@ ",
               P4 P9, "?TITLE?", P9 SE(P9) :                     1d2b1a3

            ELSE                                                 1d2b1b

               :C P1 ', ↑P1 ; > :                                1d2b1b1

               :C ST P1 ← SF(P1) P1, " *c1 ", P2 P3, " *@ ",
               P4 SE(P4) : ENDF ENDF                             1d2b1b2

   flag ← 1;                                                     1d3

   RETURN END. %%                                                1d4
```

```
(getauthors) PROCEDURE; % Delimit autnors in author field %          1e
   +<cleanalist>                                                     1e1
   :C SF(P1) /')/ ↑P1 ←P1 /PT/ ↑P2 ←P2 :                             1e2
   :C ST P1 ← SF(P1) P1, " *a1 ", P2 SE(P2) :                        1e3
   +<delauthor> IF NOT flag                                          1e4
      THEN RETURN                                                    1e4a
      ELSE :C ST P1 ← SF(P1) P1, " *a2 ", P2 SE(P2) :                1e4b
      +<delauthor> IF NOT flag                                       1e4c
         THEN RETURN                                                 1e4c1
         ELSE :C ST P1 ← SF(P1) P1, " *a3 ", P2 SE(P2) :             1e4c2
         +<delauthor> IF NOT flag                                    1e4c3
            THEN RETURN                                              1e4c3a
            ELSE :C ST P1 ← SF(P1) P1, " *a4 ", P2 SE(P2) :          1e4c3b
            +<delauthor> IF NOT flag                                 1e4c3c
               THEN RETURN                                           1e4c3c1
               ELSE :C ST P1 ← SF(P1) P1, " *a5 ", P2 SE(P2) :
                                                                     1e4c3c2
                  ENDF ENDF ENDF ENDF                                1e4c3c2a
RETURN END. %%                                                       1e5
```

```
(cleanalist) PROCEDURE; % Fix up list of authors %                    1f
   :C SF(P1) /')/ ↑P1 /"*c1"/ ↑P2 ←P2 ←P2 ←P2 ←P2 :                   1f1
   :C BETWEEN P1 P2 ( /", and "/ ↑P4 < /',/ ↑P3 > ) : IF flag         1f2
      THEN                                                           1f2a
         NULL                                                        1f2a1
      ELSE                                                           1f2b
         :C BETWEEN P1 P2 ( /" and "/ ↑P4 < /" dna "/ ↑P3 > )
         : IF NOT flag                                               1f2b1
            THEN                                                     1f2b1a
               flag ← 1; RETURN ENDF ENDF                            1f2b1a1
   :C ST P1 ← SF(P1) P3, ", ", P4 SE(P4) :                           1f3
   +<cleanalist>                                                     1f4
   RETURN END. %%                                                    1f5
```

```
(delauthor) PROCEDURE;  % Set up pointers to delimit one
author %                                                          lg

   :C SF(P1) ['',] [PT] ↑P2 ←P2 < ['',] [PT] ↑P1 ←P1 > ["*c1"] :  lg1

   RETURN END.                                                    lg2

FINISH %%                                                         lh
```

ANALYSER-FORMATTER PROGRAMS FOR INITIAL CONVERSION
OF CATALOG ENTRIES TO NEW FORMAT

```
PROGRAM                                                                    2
   (walt2) PROCEDURE; % Control Procedure % :C > ↑P1 :                     2a
      % Tag entry as having been processed by "Walt2" %                    2a1
         :C SE(P1) < ['*] ↑P3 : IF NOT flag                               2a1a
            THEN                                                          2a1a1
               flag ← 1;                                                  2a1a1a
               RETURN                                                     2a1a1b
            ELSE                                                          2a1a2
               :C " ltlaW " ↑P2 : IF flag                                 2a1a2a
                  THEN                                                    2a1a2a1
                     :C > ; ST P1 ← SF(P1) P2, " Walt2 *" :               2a1a2a1a
                  ELSE                                                    2a1a2a2
                     flag ← 1;                                            2a1a2a2a
                     RETURN ENDF ENDF                                     2a1a2a2b
      % Delimit date of publication %                                     2a2
         :C < SE(P1) ["2z* "] ↑P8 [".)"] ↑P6 ↑P7 ←P7 ←P7 ←P7
         [-'*] ['(] ↑P5 ←P5 ←P5 [PT] ↑P4 ←P4 : IF NOT flag               2a2a
            THEN                                                          2a2a1
               :C SE(P1) ['*] ↑P3 > ; '* ;                              2a2a1a
               ST P1 ← SF(P1) P3, "*DATE* *" :                          2a2a1b
               flag ← 1;                                                2a2a1c
               RETURN                                                   2a2a1d
            ELSE                                                          2a2a2
               :C P4 ', ↑P4 :                                           2a2a2a
```

```
            :C > BETWEEN P7 P8 (/PT/) : IF flag                    2a2a2b

               THEN                                                2a2a2b1

                  :C ST P1 ← SF(P1) P4, " *d1 ", P5 P6, " *?",
                  P7 SE(P8) :                                      2a2a2b1a

               ELSE                                                2a2a2b2

                  :C ST P1 ← SF(P1) P4, " *d1 ", P5 P6, P7
                  SE(P8) :                                         2a2a2b2a

                  flag ← 1; ENDF ENDF                              2a2a2b2b

% Delimit journal name, volume, number, and pages, if any.
If all are found, add f1 and f2 fields. %                          2a3

   +<v> IF NOT flag                                                2a3a

      THEN                                                         2a3a1

         +<try>                                                    2a3a1a

      ELSE                                                         2a3a2

         +<n>                                                      2a3a2a

         +<p> ENDF                                                 2a3a2b

flag ← 1;                                                          2a4

RETURN END. %%                                                     2a5
```

```
(v) PROCEDURE;  % Delimit journal name and volume. %                    2b

   +<d1> IF NOT flag THEN RETURN ENDF                                   2b1

   :C [ SP ( 'V / 'v / "/v" / "/V" ) 'o ( "1." / "1s." / "1s"
   / '1 )                                                               2b2

      ↑P4 ←P4 ( ( SP PT ) / D ) ] ↑P5 ←P5 +<d2> :                       2b2a

      IF NOT flag THEN RETURN ENDF                                      2b2b

   :C < P4 [SP] ↑P4 ', ↑P4 ; > : +<fix>                                 2b3

   :C ST P1 ← SF(P1) P1, "*c2 ", P3 P4, " #2 Vol. ", P5 P6, P1
   P2, P7 SE(P7) :                                                      2b4

   flag ← 1;                                                            2b5

   RETURN END.                                                          2b6

(n) PROCEDURE;  % Delimit journal number. %                             2c

   +<d1> IF NOT flag THEN RETURN ENDF                                   2c1

   :C ( 'N / 'n / "/n" / "/N" ) ( "o." / "os." / "os" / 'o ) (
   ( SP PT ) / D ) ↑P3 ←P3 +<d2> :                                      2c2

   IF NOT flag THEN RETURN ENDF +<fix>                                  2c3

   :C ST P1 ← SF(P1) P1, "#3 No. ", P3 P6, P1 P2, P7 SE(P7) :           2c4

   RETURN END.                                                          2c5

(p) PROCEDURE;  % Delimit journal pages. %                              2d

   +<d1> IF NOT flag THEN RETURN ENDF                                   2d1

   +<dp> IF NOT flag THEN RETURN ENDF                                   2d2

   +<d2> IF NOT flag THEN RETURN ENDF                                   2d3

   +<fix> :C ST P1 ← SF(P1) P1, "#6 ", P3 P6, P1 P2, P7 SE(P7)
   :                                                                    2d4

   +<add>                                                               2d5

   RETURN END. %%                                                       2d6
```

```
(try) PROCEDURE;  % Check for jname and maybe pages only. %          2e
   +<d1> IF NOT flag THEN RETURN ENDF                               2e1
   +<d2> IF NOT flag THEN RETURN ENDF                               2e2
   :C P9 '* : IF flag                                               2e3
      THEN                                                          2e3a
         :C ST P1 ← SF(P1) P1, "*c2 ", P3 P6, " ",  P9 SE(P9)
         :                                                          2e3a1
      ELSE                                                          2e3b
         :C P7 +<dp> : IF NOT flag THEN RETURN ENDF                 2e3b1
         :C [*/',] < CH ↑P9 '* [PT] ↑P8 ←P8 > :                    2e3b2
         IF NOT flag THEN RETURN ENDF                               2e3b3
         :C ST P1 ← SF(P1) P1, "*c2 ", P3 P6, " #6 ", P7 P8, "
         ", P9 SE(P9) : ENDF                                        2e3b4
   +<add>                                                           2e4
   RETURN END. %%                                                   2e5
```

ANALYSER-FORMATTER PROGRAMS FOR INITIAL CONVERSION
OF CATALOG ENTRIES TO NEW FORMAT

```
(d1) PROCEDURE;  % Delimit some stuff. %                                  2f

   :C SF(P1) [" *@ "] ↑P3 ↑P2 ←P2 < [" @*"] ↑P1 > P3 :                   2f1

   RETURN END.                                                            2f2

(d2) PROCEDURE;  % Delimit some stuff. %                                  2g

   :C [',/'*] ↑P9 ←P9 [PT] ↑P7 ←P7 < CH [',/'*] [PT] ↑P6 ←P6 >
   :                                                                      2g1

   RETURN END.                                                            2g2

(add) PROCEDURE;  % If all fields converted, add f1, f2
fields. %                                                                 2h

   :C ["*d1"] ['*] ↑P1 ←P1 ←P1 ↑P2 :                                      2h1

   :C ST P1 ← SF(P1) P1, "*f1 a *f2 o *", P2 SE(P2) :                     2h2

   RETURN END.                                                            2h3

(dp) PROCEDURE;  % Delimit some stuff. %                                  2i

   :C ( 'p / 'P / "/p" / "/P" ) ( "p. " / "p " / ". " / SP ) :            2i1

   RETURN END.                                                            2i2

(fix) PROCEDURE;  % Select string " *@ " or " *". %                      2j

   :C P9 '* : IF flag THEN :C ←P2 ←P2 : ENDF                              2j1

   RETURN END.                                                            2j2

FINISH  %  %                                                              2k
```

ANALYSER-FORMATTER PROGRAMS FOR INITIAL CONVERSION
OF CATALOG ENTRIES TO NEW FORMAT

```
PROGRAM %%% NOT COMPLETED %%%                                          3
   (walt3) PROCEDURE; % Control Procedure % :C > ↑P1 :                 3a
      % Tag entry as having been processed by "Walt2" %                 3a1
         :C SE(P1) < ['*] ↑P3 " 2tlaW " ↑P2 : IF flag                  3a1a
            THEN                                                       3a1a1
               :C > ; ST P1 ← SF(P1) P2, " Walt2 *" :                  3a1a1a
            ELSE                                                       3a1a2
               :C > ; ST P1 ← SF(P1) P3, "Walt2 *FORMAT* *" :          3a1a2a
               RETURN ENDF                                             3a1a2b
      % Break up *@ field at each comma. %                             3a2
         +<break>                                                      3a2a
      flag ← 1;                                                        3a3
      RETURN END. %%                                                   3a4
```

```
(break) PROCEDURE;  % Break up *@ field at each comma. %                3b
   +<d1> IF NOT flag THEN RETURN ENDF                                   3b1
   +<d2>                                                                3b2
   RETURN END.                                                          3b3
(d1) PROCEDURE;  % Delimit some stuff. %                                3c
   :C SF(P1) [" *@ "] ↑P3 ↑P2 ←P2 < [" @*"] ↑P1 > P3 :                 3c1
   RETURN END.                                                          3c2
(d2) PROCEDURE;  % Delimit some stuff. %                                3d
   :C [',/'*] ↑P9 ←P9 [PT] ↑P7 ←P7 < CH [',/'*] [PT] ↑P6 ←P6 >
   :                                                                    3d1
   RETURN END.                                                          3d2
FINISH  % That's all there is.  There is no more. %                     3e
```

```
':5227', ||/23/70 ||35:20 JCN ; .DPR=|; :WALT|-3, ||/|8/70 ||20:|3 WLB ;

Distribute to NIC file: WLB DCE JBN JCN CXP

|   .   |   .   2   .   3   .   4   .   5   .   6   .   7
.HED="                                                  |8NOV70 WLB 5227
ANALYSER-FORMATTER PROGRAMS FOR INITIAL CONVERSION
 OF CATALOG ENTRIES TO NEW FORMAT";
.SNF=72; .MCH=65; .DLS=1; .PGN=0; .PST=1; .COD/21B/=11|B; .DIR=0;
.DPR=0;
```

20NOV70 JBN 5228

Answering Service for the NIC

1

Palo Alto Answering Service
445 Sherman Avenue
Palo Alto, California
Att: Ruth Stewart

November 20, 1970

2

Re: Answering Service for the ARPA Network Information Center (at Stanford Research Institute) 3

As discussed by phone, we would like the following procedures to be used for our service, which we understand is now available. 4

Incoming calls to 329-0740 and 329-0741 will be answered by the Palo Alto Answering Service after 3 rings, on a 24-hour basis. Calls to these numbers will come in from many different points in the country, frequently through an Enterprise or Zenith number arrangement. The first of these numbers automatically hunts to the second if busy. 5

PAAS will answer as "Network Information Center Answering Service" 6

Between 5 pm. and 8 am. PAAS will also say: "It is xx:xx o'clock here. Is it an emergency or may I take a message?" 7

If it is an emergency, our key numbers in order of preference are: 8

For Network Information Center Problems: 8a

Jeanne North	(home)	326-7716
Walter Bass	(home)	493-3177
Jim Norton	(home)	851-0589
Doug Engelbart	(home)	322-9087

8a1

For Network Technical Problems: 8b

ARC Computer Room at SRI		327-4990
ARC Console Room at SRI		327-4562
John Melvin	(home)	328-7745
Bill English	(home)	851-1732

8b1

Please relay after-hours messages to Jeanne North at SRI at 329-0742 as soon after 8 am. as possible; and assume that any taken during the day will be deliverable in a few minutes. We are trying to keep the phones at the Augmentation Research Center

completely covered by our people during the day.

Very truly yours,

Jeanne B. North

':5228', 11/23/70 1146:45 JCN ; .DPR=1; :PAANS, 11/20/70 1051:01 JCN ;
.DPR=0;

21Nov69 DGC 5229

Proposal for Research No. ESU-69-100
Extension to Contract No. F30602-68-C-0286 1

STUDY FOR THE DEVELOPMENT OF COMPUTER AUGMENTATION TECHNIQUES 2

PART ONE -- TECHNICAL PROPOSAL 3

I INTRODUCTION .CEN=1; .CEN=0; 4

A. General 4a

This proposal is for a two-year extension to Air Force (RADC) Contract No. F30602-68-C-0286. 4a1

This contract supports research within the Augmented Human Intellect Research Center (AHIRC) at Stanford Research Institute. 4a1a

A brief description of the Center and its developments is presented below; for a more extensive summary see Ref. 1 (Section VI). 4a1b

B. The Augmented Human Intellect Research Center 4b

The AHIRC is a community of researchers, supported by several different contracts, in which all the research activity is aimed at exploring the possibilities for augmenting the performance of intellectual work with the help of real-time computer aids and the actual experimental development of computer aids and augmentation systems. 4b1

Several different coordinated research activities have been developed, sponsored by different contracts, to pursue the various aspects of this augmentation research. Important aspects include the following: 4b2

(1) The Management System Research Activity, which has been supported by RADC under the current contract 4b2a

(2) The basic development, operation, and maintenance of a real-time computer-display facility, which has been supported by ARPA (through RADC) under this contract and is dedicated solely to the AHIRC's activities. 4b2b

All the researchers within the AHIRC do as much of their work as possible at display consoles (depending on console availability and whether a specific task can appropriately be done at a console). Thus they serve not only as researchers but as the subjects for the analysis and evaluation of the augmentation systems that they are developing. 4b3

Consequently, an important aspect of the augmentation work done within the the AHIRC (for instance, of the RADC-supported Management-Systems Research) is that the techniques being explored are implemented, studied, and evaluated with the advantage of intensive everyday usage within a coordinated working environment that is compatible with the particular techniques being studied. 4b4

C. Organization of this Proposal 4c

This proposal is divided into two parts, each of which is broken down into several sections. 4c1

Part One is the Technical Proposal, covering the proposed work and its background and context. 4c1a

Section II of Part One is a brief, formal summary of the proposed work. 4c1a1

Section III discusses the current orientation and direction of the AHIRC, in relation to the proposed work and to other work being considered for performance under other sponsorship. 4c1a2

Section IV is a presentation of background information relevant to the proposed work, covering the present status of work which will be continued under the proposed contract and including some information on current planning status of certain future activities. 4c1a3

Section V is the detailed discussion of the proposed work, and Section VI is the reference section. 4c1a4

Part Two is concerned with proposed contractual provisions, with sections covering such topics as contract period, reporting schedules, etc. A detailed cost estimate for the proposed work is attached.

4c1b

II SUMMARY OF PROPOSED WORK .CEN=1;
.CEN=0; 5

A. Computer Facility 5a

This contract will support the lease, maintenance and operation of the basic computer facility, including the display system, disc file, and other special hardware devices. 5a1

In addition, it is planned that the following specific improvements will be made in the facility: 5a2

(1) Replacement of the current XDS drums with faster Univac FH-432 drums, to improve service capacity 5a2a

(2) An extended external core system to provide improved response to display terminals 5a2b

(3) A disc system, such as the IBM 2314, to increase the file storage capacity 5a2c

(4) A conference facility, with projection display, for experiments in team collaboration 5a2d

(5) A video and control switching facility to allow switching of display terminals to active computer ports. 5a2e

B. ARPA Network Participation 5b

Participation in the Network experiment will continue, with the following primary goals: 5b1

(1) Development of basic facility hardware and software to support Network Information Center (NIC) services 5b1a

(2) Development of techniques to permit the use of our on-line system (NLS) from display terminals in the Network. 5b1b

C. Network Information Center (NIC) 5c

Operational administration of the Network Information Center services will be continued. 5c1

The following services will be expanded and improved: 5c2

(1) Typewriter-Oriented Documentation Aid System (TODAS), allowing flexible access to the NIC from typewriter terminals throughout the Network 5c2a

(2) Graphics-Oriented Document Output System, producing hard copy in microform and paper for distribution to NIC users 5c2b

(3) Collection techniques for soliciting and integrating documents into the NIC collection 5c2c

(4) File management techniques, including indexing and retrieval, to accommodate the expanding collection. 5c2d

New services such as messages, news, complaints, etc., will be added as the needs emerge. 5c3

D. Team Augmentation Research 5d

In augmentation system development and research we will concentrate on those aspects that support design teams. This will involve the following: 5d1

(1) Development of a user- and service-system design discipline to guide the evolution and evaluation of team augmentation systems 5d1a

(2) Study and development of management techniques necessary to effectively coordinate augmented design teams 5d1b

(3) Development of special user subsystems to support team collaboration.

5d1c

III DIRECTIONS FOR THE AUGMENTED HUMAN INTELLECT RESEARCH CENTER .CEN=1;
.CEN=0; 6

A. General 6a

Future directions for work in the AHIRC will be influenced by forces originating both inside and outside the Center. 6a1

Forces generated by our cumulative experience in the development of augmentation systems within the Center indicate some new directions for our own bootstrapped research effort. 6a1a

External forces are generated by our participation in the ARPA Network experiment and by an increased awareness for the need to communicate with the "outside world" -- people outside the Center who are engaged in related work. 6a1b

The internal forces and those generated by our Network participation combine to produce a shift in our internal research emphasis towards two specific activities: (1) team augmentation and (2) the development of a system design discipline. These are discussed below under "Shifts in Emphasis." 6a2

Increased awareness of the need to communicate and interact with the outside world will lead toward the development of a new area of specific concern, discussed below under "Transfer of Results." 6a3

The goals associated with research in team augmentation, with the development of a system design discipline, and with the transfer of results are related to one another within the AHIRC goal structure as described below in the section entitled "Short-Term and Long-Term Goals." 6a4

The proposed work will contribute only incidentally to the transfer of results. In the section "Selected Plans Under Other Sponsorship," we discuss the System Developer Interface Activity (SYDIA), for which we are seeking additional sponsorship. It is intended that this activity will be the primary effort in the area of the transfer of results. 6a5

B. Shifts in Emphasis 6b

This proposal reflects a maturing shift in emphasis in our research work. We propose to shift our emphasis toward two

basic activities: (1) team augmentation and (2) the development of a system design discipline. 6b1

1. Team Augmentation 6b2

Whereas in the past we have given almost exclusive attention to augmenting the individual worker, we are now considering also the augmentation of a team of collaborating workers, each of whom is individually augmented. 6b2a

The high mobility and manipulative capability of a skilled "augmented individual" has a unique potential which can be realized when a number of augmented individuals join into a collaborative team. Not only can each individual move very rapidly through the joint working files to study them, enter new information, and update old material, but this power can be amplified by special computer aids, conventions, and skills that directly facilitate the processes of intercommunication and coordination. 6b2b

The contemplated efforts in "team augmentation" involve several facets: 6b2b1

(1) The development of conventions and procedures for organizing the working records of our plans, designs, objectives, design principles, schedules, etc., so as to give effective mutual "task orientation" to the members of a team by ensuring optimal accessibility of all information related to the team's objective 6b2b1a

(2) The special development of a "Dialogue Support System" to facilitate the rapid evolution of these working records via dialogue among members of the design team 6b2b1b

(3) The development of techniques to facilitate simultaneous remote collaboration among people at physically remote on-line terminals (of any sort), by giving them direct communication with one another, independent of their current individual work interactions with the computer. This includes provision, where feasible, for the following: 6b2b1c

(a) Video and/or voice intercommunication 6b2b1c1

(b) Easy and flexible control of means for duplicating, at any terminal, all or part of the type-out or display from another terminal 6b2b1c2

(c) Ready transfer of control of one terminal's computer interaction to another terminal's input devices. 6b2b1c3

These techniques will evolve within AHIRC under conditions of application to our own coordinated system-development work, and will be applied over a wide range of collaborative actions, from simple question-answering facilities to complex design work involving intense mutual participation by the team members. Much of our team-augmentation research will be done as part of our continuing Management System Research activity (see Section V below). 6b2b2

As applicable techniques become effective within AHIRC, we will explore their use and value for the following: 6b2b3

(1) Support of Network Information Center (NIC) services such as teaching, question-answering, and some types of query servicing 6b2b3a

(2) Working collaboration between AHIRC staff and personnel at other Network sites 6b2b3b

(3) Working collaboration between people at remote Network sites, independent of AHIRC staff. 6b2b3c

2. Development of User- and Service-System Design Discipline 6b3

The functional features of the "user system" -- the large collection of computer aids available to an AHIRC worker -- have evolved with some ingenuity, a great deal of cut-and-try experimentation under actual-usage conditions, and a certain special orientation offered by our overall research framework. However, up to now there has been a significant lack of objective, methodical engineering design for the overall user system. 6b3a

A user-system design discipline is definitely needed, and we intend to devote an increasing amount of effort toward developing such a discipline. 6b3a1

Like the user system, the "service system" -- the hardware and software underlying the features for augmenting users -- has evolved in an ad hoc fashion. 6b3b

Here there is also a significant need for a system-design discipline. 6b3b1

A system-design discipline would have a communicable, teachable, generally applicable framework supporting a coordinated set of concepts, terminologies, principles, methods, and special tools. 6b3c

C. Transfer of Results 6c

Behind these basic aspects of our work in the AHIRC (team augmentation and design disciplines) lies an essential feature of our long-term strategy, namely the goal of producing results that will be of direct value to other groups of system developers -- in particular, to those who will be developing augmentation systems. 6c1

This is in contrast to being of direct value to customers who will want systems for their own direct use (e.g. to augment a manager, a designer, an editor, or a researcher). 6c1a

Display terminals, communication channels, and computer service are destined to become both cheap and plentiful, and it is certain that a very large number of organizations will want to use them. They must rely upon system developers who will need to be capable of the following: 6c2

(1) Analysis of system-usage environments 6c2a

(2) Design and implementation of a smooth, powerful, and coordinated system of user aids, conventions, methods, etc. 6c2b

(3) Training and "education" of new users, many of whom will be completely unfamiliar with the potential of this new technology 6c2c

(4) Subsequent monitoring of user performance so as to

implement the changes necessary to track the evolution of users' attitudes, concepts, skills, usage habits, and wants. 6c2d

Although it is important to stimulate the eventual customers for augmentation systems, and to make them aware of the potential for these systems in their work, we feel that our results should be directed primarily toward helping system developers. Over the longer term, we plan to do this by pursuing the following goals: 6c3

Item 1: Making visible an advanced, integrated system, operating in a heavy-usage environment, that can orient system developers to the available cost-value tradeoffs 6c3a

Item 2: Developing an effective system-design discipline to aid in developing augmentation systems, whether or not these systems resemble ours 6c3b

Item 3: Maintaining thorough, highly current, comprehensive documentation, designed for quick location of relevant material 6c3c

Item 4: Establishing broad-band communication channels over which a dynamic interchange of information can take place, so that a maximum proportion of our knowledge can be quickly available in useful form 6c3d

Item 5: Offering, as a model, a complete prototype design of an augmentation system especially designed for augmenting system development. 6c3e

This system would be compatible with the system-design disciplines described above, and would include techniques for planning, analyzing, designing, programming, debugging, documenting, and teaching. 6c3e1

D. Short-Term and Long-Term Goals 6d

Our plans for executing the proposed work are as follows: 6d1

(1) Achieve the short-term goals implicit in the team augmentation activity, in the development of a system design discipline, and in the tasks itemized under Transfer of Results (Section III-C above) 6d1a

(2) Contribute to the long-term goal of directing our results for maximum benefit to future developers of augmentation systems. 6d1b

There is considerable overlap between short-term and long-term goals. 6d2

For instance, in the case of the transfer of results, the basic bootstrapping development of techniques within the AHIRC seems to guarantee a very good basic buildup toward Items 1, 2, 3, and 5 of Section III-C; our participation in the Network experiment contributes directly to Item 4; and the development of the NIC service will contribute toward Items 1 and 4. 6d2a

E. Selected Plans Under Other Sponsorship 6e

To pursue directly the itemized long-range goals of Section III-C, we currently have other plans under consideration, coordinated with those outlined in this proposal. These plans would be carried out under other sponsorship: 6e1

We are formulating plans for what we tentatively call the System Developer Interface Activity (SYDIA). We expect early in 1970 to be approaching representative candidates with proposals for multiple sponsorship. The initial purpose of the SYDIA will be to develop the following: 6e1a

(1) A facility for an effective interchange of information, skills, orientation, etc. between AHIRC and the existing and potential community of augmentation-system developers 6e1a1

(2) The ability to assist other groups to transfer our system, or parts of it, directly into another hardware environment. 6e1a2

Later, with specific individual funding arrangements, we would expect to begin developing close interchange relationships with various system-development groups; hopefully, some groups would then adopt our augmented techniques for system-development work.

6e1b

IV RELEVANT BACKGROUND .CEN=1;
.CEN=0; 7

A. Facility Support 7a

1. Hardware 7a1

The computer facility currently consists of the following: 7a1a

(1) A leased XDS 940 with 65K memory, 4.5 megabyte swapping drums, 96 megabyte disc file, 3 tape transports, and 16 Teletype lines 7a1a1

(2) A display system (government-furnished equipment) providing for 12 display consoles, each with keyboard, keyset (five microswitches), and pointing device ("mouse") 7a1a2

(3) A leased line printer, 340 lines per minute with 96 ASCII characters. 7a1a3

The leased disc file, display system, and line printer operate through a special multiplexer, built here, that provides direct memory access for up to 6 devices. 7a1a4

We have just completed an interface to the Interface Message Processor (IMP) for Network communications. This currently operates with direct access to 940 memory through the multiplexer. 7a1b

We are in the process of adding to this an external core system that will relieve some of the congestion in the 940 core. 7a1c

External core will be used initially for display buffers, printer buffers, and communication buffers for the ARPA Network. Further plans are for an interactive external core system with small processors operating from the external core to handle some of the high-frequency functions for display users. This system is described in more detail in Section V of this proposal. 7a1c1

We are also looking into different types of typewriter terminals, and will soon add 8 more Teletype channels with provision for faster operation (up to 30 characters per second) on some channels. 7a1d

2. Software 7a2

Basic support software consists of the following: 7a2a

a. Time-Sharing System (TSS) 7a2b

This is a modified version of TSS 1.96 developed by Project GENIE at Berkeley. 7a2b1

b. Tree Meta Compiler-Compiler 7a2c

Tree Meta, developed by AHIRC and patterned after basic work at SDC, produces compilers with direct binary output. Its principal application is in the production of compilers for the MOL and the SPLs (see below). 7a2c1

c. Machine-Oriented Language (MOL) 7a2d

The MOL is a high-level ALGOL-like language with special features oriented to the characteristics of the XDS 940. It is used for basic system programming. 7a2d1

d. Special-Purpose Languages (SPLs) 7a2e

The SPLs are used for content analysis, string manipulation, and input feedback specification in NLS. 7a2e1

e. On-Line System (NLS) 7a2f

The On-Line System is the basic AHIRC system of interactive computer aids for manipulation of text and graphics. 7a2f1

f. Typewriter-Oriented Documentation Output System (TODAS) 7a2g

TODAS is a typewriter-oriented counterpart of NLS. 7a2g1

B. Management Systems Research 7b

The Management Systems Research Activity is best thought of within the framework of the following three categories: (1) Manager Augmentation, (2) Organization Augmentation, and (3) Management Research. 7b1

"Manager Augmentation" involves the augmentation of

managers, as distinct from the enhancement of the organizations they manage. Work under way in the present contract includes the design, development, and use of special on-line aids for management functions. Specific examples of these developments include the following: 7b1a

(1) A new on-line graphics package is being implemented, with special features for the portrayal of management data. 7b1a1

(2) A special on-line calculator has been developed. 7b1a2

(3) A "portal processor" (previously called the "NLS processor") is being developed to perform powerful analytical operations and to return text and graphic information as NLS file data. 7b1a3

"Organization Augmentation" refers to specific enhancement of an organization as a whole, as distinct from augmentation of managers of the organization. Much of this work is in the realm of improved communications between individuals and groups in the organization. Examples of the work under way in this area include the following: 7b1b

(1) Development of methods for maintaining on-line working versions of our own files, containing plans, specifications, estimates, status reports, etc., and the development of techniques to aid individual members of the organization in cooperating on the continued study and modification of these files. 7b1b1

(2) The first-stage implementation of the Journal and the Dialogue Support System, which will be basic systems to support the ongoing deliberations of a team of planners and designers. 7b1b2

"Management Research" is concerned with the development of methodology for building management-augmentation systems. Actual work under way as a part of the current contract focuses on the study of our own organization, which is composed almost entirely of on-line workers. 7b1c

A most important feature of our Management Systems Research Activity is the use of our own organization to test our developments in augmentation of managers and

organizations, and as the focus of our attention in the development of Management Systems methodology. This is in keeping with our overall bootstrapping strategy. 7b1d

C. ARPA Network Participation 7c

The ARPA Computer Network will be operating in its preliminary phases by the beginning of this contract, with the AHIRC as one of the first four nodes. 7c1

In the past year we have participated with other Network members in the development of basic communication procedures and in the design of a general approach to the problem of operating display terminals and complex subsystems over the Network. 7c1a

At this time our hardware and preliminary software interfaces are in operation and we have been conducting three-node tests with UCSB and UCLA. 7c1b

D. Network Information Center (NIC) 7d

The AHIRC has agreed to operate a Network Information Center (NIC) for the ARPA Computer Network. During the current contract period we have developed an overall plan for the NIC and have been developing the following basic services as components of the planned "NIC System." 7d1

1. Master Collection Acquisition and Processing System 7d2

This service will acquire relevant information and documents, possibly transcribe some of them into computer-held form, and catalog and index these documents. 7d2a

2. File Structure and Catalog System 7d3

This system will provide the means for using index and catalog files to locate and retrieve document files in the master collection, and will provide for archival storage of the computer-held NIC files (including index and catalog files). 7d3a

3. Typewriter-Oriented Documentation-Aid System (TODAS) 7d4

This system will enable a remote typewriter-terminal

user (operating on line at his host site, coupled through the Network to our computer) to do the following: 7d4a

Access NIC files, do retrieval operations through indices and the NIC catalog, obtain flexibly abbreviated printouts of summary or document files, or have complete printouts routed through either his typewriter terminal, a local printer, or the GODOS system (see below). 7d4a1

Compose document files for entry into computer storage in the NIC, or modify and update computer-held NIC document files that he is responsible for. 7d4a2

4. Graphics-Oriented Document-Output System (GODOS) 7d5

GODOS will provide for rapid automatic output of computer-held document files onto either paper or microfilm (yielding either microfiche or roll-microfilm copies). 7d5a

Such files currently can contain a fairly flexible mixture of text and line drawings or character-plotted drawings. Currently, GODOS uses a Stromberg-Carlson SC4060 CRT-to-film output system; it automatically produces a succession of film frames, organized by page, with drawings embedded appropriately in the associated text.

V PROPOSED PROJECT ACTIVITY .CEN=1;
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A. Computer Facility Support and Development 8a

This contract will support the computer facility as shown in the estimated cost breakdown attached to Part Two of this proposal and will provide for anticipated improvements in the hardware facility. 8a1

The following specific improvements are planned, but because of the experimental nature of the facility, this list may not be complete and changes or additions may be expected. 8a2

1. Expansion of Service Capacity 8a3

We have been studying ways to increase the capacity of our system to accommodate the anticipated load of the Network experiments and NIC service without excessive loss of service to local users. 8a3a

The present facility, with the improvements currently in progress, is expected to provide good local service for 12 displays and about 20 Teletype users. Beyond this we are planning for 20 Teletype users over the Network within the next year, and by the end of the year 2 or 3 experimental display (NLS) users over the Network. 8a3a1

a. Considerations for Replacement of Computer 8a3b

We have considered the possibility of replacing the XDS 940 facility with a more powerful computer, but have decided not to base our planning on a new machine at this time. We have investigated the anticipated Berkeley Computer Corporation machine, the Standard Computer Corporation SC-9000, and the PDP-10. The first two of these were candidates because of code compatibility, and the PDP-10 was considered because of ARPA's extensive support of work on this machine. 8a3b1

The Berkeley machine promises to be very good, but delivery of a machine for us would be somewhat uncertain and it appears that the cost will be too high. 8a3b1a

We rejected the PDP-10 at this time because of the very large software effort to convert our

system to a new machine and the current lack of a really good time-sharing system. 8a3b1b

The SC-9000 is the most likely, but delivery would be in early 1971 at best -- and then uncertain since a true 940 emulation has never been developed. 8a3b1c

At some time within the next two years it may be appropriate for us to consider a new machine, but at this time we plan instead to extend the capability of the 940 by replacing the current swapping drums with faster devices and by continuing the development of an interactive external core system for display and Network users. 8a3b2

b. Fast Drums 8a3c

We find that the primary problem with system response is the swapping load. This could be significantly improved with faster drums (such as the one used on the Project GENIE machine). Our plans are now to replace the current RADs with Univac FH-432 drums. 8a3c1

These drums have a word (24-bit) transfer rate of about 360 kc/s as compared to about 140 kc/s for the current RADs. We would lease the drums and a controller from Univac, and build the interface to the 940 here. 8a3c1a

This interface would be similar to the current interface for the Bryant disc, but considerably simpler since much of the bookkeeping is taken care of by the Univac controller. 8a3c1a1

We are currently investigating these drums more thoroughly, including a simulation program to look into memory conflicts and expected system improvement. If all goes well we expect to install them in about 4 to 6 months. 8a3c2

The increase in cost will be about $2000 per month over the present facility. Details are shown in the cost estimate. 8a3c2a

c. Interactive External Core System 8a3d

[Sec. V
PROPOSED PROJECT ACTIVITY]

We are currently in the process of implementing an external core memory system to be used for display refreshing, line-printer buffers, and communication buffers for the ARPA Network. 8a3d1

We have been considering a means of further extending the capability of our system through the addition of small processors operating out of this external core. These processors would handle feedback to local display users and do preliminary processing for Teletype users on the Network. 8a3d2

For local displays the intent is to partition the on-line system (NLS) so that the highly interactive feedback to display users is handled by the small processors and the 940 itself is called only for changes in the data or major reformatting of the display image. 8a3d2a

Early studies have shown that with this system we can expect a two- or threefold improvement in the response to on-line users. 8a3d2a1

An important additional advantage would be that the partition of NLS between the 940 and the external processors is similar to what we anticipate for Network users, with remote host computers performing the same functions as our external processors. Much of the work here will overlap that required to develop NLS service for remote display users over the Network. 8a3d2a2

We plan to complete detailed plans and some preliminary experiments on the interactive external core system during the current contract period. The funds in this proposal are for the second phase of development, assuming that the experiments show this to be the right approach. 8a3d3

2. Additional File Storage 8a4

Expanding service to the NIC increases the demand for file storage capacity of the facility. The immediate plan for expansion is to expand the Bryant disc file to its full capacity of 192 megabytes. 8a4a

Although this will not be adequate capacity for very long, it is a quick and relatively inexpensive way to get an extra 96 megabytes, involving only a field modification to the hardware and straightforward software changes. 8a4a1

Beyond this, we anticipate considerable need for a very large reference-file store with relatively rapid access. 8a4b

This storage system will be for use in contexts where tape systems would be inappropriate because tape mounting and searching processes would lead to inefficient service queueing and response delays in otherwise fluid interactions. 8a4b1

As the best currently available answer, we are tentatively planning on the addition of a multiple disc drive, such as the XDS 7242 (similar to the IBM 2314). This would be relatively easy to add to the system and, with the interchangable disc packs and some operator procedures, should provide the needed storage for some time to come. 8a4c

3. Conference Facility 8a5

We would like to provide better facilities for a group of people working together at consoles and for small meetings where consoles are not available for everyone. 8a5a

To this end, we propose to assemble a meeting-room facility consisting of a projection TV, several appropriately designed consoles, and furniture designed so that three or four people may work at the consoles with ten or so "inactive" participants. 8a5b

Consoles, probably like our existing chair/console system, will be designed so that they can be positioned for reasonably independent operation yet turned to view a common blackboard-size projection display. The picture from any console will be readily switchable to the screen. 8a5b1

This facility should be extremely valuable for local meetings and design sessions, as well as for discussions with visitors and for demonstrations. 8a5b2

4. Console Switching Facility 8a6

[Sec. V
PROPOSED PROJECT ACTIVITY]

We expect the 940 system to be limited to 12 active display stations (along with Network service) for some time, but much more flexible and effective utilization of the system could be made if additional consoles were available, at different locations, with provisions for logging in. 8a6a

For example, a console available in the computer room and shop would facilitate the development of on-line aids to debugging and maintenance. 8a6a1

Certain individuals with high console usage would benefit greatly if they had consoles in their offices. 8a6a2

The conference facility described above could be developed expressly for collaboration with other consoles located more appropriately for individual use. 8a6a3

We propose to use several more consoles (including those in the conference facility) with video and control switching so that any console can be switched to any of the 12 active channels that might be available. 8a6b

The video switching facility will also be used to enhance the experiments with video coupling of work stations and for experimenting with new features such as microfiche viewing over work-station displays. 8a6b1

B. Representative User Subsystems 8b

1. Graphics Construction and Manipulation 8b1

The ability to compose and edit line drawings will be extended and coordinated better with the text-editing capabilities. 8b1a

In addition to vectors and labels, several predefined and parameterized entities such as ovals and rectangles will be offered. For editing purposes a rectangular area may be dynamically defined and treated as a unit. 8b1b

2. Calculator 8b2

An interactive calculator has been incorporated into NLS, allowing the user to perform simple arithmetic

operations on file material. The text of the file is used both as the source of operands and as the destination of results. 8b2a

Extensions will include a small operator-precedence compiler for the evaluation of arithmetic expressions. 8b2b

3. Portal Processors 8b3

To allow for the expansion of NLS to fit certain functional needs of its users, an interface to NLS called the "portal" is proposed. Through this interface, processors (programs) will have the entire power of NLS available as a file-processing system. 8b3a

This method of implementing the less significant or more specialized parts of the total system as processors operating via the portal allows the basic part of NLS to be a stable program, neither increasing in size nor slowing in response to a user's requests. Some of the capabilities to be added in this way are listed below. 8b3b

One processor will provide for more sophisticated hard-copy output. This processor will allow for improved formatting control, conversion of on-line file "links" into hard-copy references (i.e., references to page numbers in documents), integration of graphics and textual material, and creation of tables of contents and indices. 8b3b1

Processors are proposed for constructing graphs and curves from numerical data contained in NLS files and inserting the graphic results back into files. Other processors will generally extend the numerical calculating capabilities of NLS. 8b3b2

Through the content-analysis capabilities of NLS, processors will be used to define and manipulate sets involving segments of several different files. 8b3b3

Special processors will be used to modify the internal structure of files in accordance with changes in the programming of NLS. Other processors may be used to modify the visible structure or content of NLS files. 8b3b4

Processors will also be used in the addition of data

to specially formatted files, such as NIC catalogs or weekly cost tables. 8b3b5

4. Programming Support 8b4

We will explore techniques for using NLS as an aid to programming. Problems to be considered include debugging, language design, system reference files, and training of new programmers. 8b4a

The first effort to aid debugging will be the development of methods for the use of NLS in conjunction with DDT, the 940's loading/debugging subsystem. This will allow the programmer to use NLS with his source code and documentation while simultaneously using DDT with the compiled code. 8b4b

The use of a compiler-compiler called Tree Meta greatly reduces the effort required to implement changes in the programming languages. This aids the development of languages that contribute to lucid code while exploiting the power of NLS to compose, study, and modify source code. An example of this is a recent modification allowing file links to be used for procedure calls. Further changes are planned for the special-purpose languages. 8b4c

System reference files are being developed to aid the programmer in using the existing facilities in NLS. Future development will include a system for the automatic generation of an NLS file containing cross-reference information in the form of links and suitable for use with the content-analysis and keyword systems. 8b4d

The problem of training new programmers will be approached through the development of an on-line curriculum covering the structure of NLS, its design principles, and its programming conventions. In conjunction with this, better methods for developing and maintaining technical documentation will be explored. 8b4e

5. Reference-Collection Retrieval 8b5

We hope to improve our techniques for retrieving and saving references to on-line files and to off-line documents. 8b5a

At present we have a "keyword" system that retrieves a set of references ordered according to their relevance to a set of keywords chosen by the user. 8b5b

We plan to extend this facility to show the user a measure of the relevance of each retrieved reference and to allow him to collect references from several different files at once. 8b5b1

We also hope to improve our techniques for saving the retrieved references and for recording the retrieval process so that the same retrieval operations can be performed on other reference collections or on a constantly expanding collection. 8b5b2

6. Dialogue Support Systems 8b6

Systems will be developed to support three basic types of dialogue among members of system-design teams. 8b6a

a. Simultaneous Remote Collaboration 8b6b

Augmented simultaneous remote collaboration will enable a small group whose members may be physically remote from one another to collaborate on system design problems through intimate, interactive combination of their efforts over short periods of intensive work. 8b6b1

b. Conferencing 8b6c

Augmentation systems will be developed to support "conferencing." This is defined as a dialogue mode in which either of the following conditions is satisfied: 8b6c1

(1) Participants are gathered together physically in one place, similar to the setting for a conventional conference. 8b6c1a

(2) Participants are not necessarily gathered together physically, but each remote contributer devotes his attention to the same subject matter over the same time period. 8b6c1b

c. Distributed Dialogue 8b6d

"Distributed Dialogue" is a dialogue mode in which participants make various contributions to many subjects on a continuing basis, over an extended period of time, at an intensity somewhat less than that in the collaborative mode. 8b6d1

7. Collection of Data on NLS User Behavior 8b7

Insight gained from data on the behavior of NLS users is needed to aid in the design of hardware and software and in development of techniques for use of the system. Data on user behavior is needed to tell us more about such things as the following: 8b7a

(1) The effect of system characteristics, such as user-perceived system response time, on the actions of the user 8b7a1

(2) The ease with which particular tasks can be done on the system 8b7a2

(3) The patterns of interaction between the various users of the system. 8b7a3

Data on the behavior of users can come both from informal observation and from controlled experiments. We will use a variety of analytic and descriptive techniques in the interpretation of the data. 8b7b

C. Management Systems Research 8c

We propose to continue our research in the three areas of Manager Augmentation, Organization Augmentation, and Management Research. 8c1

In all cases we will use the basic bootstrap principle, developed in the current contract period, of designing and developing management-augmentation systems for use within the Center to enhance the Center's own effectiveness. The proposed areas for continued research are as follows: 8c2

1. Management Research 8c3

a. Study of an On-Line Organization 8c3a

An on-line organization is a new phenomenon. We propose to continue and intensify our study of its

basic nature and potential, and to study alternative structures for its management. The work under way in the present contract is an excellent start, but much remains to be done. 8c3a1

b. Augmented-Manager System Development 8c3b

We will develop our ability to design, develop, implement, and understand manager-augmentation systems. This is the system-development research necessary to support the augmentaton of an individual manager, as described in Section V-C-2 below. 8c3b1

c. Augmented-Organization System Development 8c3c

We will continue and intensify our effort to develop the ability to design and develop organization-augmentation systems. This is the system-development research necessary to support the augmentaton of an organization, as described in Section V-C-3 below. 8c3c1

2. Manager Augmentation 8c4

a. On-Line Aids for a Manager 8c4a

Design, development, implementation, and use of systems of interactive display-oriented man/computer management aids. A possible example would be an improved interactive dynamic graphics package tailored especially for management functions, with the following features: 8c4a1

(1) Display of charts, graphs (possibly showing dynamic phenomena), and tables 8c4a1a

(2) Incorporation of these into the overall structure of NLS, with all the powerful NLS commands available for operating on them. 8c4a1b

b. Analysis and Evaluation 8c4b

Development of on-line techniques for analyzing management data and the performance of a manager. 8c4b1

3. Organization Augmentation 8c5

[Sec. V
PROPOSED PROJECT ACTIVITY]

a. Design, Implementation, and Use of Basic Communication Systems 8c5a

A central factor in organization augmentation is the enhancement of communication between members and groups and the integration of this enhanced communication into the basic operation of the organization. This will be a major activity in the coming period, building on the work started in the Journal and the Dialogue Support System. 8c5a1

b. Data Collection, Experimental Design 8c5b

There is much to be understood about techniques for collecting data about the nature, performance, status, and needs of an organization. An on-line community offers an extraordinary opportunity for the development of data-collection techniques, especially if every member of the organization works on line for a reasonable part of his day. 8c5b1

In parallel with this is the need to develop a repertoire of designs for experiments in the management of an organization, using as much of the available computer technology as possible. 8c5b2

c. Analysis, Measurement, and Evaluation 8c5c

Further work will be performed to define and analyze the relationships among an on-line organization's goals, tasks, strategies, jobs, etc., and to build on-line aids to support these analyses. This work will be directed towards building methods for measuring and evaluating an organization's performance. 8c5c1

D. ARPA Network Participation 8d

Our participation in the ARPA Network experiment will increase over the next two years. Our major involvement, the Network Information Center, is described in detail below. In support of the NIC we will continue to develop the basic communications software necessary to permit access to our system from typewriter-like terminals over the Network. 8d1

Immediate plans are to allow up to six or so users to

log into our system over the Network and obtain access to the NIC services exactly as local users would. 8d1a

Beyond this we plan to develop systems (possibly in an extended external core system) that will allow many users (20 to 30) access to the NIC without the overhead of logging in to the time-sharing system. 8d1b

As our primary focus in further work on Network problems, we will aim at making our on-line system (NLS) available first for experimental operation from remote display terminals, and later as a high-grade means of access to NIC services. 8d2

This will involve continued participation in the development of a general-purpose language and interface that will allow the operation of complex subsystems from various kinds of display terminals throughout the Network. 8d2a

It is difficult to predict how the Network will develop, but we expect to participate fully in its experimental operation and in specific tests that may evolve. 8d3

E. Network Information Center (NIC) 8e

1. General 8e1

Planning for the NIC has purposely concentrated on the development of basic service capabilities adaptable to a variety of probable ways in which the needs for and usages of a NIC might evolve. 8e1a

The budgetary level assigned to NIC activities within the AHIRC, as proposed herein, is in accord with this approach and covers an expected continuation of developmental activity and a modest but growing amount of service activity. 8e1a1

As we evaluate the type and quantity of NIC services in the light of the evolving Network "experiment," emergent needs and possibilities will probably call for subsequent adjustments to the level, scope, and nature of NIC activity. 8e1a2

The AHIRC assumes that it has the following responsibilities with respect to the NIC: 8e1a2a

(1) To keep RADC and ARPA apprised of NIC needs and possibilities 8ela2al

(2) To make specific recommendations for appropriate changes in NIC activities 8ela2a2

(3) Possibly to readjust, to a reasonable extent, the internal allocation of the AHIRC funding under this contract in order to accomodate such changes. 8ela2a3

Beyond this, it is expected that further increases in scope or quantity of NIC services will come only from a negotiated increase in funding level. 8ela2b

2. Services 8e2

The various services comprised in the NIC system will need continuing attention; the following are examples: 8e2a

a. Collection 8e2b

The material that should be included within the NIC reference collection will naturally expand in both scope and quantity. 8e2b1

We will need to develop criteria for soliciting documents, and procedures for acquiring and integrating new material. 8e2b2

b. File-Management System 8e2c

Means must be developed to handle the large size of the collection (large both in total bit mass and in the number of separate items to be coordinated). 8e2c1

Improvements are likely to be needed in the indexing conventions and in the computer aids for search and retrieval. 8e2c2

Our general approach encourages the practice of having primary reference documents stored as computer-held files. 8e2c2a

AHIRC developments outside of NIC are producing techniques for doing string analysis and

manipulation processes over such a document file -- indeed, over specified collections of document files, such as all the files referenced by some particular file. 8e2c2b

Reasonable extensions of these techniques promise to provide contextual-analysis capabilities that would be quite powerful for automatic development of associated indexing files. 8e2c2c

Other practices and computer aids are developing within AHIRC to serve relatively basic intellectual activities of individuals and collaborative teams. These promise additional important possibilities for adaptation to NIC user service. 8e2c3

c. TODAS 8e2d

We plan to develop more efficient command repertoires, with smoother and more flexible usage procedures, including such features as the following: 8e2d1

(1) Expanded character set, equations, diagrams, footnotes, tables of contents, concordances (word-usage reference tables), etc. 8e2d1a

(2) Improved search and retrieval power 8e2d1b

(3) Different versions of commands for different categories of users. 8e2d1c

We plan to improve the TODAS instructional and reference documentation. 8e2d2

As use of the Network increases, we expect that our system will have to handle an increasing number of TODAS users. We hope that the interactive external core system, described in Section V-A-1-c, will accommodate 20 to 30 TODAS users. We would have to develop other techniques to further increase this number. 8e2d3

For example, the number could be increased by having "remote subsystem" interfacing programs, operating within a remote host computer. These programs would act as interfaces between our

computer and remote TODAS users, and would reduce the per-user burden on our system. 8e2d3a

d. GODOS 8e2e

We plan a continuing effort to extend the capability for handling such special constructs as drawings, equations, special symbols, footnotes, marginal notes, etc. 8e2e1

We plan to develop automatic techniques for converting the links used to cross-reference computer-held files from their current form (user-name, file-name, referenced location) to some form more useful to a hard-copy reader (such as document-name, page-number, paragraph-number). 8e2e2

There will be a general development of such auxilliary output-processing features as automatic generation of word-occurrence indices, tables of contents, lists of other NIC documents referencing a particular document, etc. 8e2e3

Special attention to the automatic production of microform (i.e., microfiche or roll film) editions of collections of computer-held NIC documents (as well as their associated indices, etc.) is planned, depending upon how the use and value of local microform collections develops among the remote-user clientele. 8e2e4

e. Development of New Services 8e2f

New services might include messages, complaints, news, personnel rosters, etc. 8e2f1

3. Operational Administration 8e3

Various new activities will evolve and old activities will receive increased attention. 8e3a

For example, an increasing burden of routine service functions will be associated with the expected growth in the size of the reference collection, in the size and interest range of the user clientele, and in the number of service transactions with this clientele. 8e3a1

[Sec. V
PROPOSED PROJECT ACTIVITY]

Procedures and methods for providing routine service must be established, and the necessary personnel assigned, trained, and supervised. 8e3a2

It is expected that the NIC operation will gradually develop a staff devoted entirely to operational service and that, perhaps within the period of the proposed work, this operational staff will be fairly large and will outnumber the remaining developmental staff.

VI REFERENCES .CEN=1;
.CEN=0;

1. Engelbart, D. C., and W. K. English, "A Research Center for Augmenting Human Intellect," in AFIPS Proceedings, Vol. 33, Part One, 1968 Fall Joint Computer Conference, pp. 395-410 (Thompson Book Co., Washington, D. C., 1968).

Proposal for Research No. ESU-69-100
Extension to Contract No. F30602-68-C-0286 10

STUDY FOR THE DEVELOPMENT OF COMPUTER AUGMENTATION TECHNIQUES 11

PART TWO -- CONTRACTUAL PROVISIONS 12

I ESTIMATED TIME AND CHARGES 13

It is proposed that the research work outlined herein be performed during a period of 24 months, starting 8 February 1970. 13a

Pursuant to the provisions of ASPR 16-206.2, attached is a cost estimate and support schedule in lieu of the DD Form 633-4. Also enclosed is a signed form complete except as to the "Detail Description of Cost Elements." 13b

II GOVERNMENT-FURNISHED EQUIPMENT 14

The performance of the proposed work will involve the use of government-furnished equipment covered by NASA Contract No. NAS1-7897 and Air Force (RADC) Contract No. F30602-68-C-0286. 14a

III REPORTS 15

The Institute will submit an Interim Technical Report which documents and summarizes the work performed during the first 12 months under the proposed modification. This report will be submitted in draft form 12 months and 30 days after commencement of the proposed work. 15a

A Final Technical Report will be submitted 30 days after the second 12 months. 15b

The Institute will submit management reports on a quarterly basis as under the present contract. 15c

During the period of the proposed work, we expect to be developing a "Handbook," which will be a comprehensive description and history of all work in the Center, suitably structured for study and revision with the Center's computer aids. It is anticipated that individual projects, such as the proposed work, will be covered in the Handbook as "chapters" and reports will be produced in hard copy directly from the Handbook (with suitable editing to produce useful hard-copy formats). Depending on the progress of Handbook development, reports on this contract may be in this form. 15d

IV CONTRACT FORM 16

[PART TWO
CONTRACTUAL PROVISIONS]

It is requested that any contract resulting from this proposal be awarded as a supplemental agreement to Contract No. F30602-68-C-0286.

/PART TWO
CONTRACTUAL PROVISIONS/

16a

V ACCEPTANCE PERIOD 17

This proposal will remain in effect until 7 February 1970. If consideration of the proposal requires a longer period, the Institute will be glad to consider a request for an extension of time. 17a

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