EJK 26-JUN-74 13:47 30901

A pointer from your friendly AKW,

This is a training file that I stole from BB&N, The original state was all caps, The material in lowercase was inserted with a user program called ADDTEXT, To try it type gpgaddtext<cr> then gpeaddtext<cr> and see what happens - it prompts you, This could be a useful program for someone doing repetitive work ie, programming for WWMCCS, It is especially good because you can add text to the frOnt as well as the back of a statement, branch, plex and, probably, file, 1

hot SOUP 2

hot TOMATO 2a

hot VEGETABLE 2b

hot CREAM OF MUSHROOM 2c

sizzling ENTREE 3

sizzling FRIED CHICKEN 3a

sizzling PRIME RIBS 3b

sizzling SCALLOPS 3c

sizzling BROILED 3c1

sizzling FRIED 3c2

sizzling SALMON 3d

sizzling WITH CREAM SAUCE 3d1

EGGS 4

SCRAMBLED with shit on a shingle 4a

FRIED with shit on a shingle 4b

SUNNY-SIDE-UP with shit on a shingle 4b1

OVER-EASY with shit on a shingle 4b2

BOILED with shit on a shingle 4c

DESSERT 5

PIE ala mode 5a

A pointer from your friendly AKW,

EJK 26-JUN-74 13:47 30901

A pointer from your friendly AKW,

(J30901) 26-JUN-74 13:47; Title: Author(s): Edmund J. Kennedy/EJK; Distribution: /RADC; Sub-Collections: RADC; Clerk: EJK;

TIP connection for Hudson Inst,

(HARDY, SLEVY,NLS;6,), 27-JUN-74 10:26 MEH ;

Saul Levy:

I believe we have not met, I work at SRI-ARC, I am, in part, responsible for contract and Computer service at our Office-1 facility,

I have been trying for several days now to get in touch with Saul Amarel to get his approval to connect Hudson Institute, an ARPA contractor and proposed Office-1 user, to the Rutger TIP, Saul is apparently away on trip and not expected back for several days and I was informed by his secretary that perhaps you were the one acting in his absence on these matters,

The connection has been discussed with Craig Fields and in order for Hudson to connect he requires a Sndmsg from Amarel and Walden@BBN, Walden has given his Ok, but as I mentioned I have not been able to contact Amarel, Specifically what Fields wants from Amarel is his OK that he won't mind the line,

The line we would like to connect is a 4800 baud link using AT&T 208A modems, This is identical to a line we have connected at MITER-TIP,

8

It is important to our proposed contract that I resolve this matter 8a

as soon as possible, any assistance you can give me in this matter 8b

that would be greatly appreciated, 8c

9

Hardy@SRI, (415) 326-6200 X3921 9a

10

------- 11

12

MEH 27-JUN-74 11:22 30902

TIP connection for Hudson Inst.

(J30902) 27-JUN-74 11:22; Title: Author(s): Martin E. Hardy/MEH;
Distribution: /SYL; Sub-Collections: SRI-ARC; Clerk: MEH;

AAM 28-JUN-74 13:10 30905

As you know, the BBN IMP-development group at BBN has used the Journal system from time to time for the propagation of important announcements about changes to the IMP and TIP systems. With the NIC phasing out its support of the RFC system, I am trying to construct a list of both network mail and US mail addresses for "Technical Liaisons". Some of you have recently received a test message via network mail from me; if you received it I have your network mail address. If you did not receive the test message, but you do have a network mail address, please let me know what it is. MY network mail address is MCKENZIE@BBN-TENEX.
Thank you for your assistance.
Alex McKenzie

1

AAM 28-JUN-74 13:10 30905

(J30905) 28-JUN-74 13:10; Title: Author(s): Alex A. McKenzie/AAM;
Distribution: /NLG; Sub-Collections: NIC NLG; Clerk: AAM;

EJK 28-JUN-74 13:30 30906

Notes on trip to IBM

CALL DIRECTOR INFORMATION SYSTEM 1

The system is structured in such a fashion that one person (at any given time) has a full-time responsibility for keeping track of all the personnel assigned to the Administration Center Locator, answering their telephone in their absence, and functioning as though each of the people has HER as his full-time secretary, 1a

ADMINISTRATION CENTER LOCATORS (14 In Gaithersburg) 1b

Each Administration Center is staffed by several women (no men were observed) and located in highly plush office areas. The two that I personally observed looked as though each had been given individual attention by a highly competent interior decorator. The colors, the rugs, the clocks and the paintings on the wall were superior to those in many homes I have visited. In contrast, the offices of the engineering and scientific personnel were stark monastic cubicles, about ten feet square, furnished in spartan style with a desk, a couple of chairs and a filing cabinet. They were uniformly and drably painted, with no rugs or paintings. They were however, unquestionably private and quiet, 1b1

100-150 employees are handled by each of the administration center locators, 1b2

With virtually no exceptions, each of the scientific and engineering people is responsible for answering his own telephone. Each person has his own number and no telephones are shared. When it is impossible for the person to answer his own telephone because of travel, a meeting, transfer etc., the individual is personally responsible for notifying the locator where he will be, and for turning a switch on his phone in such a way that the phone will be answered by the administration center locator, 1b2a

MASTER LOCATOR 1c

2000 to 3500 employees at Gaithersburg are included in the master locator, which is an on-line, current information directory which is structured about organizations/programs/services 1c1

Notes on trip to IBM

- calls can be referred on the basis of any one or more of these 1c2

FRUSTRATION OF THE CALLER 1d

Elimination of caller frustration was the single goal of the development. (Nevertheless the entire program was justified on the basis of cost-effectiveness). We have all experienced caller frustration, and it is not the type of thing to which we would like to subject the people upon whom we are dependant for our living. In the case of IBM, this person is the customer. The reasons for the frustration are the following: 1d1

Busy signal 1d2

Unanswered telephone - even when ringing 1d3

Bad manners or indifference of person who does answer the phone. 1d4

Lack of satisfaction when phone is answered due to lack of information on part of person who replies (who may be from another department) 1d5

RESULTS 1e

Lost time of customer and their own personnel 1e1

Interruptions in smooth flow of effort by customer and their own personnel 1e2

SAVINGS 1f

For Four Years 708K(Old Way) - 215K(New Way) = $493K 1f1

CENTER LOCATOR 1g

The Administration Center Locator has two-digit access to a dedicated minicomputer (Series 3). When a phone rings in an unoccupied office, and the telephone switch in that office has been properly set, the call is handled by the administration center locator. The call director lights up and illuminates the keying number of the individual called. As the woman on duty reaches to answer the phone she also

keys in the number, This causes the information available about the person called to appear on a CRT in front of her, This information is arranged ithe following manner: 1g1

Fixed Information 1g2

Organization 1g2a

Manager 1g2b

Projects in which involved 1g2c

Referrals to other people who can handle inquiries or to other information sources 1g2d

Variable Information 1g3

Attendance status 1g3a

Itinerary 1g3b

Meetings 1g3c

Schedules/Calendars 1g3d

Projects/Contracts 1g3e

Logs 1g3f

Office follow-up 1g4

Actions that need to be taken 1g4a

Miscellaneous notes 1g4b

MASTER LOCATOR 1h

The master locator is an on-line, completely up-to-date telephone directory with the following characteristics: 1h1

80 characters/name 1h2

5 names /page 1h3

10,000 names 1h4

Accessible by all terminals 1h5

Notes on trip to IBM

TWO DIGIT ACCESS 1i

The call director has the referral/access number already on it, Using the computer by means of this two digit access number calls up all the needed information on the individual being called, 1i1

It is possible to take calls for a transferred individual - determine where he is presently located - determine if he is available to take a call - determine who takes his calls - and make a smooth transition as though he had been called at the new location, 1i2

GROWTH 1j

It is planned that the Administration Center will expand its use of the minicomputer to include the following functions: 1j1

Filing access and retrieval 1j2

Document control 1j3

There will be a total of 24 terminals including one for the receptionist and another for the mailroom, 1j4

COMMENTS 1k

At one time they had 197 call directors - fruitless and wasteful 1k1

One pre-requisite to successful operation is that the person leaving his office MUST disable his phone by a switch, This transfers his call to the message center, The message center handles the call, Upon his return a light tells him that he had one or more calls and that he should contact the message center for info on what has transpired in his absence, 1k2

PUBLICATIONS SUPPORT SYSTEM 2

This system, located at Gaithersburg, supports the entire IBM organization, 2a

VOLUME 2b

700 publications per year 2b1

90,000 pages per year 2b2

2000 originators within IBM 2b3

50 copies = average for each publication 2b4

Fast turnaround is essential 2b5

REMOTE OPERATING FACILITIES 2c

All of IBM is supported by the facility at Gaithersburg by means of remote terminals/computers and a message sending capability 2c1

ECONOMIES 2d

The total system is justified entirely on the basis of cost and manpower savings 2d1

There is no re-keying anywhere. All information goes directly into a computer the first time and any editing is done within the computer. 2d2

140 secretaries now do the work of 260 2d3

The cost of flowcharting has been cut 50% (pilot operation) 2d4

The cost of columnar material preparation = bar charts, matrices etc, have been cut 50% 2d5

FUNCTIONS 2e

Documentation support 2e1

Management data collection 2e2

Library system 2e3

Source data management 2e3a

Design language 2e3b

EJK 28-JUN-74 13:30 30906

KENNEDY

29 JUN 74

Augmentation Research Center

STANFORD RESEARCH INSTITUTE
MENLO PARK, CALIFORNIA 94025

Notes on trip to IBM

(J30906) 28-JUN-74 13:30; Title: Author(s): Edmund J. Kennedy/EJK;
Distribution: /ARB FJT JLM DLS RN2; Sub-Collections: RADC; Clerk: EJK;
Origin: <KENNEDY>NOTES.NLS;1, 28-JUN-74 13:26 EJK ;

Notes on trip to IBM.

CALL DIRECTOR INFORMATION SYSTEM 1

The system is structured in such a fashion that one person (at any given time) has a full-time responsibility for keeping track of all the personnel assigned to the Administration Center Locator, answering their telephone in their absence, and functioning as though each of the people has HER as his full-time secretary. 1a

ADMINISTRATION CENTER LOCATORS (14 In Gaithersburg) 1b

Each Administration Center is staffed by several women (no men were observed) and located in highly plush office areas. The two that I personally observed looked as though each had been given individual attention by a highly competent interior decorator. The colors, the rugs, the clocks and the paintings on the wall were superior to those in many homes I have visited. In contrast, the offices of the engineering and scientific personnel were stark monastic cubicles, about ten feet square, furnished in spartan style with a desk, a couple of chairs and a filing cabinet. They were uniformly and drably painted, with no rugs or paintings. They were however, unquestionably private and quiet. 1b1

100-150 employees are handled by each of the administration center locators. 1b2

With virtually no exceptions, each of the scientific and engineering people is responsible for answering his own telephone. Each person has his own number and no telephones are shared. When it is impossible for the person to answer his own telephone because of travel, a meeting, transfer etc., the individual is personally responsible for notifying the locator where he will be, and for turning a switch on his phone in such a way that the phone will be answered by the administration center locator. 1b2a

MASTER LOCATOR 1c

2000 to 3500 employees at Gaithersburg are included in the master locator, which is an on-line, current information directory which is structured about organizations/programs/services 1c1

- calls can be referred on the basis of any one or more of these 1c2

FRUSTRATION OF THE CALLER 1d

Elimination of caller frustration was the single goal of the

development, (Nevertheless the entire program was justified on the basis of cost-effectiveness), We have all experienced caller frustration, and it is not the type of thing to which we would like to subject the people upon whom we are dependant for our living, In the case of IBM, this person is the customer, The reasons for the frustration are the following: 1d1

Busy signal 1d2

Unanswered telephone - even when ringing 1d3

Bad manners or indifference of person who does answer the phone, 1d4

Lack of satisfaction when phone is answered due to lack of information on part of person who replies (who may be from another department) 1d5

RESULTS 1e

Lost time of customer and their own personnel 1e1

Interruptions in smooth flow of effort by customer and their own personnel 1e2

SAVINGS 1f

For Four Years 708K(Old Way) - 215K(New Way) = $493K 1f1

CENTER LOCATOR 1g

The Administration Center Locator has two-digit access to a dedicated minicomputer (Series 3), When a phone rings in an unoccupied office, and the telephone switch in that office has been properly set, the call is handled by the administration center locator, The call director lights up and illuminates the keying number of the individual called, As the woman on duty reaches to answer the phone she also keys in the number, This causes the information available about the person called to appear on a CRT in front of her, This information is arranged ithe following manner: 1g1

Fixed Information 1g2

Organization 1g2a

Manager 1g2b

projects in which involved 1g2c

Notes on trip to IBM.

Referrals to other people who can handle inquiries or to other information sources 1g2d

Variable Information 1g3

Attendance status 1g3a

Itinerary 1g3b

Meetings 1g3c

Schedules/Calendars 1g3d

Projects/Contracts 1g3e

Logs 1g3f

Office follow-up 1g4

Actions that need to be taken 1g4a

Miscellaneous notes 1g4b

MASTER LOCATOR 1h

The master locator is an on-line, completely up-to-date telephone directory with the following characteristics: 1h1

80 characters/name 1h2

5 names /page 1h3

10,000 names 1h4

Accessible by all terminals 1h5

TWO DIGIT ACCESS 1i

The call director has the referral/access number already on it. Using the computer by means of this two digit access number calls up all the needed information on the individual being called, 1i1

It is possible to take calls for a transferred individual - determine where he is presently located - determine if he is available to take a call - determine who takes his calls - and make a smooth transition as though he had been called at the new location, 1i2

Notes on trip to IBM.

GROWTH 1j

It is planned that the Administration Center will expand its use of the minicomputer to include the following functions: 1j1

Filing access and retrieval 1j2

Document control 1j3

There will be a total of 24 terminals including one for the receptionist and another for the mailroom. 1j4

COMMENTS 1k

At one time they had 197 call directors - fruitless and wasteful 1k1

One pre-requisite to successful operation is that the person leaving his office MUST disable his phone by a switch. This transfers his call to the message center. The message center handles the call. Upon his return a light tells him that he had one or more calls and that he should contact the message center for info on what has transpired in his absence. 1k2

PUBLICATIONS SUPPORT SYSTEM 2

This system, located at Gaithersburg, supports the entire IBM organization. 2a

VOLUME 2b

700 publications per year 2b1

90,000 pages per year 2b2

2000 originators within IBM 2b3

50 copies - average for each publication 2b4

Fast turnaround is essential 2b5

REMOTE OPERATING FACILITIES 2c

All of IBM is supported by the facility at Gaithersburg by means of remote terminals/computers and a message sending capability 2c1

ECONOMIES 2d

Notes on trip to IBM.

The total system is justified entirely on the basis of cost and manpower savings 2d1

There is no re-keying anywhere. All information goes directly into a computer the first time and any editing is done within the computer. 2d2

140 secretaries now do the work of 260 2d3

The cost of flowcharting has been cut 50% (pilot operation) 2d4

The cost of columnar material preparation - bar charts, matrices etc, have been cut 50% 2d5

FUNCTIONS 2e

Documentation support 2e1

Management data collection 2e2

Library system 2e3

Source data management 2e3a

Design language 2e3b

TITLE PAGE 3

KENNEDYAugmentation Research CenterSTANFORD RESEARCH INSTITUTEMENLO PARK, CALIFORNIA 94025 3a

EJK 28-JUN-74 13:41 30907

Notes on trip to IBM.

(J30907) 28-JUN-74 13:41; Title: Author(s): Edmund J. Kennedy/EJK;
Distribution: /ARB FJT JLM RBP DLS; Sub-Collections: RADC; Clerk: EJK;
Origin: <KENNEDY>NOTES.NLS;1, 28-JUN-74 13:36 EJK ;

RJC 1-JUL-74 12:18 30908

SAAAWARD

(J30908) 1-JUL-74 12:18; Title: Author(s): Roberta J. Carrier/RJC;
Distribution: /TJB2; Sub-Collections: NIC; Clerk: RJC;
Origin: <CARRIER>SAAAWARD.NLS;1, 1-JUL-74 11:54 RJC ;

SAAAWARD

RJC 1-JUL-74 12:20 30909

saaaward

(J30909) 1-JUL-74 12:20; Title: Author(s): Roberta J. Carrier/RJC;
Distribution: /RJC; Sub-Collections: NIC; Clerk: RJC;
Origin: <CARRIER>SAAAWARD.NLS;1, 1-JUL-74 11:54 RJC ;

saaaward

EJK 2-JUL-74 10:41 30910

Computer Aided Instruction For NLS - Demonstration

(J30910) 2-JUL-74 10:41; Title: Author(s): Edmund J. Kennedy/EJK; Distribution: /RADC; Sub-Collections: RADC; Clerk: EJK;

EJK 2-JUL-74 10:41 30910

Computer Aided Instruction For NLS - Demonstration

Dr. Sylvia Mayer ESD/MCI, called me 2 Jul 74 0930 to confirm arrangements for her visit and a demonstration of the NLS/ Computer Aided Instruction work being done by Bolt, Baranek & Newman. 1

Background information has been put into the Journal System (MJOURNAL ,30898, 1: w). 1a

She will be here on 10 July 74 at 0915. The time for the demonstration has not yet been decided. It depends on the availability of the system and the availability of people to witness the demonstration. There is one demonstration planned, lasting for about an hour. It is not impossible that two of them can be given depending on the interest and availablity of people. 1b

Request that you review your schedule and your interests and provide me with any ideas you might want to develop and your availablility for that day. Feedback so far has been nil, so I am doing it my way until I get some info that might cause me to change.. Either on the system, in person, or by phone x3857, 3827 or 7834. (Or you can leave me a note or tell someone else.) 2

response to request from Shankar for a motion of support for their development guys, so that they can continue to fund the work out of their own budget.

(J30911) 3-JUL-74 07:36; Title: Author(s): Michael T. Bedford/MIKE; Distribution: /LHD; Sub-Collections: NIC; Clerk: MIKE;

response to request from Shankar for a motion of support for their development guys, so that they can continue to fund the work out of their own budget.

TO: S. Sanyal, Systems Engineering, Bell-Northern Research
FROM: M. Bedford, Business Planning Group, Bell Canada
RE: Tentative date for demo. of rotary-dial signal receiver.....July 8, 1974 in Toronto. 1

I met yesterday with Mr. Tony Tyler, Sears' National Communications Manager. He was pleased to hear that your work on the receiver/decoder for rotary-dial signaling had reached the stage where a rudimentary demonstration could be made for Maurice Anderson, @, and Mike Lutze. Tony and I set a tentative date of July 8, 10:00 a.m., in Toronto. 2

As we discussed on the phone, this demonstration will be a symbol of our intent to cooperate with Sears in this project, rather than the unveiling of a startling new technological capability. It is important that Sears realize the interest we have in this project, and to this end, the Business Planning Group gives its whole-hearted encouragement to your development people in their efforts to understand Sears networking plans for the Automated Order Service, and to design a possible signal receiver accordingly. 3

As a result of the meeting on July 8, your development people will be in a good position to work with Sears' staff on this project. Their interest and expertise will have been demonstrated, and they will have met both the decision-makers and the technical support people on the Sears side. With this footing, I expect their work in this area to be most productive. 4

Thank you for your continuing cooperation in this venture, and for your work as interface between your development people and myself and the Sears organization. 5

DLS 3-JUL-74 09:05 30912

Suport of operation of ARC PDP-10X for 6 mo,

(J30912) 3-JUL-74 09:05; Title: Author(s): Duane L. Stone/DLS;
Distribution: /FJT ARB DTC DCR2; Sub-Collections: RADC; Clerk: DLS;
Origin: <STONE>DAVE.NLS;1, 3-JUL-74 08:57 DLS ;

DLS 3-JUL-74 09:05 30912

Suport of operation of ARC PDP-10X for 6 mo,

Memo signed by Col Krutz 2 JUL 74

DLS 3-JUL-74 09:05 30912

Suport of operation of ARC PDP-10X for 6 mo.

Col. David C. Russell
ARPA/NMRO
Arlington, Va 22209

Sub: Support of NSW Project

1. The purpose of this memo is to confirm the verbal agreement between Mr. Stone and yourself, made on 27 June 74, regarding our support of the operation of the PDP-10X facility currently residing at Stanford Research Institute.

2. RADC has forwarded a plan to AFSC for a Quality Software Production project. In this plan we have committed ourselves to support the ARPA National Software Works project, because we believe it offers an ideal vehicle for getting our software development tools into the hands of Air Force users. Since the facility will be used primarily by SRI and MCA (the two principle NSW contractors), we view the support of this facility as part of our commitment to the NSW project.

3. It is our understanding that ARPA will issue an order for the purchase and operation of the facility. ARPA will forward money for its purchase (approximately $405K) and RADC will pay for the maintenance and operation of the facility for six months, from 1 JUL 74 to 31 Dec 74 (approximately $140K).

4. A sole source statement and a statement that the contract should start 1 JUL 74 for continuity purposes should accompany the ARPA order. This is necessary to assure that the contract covers the desired time period.

Col. Robert Krutz
Chief, Information Sciences Division

NDM 3-JUL-74 10:50 30913

Sort by Date, most recent first

(J30913) 3-JUL-74 10:50; Title: Author(s): N. Dean Meyer/NDM;
Distribution: /MIKE IMM; Sub-Collections: SRI-ARC; Clerk: NDM;

NDM 3-JUL-74 10:50 30913

Sort by Date, most recent first

Not sure I used the Sort algorithm in the message handling scenario,
It a user program called: SORTMES, When you load it, it
automatically institutes as sort algorithm, then Goto Sort Plex will
use that sort key extractor INSTEAD of the standard alphabetical, 1

Bridge Report

(J30914) 3-JUL-74 10:59; Title: Author(s): Roberta J. Carrier/RJC;
Distribution: /ELF RJC; Sub-Collections: NIC; Clerk: RJC;

RJC 3-JUL-74 10:59 30914

Bridge Report

Ed, trying to get some stuff out of my directory as I am really getting loaded up...sent a copy to myself too.

<CARRIER>CHAP4BRIDGE,NLS;1, 2-JUL-74 12:58 RJC ; 1

5.3 Information Sciences 1a

(u) RADC is studying the application of the Associative Processor (AP), a highly parallel computer architecture, to some of the Air Force's real-time requirements (e.g., AWACS, radar signal processing and communications multiplexing). For this purpose, RADC has purchased a Goodyear Aerospace STARAN AP and interfaced it to a large scale computer in the R&D computer facility. 1b

(U) To aid in the analysis of data from seismic, acoustic, magnetic and photometric sensors an On-line Pattern Analysis and Recognition System (OLPARS) has been implemented. Using this interactive processing system, an analyst can design and test classification logic which will identify the target generating the data. Significant improvements in both speed and accuracy are realized by providing the analysts the ability to perform mathematical transformation and examine statistical distributions of data in an on-line mode. A corollary system, the Waveform Processing System (WPS), to extract pertinent features prior to design of classification logic is presently being developed and together with OLPARS will provide a complete pattern recognition facility. 1c

(U) To enhance the operational use of data processing systems the application and development of computer graphics is being pursued to provide operators with a visual window on the computing process. In areas such as weather forecasting, cartography, intelligence data handling, digital signal processing and computer aided design increased speed. 1d

(U) The present and future emphasis is toward more cost effective operation of the Air Force through automation. Software unreliability, and its related high costs, have been identified as the major roadblock to this trend toward automation and less labor-intensive operation of the Air Force. 1e

(U) Information Processing technology at RADC has been and is increasingly emphasizing R&D on software validation and methods of design that minimizes initial costs and simplifies modification. Related emphasis includes "software first facilities" where EDP hardware/software trade-off designs can be thoroughly evaluated before field implementation and software changes validated to the satisfaction of the operational users prior to implementation. 1f

(U) Satisfying this two-pronged approach to increasing the overall system reliability (hardware and software), while reducing the high cost of software and maintaining the flexibility of

change through "Software Mods," is a continuing management challenge, 1g

(U) RADC supervised the development of a JOVIAL Compiler Implementation Tool (JOCIT/J3) for implementing JOVIAL/J3 compilers. This has resulted in a JOVIAL/J3 compiler which far surpasses that originally provided for the recent update of the WWMCCS computer systems. The original compiler was rejected by WWMCCS because of its generation of inefficient object code and its overall poor quality. When it became known to RADC that the original compiler would be rejected, it redirected the contractor on the (JOCIT/J3) effort to test out the tool by using it to build a compiler of production quality for the WWMCCS computer. The preliminary tests of this compiler show it to be superior to the original compiler in all aspects. The WWMCCS community has tested this compiler and found it reasonably meets WWMCCS needs. The planned procurement of a JOVIAL Compiler has been halted at a savings of approximately $350,000 and WWMCCS will have a good compiler at least six months earlier than could be delivered otherwise, 1h

(U) To enhance communications between large scale computers such as the HIS/600/6000 series machines and the outside world (e.g., time sharing user terminals), The Network Processing Supervisor is being offered as a replacement for the General Remote Terminal System (GRTS), the present operating system for HIS Data Net 355. Extensive testing has revealed that higher levels of NPS such as level 9 presently is the debugging stage are necessary to gain improved performance and response over GRTS, 1i

RJC 3-JUL-74 11:09 30915

Special Achievement Award

(J30915) 3-JUL-74 11:09; Title: Author(s): Roberta J. Carrier/RJC;
Distribution: /TJB2 RJC; Sub-Collections: NIC; Clerk: RJC;

Special Achievement Award

<CARRIER>SAAAWARD,NLS;1, 1-JUL-74 11:54 RJC ; 1

ADDITIONAL INFORMATION 1a

How many government people in the group - approximately 30 - combination of military and civilian, 1b

His responsibility - Mac was in charge of the technical forecast, 1c

3 Sub Panel 1c1

Technology - forecast 1c2

Requirements 1c3

Resources 1c4

Some Contracting Support 1d

Six Mitre staff 1e

Arthur D, Little technical forecast contract 1f

Small software contract with TRW 1g

Systems implementation contract with Boeing Computer Services, 1h

AFXDC INFORMATION RETRIEVAL SYSTEM

(J30916) 3-JUL-74 12:48; Title: Author(s): Duane L. Stone/DLS;
Distribution: /JLM; Sub-Collections: RADC; Clerk: DLS;
Origin: <STONE>AFXDCA.NLS;1, 3-JUL-74 12:44 DLS ;

DLS 3-JUL-74 12:48 30916

AFXDC INFORMATION RETRIEVAL SYSTEM

Journalling for historical purposes,,,one of the first efforts of the PSO,

Table of Contents 1

AFXDC INFORMATION RETRIEVAL SYSTEM

PURPOSE 2

The purpose of this paper is threefold: 2a

To assure a common understanding for all directly concerned with the introduction of an information storage and retrieval system within DCS/Plans and Operations, AFXDC, Hq, USAF, 2a1

To give technical guidance and assistance to the office of Assistant for Automated Information, AFXDCA, on the choice of the initial system, 2a2

To inform RADC management and staff of the nature, scope, and progress of this effort, 2a3

This paper was preceded by a "Preliminary AFXDC Automation Plan" in which the need for an information retrieval system within DCS/P&O was established. This paper will be followed by a number of brief papers on file conversion and textual data processing systems comparisons. Subsequently, a detailed 3-5 year development plan will be prepared jointly by AFXDCA and RADC personnel, 2b

BACKGROUND 3

The JCS organization was established by the National Security Act of 1947 to assure that military experts had a voice in matters of national security. As such, they respond to questions from the President, NSC, and the Secretary of Defense with collateral responsibility to the people through Congress. The Defense Reorganization Act of 1958 doubled the Joint Staff size and increased their responsibilities. Orders from the president to the Secretary of Defense are now issued through the JCS to the unified and specified commands. This also makes the JCS responsible for making policy decisions and issuing implementing directives in response to the unified and specified Command inquiries. 3a

While the Joint Staff is intimately concerned with their upward directing role as advisors, the bulk of their activity is more closely tied with their downward directing role as the military staff in the chain of operational command. More specifically; the Joint Staff is continually reviewing, and updating (a) strategic plans and strategic direction for the Armed Forces; (b) logistic plans and plans for mobilization; (c) personnel, material, and logistic requirements of the services; (d) the plans and programs of the unified and specified commands. 3b

The two primary plans which are the hub of JCS operations are the Joint Strategic Objectives Plan and the Joint Strategic Capabilities Plan. As their titles suggest, the former is directed at the coming decade, seeking to identify reasonably attainable forces and to show in broad policy terms their mode of employment. The latter allocates the current year's existing forces and shows in broad policy terms how they would be employed in major conflict and in contingency situations. These plans serve as a basic guide to the Joint Chiefs in their deliberations on some 30-50 specific policy papers that require their attention each week. 3c

Before the Joint Chiefs meet, it is obvious that long hours of homework must be undertaken to assure that the issues are clearly drawn. Without this, the principles could easily become bogged down in a mire of details and peripheral issues. This homework is accomplished by a Joint Staff action officer who is responsible for developing and collating pertinent data from the Joint Staff, its Agencies, and the four services. Within the four services, Action Officers (AO) are in turn assigned to collect and collate pertinent data representing their services viewpoint on the matter. With this background in mind, we now turn to a discussion of the Air Force Action Officer's duties and mode of operation. It should become increasingly evident that the Action Officer is

the center of activity in the development of Air Force positions on JCS policy papers. Any automation which might relieve him of some of his current manual activity in collecting and correlating information can only result in a higher quality product. 3d

JOINT PAPER PROCESSING 4

The task of the Deputy Chief of Staff, Plans and Operations (DCS/P&O) Action Officer is to establish a coordinated Air Staff position on a specific action which is commensurate with the chief's past decisions and current thinking, 4a

An Action is a request to the Joint Chiefs of Staff for guidance on a military matter. The request can be originated from a number of sources; Director, Joint Staff, Commanders of Unified and Specified Commands, Secretary of Defense, Joint Chiefs of Staff, Service Chiefs, etc. This request is channeled down to the joint staff who in turn asks for service inputs. A Joint Staff Action Officer is assigned and he is responsible for preparing a recommended joint staff position on the action. Each service then coordinates with the joint staff position on the action. Each service then coordinates with the joint staff officer trying to insure that the position is compatible with their service views, 4b

A formal procedure for processing the action exists (figure 1, page 37). When the action is received by Air Staff, it is assigned to an appropriate DCS, who in turn assigns to an Air Force Action Officer who then has primary responsibility for establishing a position on the specific question. The paper work received by the Air Force Action Officer will include references to past JCS papers which the Joint Staff Action Officer believes are relevant. Suspense dates are established which the Action Officer must adhere to, 4c

The Action Officer prepares for the first coordination meeting acquiring background on the following classes of data: 4d

Past JCS positions on same, similar, or related questions 4d1

Past Unilateral Positions 4d2

Current Unilateral Thinking 4d3

Other Agency Inputs, i.e., Intelligence 4d4

He does this through literature searches and discussions with other personnel. He also prepares a coordination schedule which includes all Air Staff offices which may have an interest in the particular question, 4e

Subsequent to the Joint Services Action Officers meeting, a first draft of the paper called a "flimsy" is prepared by the Joint Staff Action Officer and formally or informally circulated for coordination among the services. The Air Force Action Officer

then coordinates the flimsy within Air Staff. This coordination is extensive. All comments, called "purples", have to be verified, substantiated or resolved by the Action Officer. He again researches the literature based on new inputs from the Joint Services' Action Officer meeting and comments received during the Air Staff coordination. 4f

A second meeting is held with the Joint Staff where changes, etc., as a result of the coordination plus research by the Action Officer are incorporated into the paper. Depending upon the importance of the action, a higher level planner may become involved in this meeting. A planner is a designated officer authorized to exercise final approval for his service on a Joint Staff "Buff" report. If the planner does become involved at this point, the Action Officer prepares a detailed briefing package for the planner. 4g

Subsequent to this meeting, a second draft is circulated. This document is called a "Buff" and does represent a tentative joint staff and service agreement, or as close to agreement as possible under time constraints. In fact, at times, actual operative directions can be generated from this document, though it is not common practice. If there is enough agreement on the paper or the points of disagreement cannot be reconciled at this level, the decision is made to submit the paper as an official document. The paper is then redrafted with any changes which resulted from the Planners' meeting and the paper turns "Green". A green paper is a numbered JCS paper. The Action Officer checks the green paper to insure that it still reflects Air Force views and the formal approval portion of the process is begun. 4h

There are basically three methods by which the green paper is officially approved. If it is a matter which is relatively minor or non controversial, the paper is circulated for approval. If there are no objections to the paper within five days, the paper is approved. The paper is physically red-striped to indicate JCS approval. If the paper has little controversy or was reasonably agreed upon during the planners' meeting, the paper can be approved by a phone call vote. Finally, if the paper is on an important or a controversial topic, it is scheduled as an agenda item to be resolved by the Joint Chiefs of Staff. 4i

When the action is an agenda item, the Action Officer prepares a briefing package which the Chief of Staff Air Force and Operations Deputy will use when the item is discussed. This is a comprehensive set of documents which includes a summary sheet (Brief), talking papers, background papers, detailed list of references and the green action paper itself with an intricate set of references to various portions of the paper which are of

controversy, key, etc. Prior to the JCS agenda meeting, the Chief or his operations Deputy, or both, are briefed on the action. This frequently necessitates changes and additional literature searches. Obviously, these changes or literature searches are done under extreme time constraints, often while the Chief and his staff are still in the briefing session. The DCS/P&O works with the Chief of Staff on the agenda items. In fact, Operations Deputies of each service meet prior to the main agenda meetings and resolve issues which are not too controversial. The remaining agenda items are then discussed by the Joint Chiefs of Staff. Issues are resolved and where agreement is reached or just cannot be reached, decisions are rendered. Agreeable papers are "red-striped". Rarely do the Joint Chiefs pass on a decision where one or more chiefs disagree. When this happens, the divergent view is incorporated into the green paper. In general though, the issues are resolved and the decision is one of joint agreement. 4j

In regards to divergent views, if the Air Force position prior to the meeting is divergent, the Action Officer prepares a document called a Chief of Staff Air Force Memorandum (CSAFM) stating the Air Force's position. If the Chief maintains a divergent view, the CSAFM is incorporated into the green paper. 4k

Once agreement is reached and the decision is rendered, the operative portion of the paper is placed into messages, etc, and dispatched to appropriate addressee. In the strictest sense, the operative portion of the paper reflects the JCS decision. The Action Officer is responsible to insure that the required Air Staff implementation takes place. Once this is accomplished, the brief package is sent to AFXPDAA (Case Files). The Action Officer usually keeps one for his own personal file. 4l

PROBLEM DISCUSSION 5

The previous discussion of the processing of a JCS paper revealed elaborate procedures for coordination and documentation. Coordination is necessary to insure that past Air Force policy is not violated and that thinking contained in more recent Air Staff studies is included in the brief. The information gained by the coordination process must be integrated into the background paper within the framework of past JCS decisions and Air Force views. This approach is dictated by the general goal of the maintenance of continuity of policy on JCS matters. The planners, Directors, or Gen. McConnell cannot afford to inadvertently reverse their past decisions. Therefore, as the AO is developing his brief, he should not unknowingly make recommendations which tend to counter previous decisions. By the same token, if the inputs from the Air Staff indicate its time for a change on a particular topic, then the General's arguments are stronger if they can be backed by references to previous decisions which support the need for that change. 5a

Thus, we see that the AO needs information from both the Air Staff and the Joint Staff viewpoints when developing a brief for his superiors. He obtains Air Staff information primarily through circulation of the JCS paper in its flimsy, buff and green form. His only direct access to Air Staff studies is through the organization of the Asst. Chief of Staff Studies and Analysis's ABACUS system, which is limited in its scope and coverage. 5b

The action officer has several ways of obtaining information on past JCS decisions. The Joint Staff appends a list of JCS red-striped paper references to the original paperwork initiating an action. The AO can obtain these from the Secretary for Joint Matters (AFXPJ) or case files and from scanning them can obtain additional references. The AO also has local files maintained within each branch or section which can be scanned for information related to the topic at hand. If coordination or personal contacts within the Joint or Air Staff reveal there should be more information, the Action Officer can search past JCS data using either the subject heading breakdown provided by Administration & Records (case files) or the JCS hierarchial indexing system used within AFXPJ. Both of these systems are limited from a retrieval standpoint. In the case of the subject heading, the categories are broad and users must manually scan a large amount of data to find those relevant. In the case of AFXPJ, the current hierarchial indexing system suffers from typical problem of all hierarchial systems. Categories are fixed and any given paper rarely fits one, and only one category. Worse yet, it has been discarded by the Joint Staff as a retrieval tool and is not properly maintained. As a result, the current method of obtaining

related data is characterized by its dependence upon people. This is not necessarily bad; in fact, any system introduced should endeavor to exploit this to the fullest. However, it does have limitations. 5c

People's memories are limited. They may forget certain information altogether, or they may recall bits and pieces, but cannot produce a JCS paper number. Even though this information is potentialy useful to the AO in developing his brief, it cannot be used in practice because he must be able to produce the green paper for the Chief of Staff. AFXPJ personnel are plagued with the same limitations. They may recall a past action that might have a bearing on the topic at hand, but cannot recall the Action Officer or the JCS number. 5d

The situation is further aggravated by the rotational policy of the Air Force. The normal tour of duty is four years. Action Officers or Air Staff personnel who could provide key information may have been transferred and are no longer accessible. An obviously related problem is the new Action Officer. He must rely upon his co-workers for sometime before he develops contacts and knowledge of his own. 5e

Another factor contributing to the problem is the increasing complexity of the issues discussed. With each JCS decision, the number of decisions potentially relevant to the current topic increases. Also, the dymanic environment formed by continuously changing inputs from Air Staff and external studies contribute to the complexity of the Action Officers task. As the complexity of the issues increases, the time in which the Action Officer has to consider each new input decreases. 5f

Within AFXPJ another type of retrieval problem also exists. This office is responsible for all JCS related matters and as a consequence has to keep track of any data related to a JCS action. Questions like; where is such a message that came in last week, who is working on what, etc,, are their typical questions. Also, since they are the focal point, they sit closer to the arena and directly support the Chief of Staff's office. This means that the response times required are short. A classical retrieval capability is only a partial answer to their problem. A data management system of some magnitude is probably required with a sophisticated retrieval capability tied to it. 5g

The net result of current information retrieval exercises within DCS/P&O is that the quality of the AO's final product may be less than it could be. He may have missed pertinent information. He has undoubtedly spent a considerable percentage of his time gathering what information he has, and a much smaller percentage

analyzing the data and formulating the recommendations, The severity of this situation can only be estimated, Such comments from the Action Officers as "I never have enough time to track down all my leads", or "I never realized this could blow up into such a big issue", or "I know there is more information around, but I can't uncover it", tend to substantiate the hypothesis that the problem is acute, 5h

RECOMMENDATIONS 6

Based on this and the preceding AFXDC study (Preliminary AFXDC Automation Plan), it is clear that one major area in which Air Staff could be aided is information retrieval. The staff is constantly striving to maintain continuity through detailed documentation, yet access to this documentation is based primarily on the ingenuity of the people involved. Though this is the most important ingredient of any system, a more effective retrieval system is needed to aid the searches and ultimately give the Action Officer better data, which would result in more time to arrive at a position. 6a

As indicated in the appended state-of-the-art summary, the system should be based on a computer produced index due to: the difficulty in hiring and retaining competent indexers, the inability of manual indexes to handle requests of a detailed nature, and the long term rigidity of manual indexing systems in responding to changing information requirements. 6a1

It is recommended that the initial installation be a free text searching system. Based upon the combined operational experience of ITIRC, ASPIN Corp, and Project LITE, it is recommended that the system have the following function as a minimum; and, or, not, phrase, sentence coincidence, and a universal match character. The system should also allow searching in certain prespecified formated fields. The free text searching approach has proven itself in operational environments and does not prohibit inclusion of automatic indexing techniques as they are developed. 6a2

The initial system should operate on the Command Post 360-50 with one remote terminal of the typewriter variety located in AFXPJ. A priority interrupt should be available for requests coming from the Chief of Staff's or Operations Deputy's office and for high priority Action Officers' requests. It may be possible to service some Action Officer requests (while working on the flimsy and buff) on an overnight basis. Experience has shown that locating a remote in the working area can lead to a significant increase in use of the system plus innovative contributions to program requirements. 6a3

It is recommended that one or two officers begin training as soon as possible in the operation of the system. The officers should be experienced in the subject areas covered by JCS actions. The intermediary between the requestor and the system is the principle individual who influences the effectiveness of a free text system. This position cannot be relegated to a clerk typist. The system should provide some surrogate of the

document as feedback to the intermediary to allow him to make a gross determination of search results, 6a4

Support software is necessary to insure early success with the system and to allow orderly improvement. Alphabetization, frequency, and concordance programs are needed to provide listings to assist the intermediary in formulating requests. Later on, they can be an input to lexical people performing synonym and thesaurus work. A program which records the search requests and some indication of the results is also a necessity for insuring the overall success of the system and for intelligently planning the next improvements, 6a5

It is recommended that the initial operational data base consist of memoranda, monitor messages, and some indicative portion of the green paper, probably the brief, for the past two years. The current AFXPJ practice of accessing memoranda and messages through the green paper should be continued until the data base has reached the recommended level. The two year period is not inflexible, but under current operations it represents a reasonably complete data base. Experience has shown that premature introduction of a system, without an adequate data base, can lead to misuse and mistrust of the system. The resulting negative feelings toward the system may take years to overcome, 6a6

A more detailed, systematic analysis of DCS/P&O data processing requirements needs to be undertaken. It should not require more than a 2-3 man year contractual effort, considering the experience gained by AFXDCA and RADC personnel during this exercise. This analysis would allow more intelligent long range planning by enumerating and defining additional data bases relevant to JCS actions. In addition, some light could be shed on the data management aspects of AFXDC and upon the support of Action Officers with simulation and computation capabilities, 6a7

IMPLICATIONS OF RECOMMENDATIONS 7

The practical implications of the above recommendations cannot be ignored. Although this study is by no means complete system design, some of the consequences can be listed. 7a

Personnel 7b

The success of information retrieval systems in general, and of free text systems in particular, is highly dependent upon the people running and maintaining it. The IBM ITIRC system, for example, requires some 30 people. The DCS/P&O system may eventually require this many. A minimal contingent for initial operation should consist of 1-2 trained request formulators, 2 programmers, 2 lexical types, 4-5 input typists and one full time manager. 7b1

Data Base 7c

The exact data base, its content and magnitude, have yet to be defined. Since the success of the system will depend to a great extent upon the data in it, this problem should receive immediate attention. 7c1

Based upon current knowledge, it would seem that the brief is the best representation of the content of the green paper for several reasons: 7c2

It is readily available, an Air Force produced and controlled document. 7c2a

It is intended to be a summary document outlining the major issues, Air Force position, etc, on the green paper. As such, it contains many of the important retrieval terms which would occur in the green paper; yet in a condensed form. This simplifies the input process and lowers the computer storage requirement significantly. 7c2b

It is ideal as a green paper surrogate for screening by the intermediary or the action officer. Since the computer will retrieve many documents which are irrelevant to the requestor's information needs, it is desirable to provide the requestor with a shortened form of the parent document which he can rapidly scan. 7c2c

The principle drawback of the brief is that it does not contain the result of the Joint Chief's deliberations. This result is called the operative portion of the paper and is generally a memoranda or message answering the initial inquiry. In most

instances, this is what the action officer must reference to support his recommendations. The memorandum, however, does not appear to have sufficient substantive content to supply adequate retrieval tags. On the other hand, there are undoubtedly times when the brief is so far out of line with the final decision that it could never replace the memoranda. In summary, a further look must be taken at potential data base candidates. They must be ranked according to their ability to serve as representations of the green paper, surrogates for rapid scanning, suppliers of retrieval terminology, and as reliable leads to the operative portion of the green paper. 7c3

Conversion of Backlog 7d

The conversion of two years of briefs and/or memorandum represents a sizeable investment of time and money. It warrants a brief but intensive planning effort. Since the planning and execution of the file conversion task may very well be the most time consuming process in realizing the initial system, planning should begin immediately. Decisions have to be made on contractual vs in-house conversion. If in-house, then what equipment should be used? What training is required by operators? What special instructions must be provided then based upon the current format of the data and the format required by the initial system? Will an edit program be necessary? If so, what are its specific functions? Can it be written in-house or must it be contracted? These are just a few of the questions that must be answered before conversion of the backlog files can commence. 7d1

Document Accessibility 7e

One aspect often overlooked and yet the goal of most information retrieval systems, is the delivery of a copy of desired documents to the user. A number of computerized document reference systems have been built allowing rapid access to the references, only to discover that the system was not used to full capacity because no provision was made for rapid delivery of desired documents. Full text systems have an advantage in that a working copy of the document can be quickly printed out by the computer. There will still be instances when access to the original hardcopy is necessary. This does not appear to be a problem in the case of green and buff papers if current AFXPDAA and AFXPJ practices are followed. AFXPJ personnel indicated that their office did not retain all memoranda. This problem could be cleared up by a change in memoranda dissemination policy. From a management viewpoint, it would seem desirable to have one copy of all documents referenced by the system in one location. There is an obvious

advantage of locating the searching services and the document retrieval function in the same office; such as AFXPJ, if a mechanical compressed filing system were obtained for maximum space economy. 7e1

The question of equipment to assist in storing, retrieving, and reproducing the hardcopy invariably arises. It would seem best in the initial system, to store the hardcopy on shelves and reproduce with a xerox machine. Once the system has been in operation for a time and the computer referenced documents begin to exceed the shelf capacity of AFXPJ, then perhaps they could be microfilmed. It is not recommended that microfilm be used as a part of the everyday operation. The process of microfilming, developing, and printing introduces delays in the system's throughput. Also, the copies produced from microfilm are inferior to xerox copies. Other approaches such as the Video File are expensive and also suffer from poor quality output. 7e2

Software 7f

As mentioned earlier, there are a number of retrieval software packages available. All of them will require some modification before they can be considered operational on the Command Post 360-50. Again, a brief but intensive study should be made of the basic operating philosophies of each system. Generally speaking, there is a trade-off between system response time and update time. Also, as system response is improved, storage requirements mount. The specific tradeoffs in each of the candidate systems should be made explicit. In addition, projections of data base and vocabulary size should be made to assure that the system will not be in trouble 2-3 years after its beginning. 7f1

Certain support packages must either be written or acquired. The program which keeps track of the system's use must obviously be written around whatever system is finally chosen. This is no small task, since it must interleave with the basic retrieval programs. The frequency, alphabetization, and concordance programs are available with DPS and can be readily acquired for any other system chosen. Since they operate independently of the retrieval package, they are straightforward and relatively easy to write. 7f2

Hardware 7g

Since the Command Posts' 360-50 appears to be available, at least on a part time basis, it is a logical choice for implementing the initial system. As the data base grows, as

the use of the system increases, and as more sophisticated searching and terminal capabilities are introduced, part time access to the Command Post 360-50 will be insufficient. ITIRC, for example, has dedicated a 360-40 to the retrieval task, even though they are operating strictly in a batch mode. It should be expected that maintenance of the system will consume more computer time than the running of searches for at least 2 to 3 years. AFXDC should be prepared to obtain a computer of the 360-40/50 class for the sole purpose of information storage, search and retrieval or to consider the alternate route of timesharing a large computer. 7g1

Funding 7h

The recommended system will be costly. AFXDC should be prepared to spend 50-100K for conversion of the backlog. It may also take 1 or 2 contracts in the range of 50K each to get the necessary software packages running on the C.P. 360-50. Once the system is operational, the combined costs of inputting, maintenance and computer rental should stabilize around 500K per year. This system is no small undertaking and the costs to develop and operate it reflect this. The severity of the retrieval problem and the benefits to be derived, however, more than outweigh the cost. 7h1

Evaluation 7i

At one time or another, pressures will be made to evaluate the information retrieval system to be implemented. A formal evaluation is very costly and worse yet, it is difficult to say what the numbers mean once they are obtained. The state-of-the-art of evaluation of information retrieval systems is not too advanced. The measures used most often are precision and recall. Precision is defined as the ratio of the number of relevant documents retrieved over the number of documents retrieved. Recall is the ratio of the number of relevant documents retrieved over the number of relevant documents in the file. The key problem is contained in the term "relevant". This is obviously a human judgement and as such is subject to variation from other things outside the content of the document under consideration. A great deal of research effort has been spent in trying to find a means of negating these outside influences, but so far to no avail. The only other approach is to obtain many relevance judgements on many documents responding to many requests in the hopes that unwanted variation will be cancelled out statistically. A second problem is the requests, i.e., do they represent the requests which normally enter the system? The only way to guarantee this is to record each request as it comes in;

preferably in its original form, rather than the way it was presented to the system. A third problem is the data base used in the evaluation, i.e., is it representative of the system's data base. Practical considerations dictate that a small subset of the data base be used when trying to obtain the "number of relevant documents in the file" figure. 711

With all these problems of getting a reading on just one system, it is virtually impossible to make an effective comparison between two or more systems. It is also impossible to assign any cost effectiveness number to a system. The best that any evaluation of a system can do is to provide the system's managers with fairly objective data. There are, of course, many other factors any manager must take into account before changing or discarding any particular system. 712

In the case of the recommended system, the principles involved have proven themselves in an operational environment at ITIRC, LITE, and ASPIN Corp. Based upon their success, it does not seem necessary to conduct a formal evaluation of the recommended system in the foreseeable future. 713

RADC-XDC Relationship 71

The data processing capability required by DCS/P&O is a comprehensive and sophisticated system. The approach of introducing it on a evolutionary or building block basis dictates the need for a close tie between developer and user. Many of the capabilities required by the system are not within the state-of-the-art. The retrieval system to be introduced, for example, is an elementary capability and definitely will require updating as the system and the state-of-the-art advance. 711

It is proposed that RADC lend its data processing expertise to AFXDC personnel on a continuing basis. This could range from informal discussions once a month to conducting a detailed study on a specific question. Secondly, to establish an engineering support project at RADC aimed directly at supporting DCS/P&O with advance developments. In this way, AFXDC could have direct influence on development programs aimed at their problem. This could be a significant step towards reducing the gap between R&D advances and actual implementation. 712

Finally, it is recommended that a development plan be documented through the joint efforts of AFXDC and RADC personnel subsequent to the detailed contractual systems

analysis to insure an orderly introduction of the sophisticated capabilities within DCS/P&O. 733

APPENDIX 8

INFORMATION RETRIEVAL - State-of-the-art 8a

The term "Information Retrieval" is generic and rather all encompassing. Experimental systems have been designed which purport to retrieve "facts", answer questions, etc. However, this discussion will deal only with the document reference retrieval problem. It is assumed that the information desired will be contained either explicitly or implicity in the documents retrieved. It is further assumed that once a reference to the document has been retrieved, that the document itself can readily be located by number or other straightforward techniques. 8a1

In discussing the similarities and differences of information retrieval systems, it is possible to construct classification schemes, i.e., manual vs computer indexing, on line vs batch processing of queries, etc. These schemes are rather arbitrary, however; and one soon discovers that with a slight additional capability the classification of a system will change. 8a2

Perhaps a more useful way to think of the relative merits of different systems is to rank order them on some continuum. Just what to call the scale is not very clear. There have been several measures proposed. Among these are effectiveness, ease of use, flexibility, sophistication, complexity, cost, etc. All of these "measures" are merely words unless they can be reduced to numbers in some objective manner. Except for some work on effectiveness, the information retrieval field has not been too successful in accomplishing this. It is safe to say, however, that there is a correlation between all of these "measures" however they are obtained. 8a3

Namely, that as the effectiveness of a system increases, there is an attendant increase in the sophistication of its language processing abilities, as well as its flexibility and ease of use. The system will tend to become more complex and, in turn, will cost more. No satisfactory means exists for combining these "measures" into one cost-effectiveness measure. Beyond this, there are no generally acceptable criteria for comparing systems or for deciding whether a given system is adequate or inadequate. It is possible, however, to type different systems by their approach to handling the "language" problem and to rank order them on a "goodness" continuum. If this "expert opinion" approach to evaluating systems seems less than desirable, it should be kept in mind that it is currently the quickest, cheapest and probably the most reliable available. 8a4

The process of document reference retrieval has been described as one of matching concepts as expressed by an unknown author, with information needs as expressed by a requestor. The expression of concepts involves the use of language, which in turn includes words, their organization, and their meaning. The job of an information retrieval system then becomes one of matching concepts within the constraints of language. The very aspects of language that make prose and poetry possible make information retrieval difficult. If there was only one way to express a concept, then retrieval of documents containing this concept would be straightforward. The language is highly redundant, however, which leads to the possibility of expressing the same thing in many different ways. Conversely, any particular word can have many different meanings. These ambiguities can only be resolved by considering the context within which the word has occurred. 8a5

The language problem is at the crux of every information retrieval system. The effort involved in the identification of important words and their relationships cannot be ignored. If this is not accomplished ahead of time on input, then it must be accomplished at the time of request. The different approaches to handling the language problem provide a useful means of differentiating systems and of assessing their relative merits. 8a6

The approach most often used in computer based information retrieval systems is to create an intermediate language into which both the author's and the requestor's statements can be mapped. Examples of systems employing this approach are CIRC, MEDLARS, DDC, NASA. The resulting language is intended to eliminate much of the redundancy and ambiguity of natural language. Natural language is typically reduced to 10-20,000 words and phrases. The possible relationships between words are reduced to a few, such as, broader term, narrower term, see also, synonym, etc. This language is published in the form of an official system vocabulary or thesaurus. Indexers are encouraged to find appropriate terms in this thesaurus for each incoming document. Requestors must use this thesaurus to retrieve anything at all from the system. 8a7

The advantages of this approach are twofold. It takes advantage of the human's ability to ignore superficial or tangential concepts and to condense the meat of a document down to a few key words or phrases. It has the practical benefit of reducing the number of words and relationships between words down to a size which is readily handled by a computer. 8a8

In practice, however, the limitations of this approach have

become apparent. The quality of the thesaurus is highly dependent upon the ability of the vocabulary maintainance personnel and upon the input they have with regard to new terminology and changing word usage. Since the system is supposed to be of service to the user, it should in theory include as much of their terminology as possible. In practice, however, it means that the user be continually questioned upon the desirability of certain words or phrases for representation of a concept. The user does not appreciate this and most attempts to secure his advice on a continuing basis have been less than successful. The net result is a thesaurus which is relatively static in nature. With the changes that are introduced coming primarily from the indexer and the intuition of the lexical people. A second problem involves the difficulty of obtaining and keeping competent indexing personnel. In practice, indexing is a rather boring job and it is difficult to pay indexers a high enough wage under current government pay scales. The approach of using author indexing has never yielded a satisfactory index, primarily because it is a nuisance task to the author. 8a9

Over and above these criticisms, studies have shown that professional indexers are notoriouly inconsistent with themselves at a later date and with other indexers, even with the use of a thesaurus and forms to assist them. Perhaps the most basic limitation of this approach is in the initial assumption that the world of science and technology, for example, can be represented adequately by a few thousand phrases. It turns out that this is an adequate representation for gross dissemination in a current awareness system. When it comes to making a one-time specific request, however, the performance of the system is woefully lacking. More in-depth human indexing is not a practical solution, because it is plagued by the previously mentioned problems. 8a10

In summary then, the above approach to handling the vocabulary problem has the effect of limiting the retrieval effectiveness, particularly on questions that are at all specific in nature. The limiting effect comes from the limited vocabulary, its relatively static nature, and from the quality and inconsistency of human indexing in an operational environment. It also has a long term drawback in that any decision to change the indexing approach, generates a need to reread and reindex all past documents. In practice, this is so costly that only selected portions of high interest actually are reindexed. 8a11

An alternative approach conceived to eliminate the limitations of an artificial language, is to input the entire text of the document in its original natural language. This then makes the

vocabulary equivalent to the humans at least in the field covered by the documentation input into the system. Although experimentation with this approach has been conducted since 1958, it has become a practical consideration for an operational system with the advent of third generation computing and storage equipment. Since there is no attempt to index documents upon input to the files, the burden of indexing is assumed at the time of search. It requires that the requestor be able to specify all the wordings and variations under which the authors might have discussed the topics of concern. An example of this approach is the GE Rapid Search Machine (RSM). 8a12

Placing the indexing burden on the requestor simplifies system design and lowers operational costs, however, unless the requestor is very familiar with the contents of the file or unless he is highly motivated and has a lot of patience he may never return to make a second query. Since the system will only find documents containing the exact same terminology used in the request, many potentially relevant documents may be missed. To increase the retrieval effectiveness, boolian logic - and, or, not - can be introduced. Also the capability to call for M out of N hits or to require that words occur within certain boundaries or in certain positions relative to each other increase the system's flexibility. To alleviate the exact match problem, it is easy to introduce a variable prefix, suffix, and root capability. Although these techniques potentially increase the system's effectiveness, it requires a trained requestor with complete familiarity with the data to take advantage of this potential. Also, there is no direct attempt to deal with the vocabulary problem. Several techniques are used to bridge the gap between the user and the system. A listing of all words, ordered alphabetically with frequency counts can be provided to the user. This allows him to get some feel for the contents of the file and he can tell at a glance the variations in word endings. A concordance can also be provided to indicate the context within which words in the data base appear. This can assist in intelligently using the "not" function and can lead to related terminology. 8a13

The above techniques increase the flexibility and, hopefully, the retrieval effectiveness of the system, but complicate the use of the system by the naive requestor. One method of making the system easier to use is to introduce a knowledgeable (system capability and data base coverage) intermediary between the requestor and the system. This approach has been used with apparent success by the IBM Technical Information Retrieval Center (ITIRC) people and by ASPIN Corp. using DPS. The alphabetized frequency listings and concordances are available

to the intermediary. Requests are phoned in and negotiated on the spot to arrive at a list of words and acceptable synonyms. The intermediary then uses these words along with the logical capabilities of ITIRC or DPS to set up a query. Its main shortcoming is that the system's ability to retrieve related data, in other words cope with the language problem, is completely dependent upon the intermediary. 8a14

A fourth approach is to build a machine thesaurus using frequency listings, concordance and humans to establish a thesaurus. This approach attempts to define the use of each incoming term within the data base. The thesaurus is then used by the computer to index incoming documents and natural language requests. There are, of course, the attendant problems of thesaurus maintenance. This may be reduced somewhat by splitting the file into several logical subfiles. And of course, the computer can keep track of new words and changes in their usage both in the requests and the documents. Hence, the dynamics of the system vocabulary will still lag somewhat the real word; however, the effect is nowhere as severe as with a manually constructed thesaurus. 8a15

It is also possible to construct lists of associated terminology completely with the computer. After passing the raw text through a root word analyzer and past a common word dictionary, frequency counts can be made on the occurrence and co-occurrence of terms within sentence, paragraph, document, and data base boundaries. The statistics thus obtained can be used to decide which terms appear to be highly related and which would be the most useful for discriminating one document from another. As with the thesaurus, the statistical association information can be used to assign further indexing to each document. The experimental SMART system developed by Dr. Salton of Cornell Univ. has taken this approach of combining several different indexing methods, including the methods just described. This system should then have the capability to find data related to the query which doesn't necessarily use identical terminology to that used in the request. 8a16

A fifth approach is that developed by Dr. Ossorio, Univ. of Colorado. He has a reliable method of accumulating the meaning of potentially important terms and phrases. Three or more informants for each potential subfield within the domain under consideration are asked to rate the importance of a number of terms to their subfield. The ratings are then averaged and factor analyzed. The result of the mathematical manipulations is an N dimensional (N being somewhat less than the original

number of subfields) "meaning" space. The location of a particular word in this space is then an index to its meaning. 8a17

Although the goal of Dr. Ossoro's work is to build a State-of-Affairs model, it is a very good retrieval device. Documents and requests can also be mapped into a volume of the N-dimensional space. A computation of the geometric distance between documents and the request then yeilds a measure of their closeness of meaning. 8a18

The method of obtaining ratings of several thousand terms to perhaps 100 subfields is costly and time consuming. It is, however, the very thing that makes the system work so well. It takes into account the system's user's view of the world right from the beginning. It requires no preconceived notion of the structure of the world and does not use a second or third party's opinion on how it should be structured. Essentially, the data obtained by this exercise determines the vocabulary structure and relationships between words. Since this data is collected from experts in their respective areas, who will be the eventual users of the system, it would seem a system based on this approach to the vocabulary problem is about the best attainable. 8a19

One recent development has been that of putting the requestor "on-line" with the data base. This is the first major contribution of the computer industry to information retrieval. Information retrieval in a real sense, is a form of communication between user and the data base. Successful libraries, through the use of intermediaries, have active dialogue between user and intermediary. With the advent of the on-line capability, the possibility of allowing the user himself to step through the data base, with appropriate computer dialogue aids, presents itself. 8a20

The retrieval effectiveness of any of the systems can be enhanced by on-line iteration. Since almost immediate response is the rule, it allows a requestor to review portions of the responses to assess whether or not he is obtaining satisfactory amounts and quality of documents. He can then change his request within the constraints of the system's vocabulary and logic if the results appear unsatisfactory. Just the fact that an on-line system provides rapid response to requests gives the requestor time to make several searches for each request. Hence, an overall improvement in retrieval effectiveness is gained at the expense of several searches. 8a21

State-of-the-art systems do not give much assistance to the user in formulating or changing his request. He is left pretty

much to his own devices in thinking of different terminology or trying to guess what terms an indexer might have assigned to documents of interest to him. The real potential of being on-line lies in the ability of the computer to assist him in formulating his initial query and in automatic reformulation of the query based upon feedback from the requestor. Rather than automatically substituting thesaurus entries, as SMART does, the entries can be displayed for a decision by the requestor as to whether or not they are appropriate substitutes. Likewise, statistically associated terminology can be displayed for consideration by the requestor. After two or three iterations of this kind, the query should be expanded to the point where the users capability to express his information needs has been exhausted. After the search is made and responding documents are rank ordered by the system in terms of what it considers to be most relevant, the user can review surrogates of the document. The user will be asked to make relevance judgements on the first few documents, i.e, relevant, irrelevant, can't tell. 8a22

By scanning the terminology in the relevant document, new words can be added to the query by the computer and weights of existing query words increased or decreased accordingly. The computer can then make a second search based upon the new list of query words. After two or three iterations of this type, most of the relevant documents will be raised in rank and most of the irrelevant depressed. The use of the feedback principle has a firm basis in cybernetic theory. The problem remaining in its application retrieval is to determine the parameters which make the entire system stable under a wide range of inputs. Dr. Salton has made some preliminary investigations in this area. On the surface, it would appear that some non-linear control technique would be most applicable. That is using different feedback algorithms depending upon what portion of the specific-general request continuum the requestor is operating in. 8a23

One added benefit of on-line, which is not readily apparent, is the fact that it gives the user easy access to the data base. Because the system is more accessible, it is used more. Batch operated computer systems often require formal procedures for requesting information. The result in many cases, has been that users avoid the system and continue to depend on personal contacts and files. Therefore, even though on-line systems are more costly to operate than batch systems, the number of searches conducted increases to the point that the cost per search is substantially lowered. 8a24

In summary, the approaches to deal with the retrieval problem are: 8a25

Intermediate language-established by trained lexical people and updated with inputs from the indexers and users, published as an official thesaurus for use in indexing and searching, Ex: DDC, MEDLARS, CIRC, COLEX, DIALOG, 8a26

No official vocabulary, search free text, System flexibility provided by boolean logic and prefix, suffix, root match, Specification of search words and their relationships left up to the user with perhaps frequency and concordance listings to assist him, Ex: RSM, RECON CENTRAL, 8a27

The approach, same as 2 above except a trained intermediary between requestor and system who negotiates and formulates the query knowing the data base and the systems capabilities, Ex: ITRIC, LITE DPS, ASPIN Corp., RECON CENTRAL, 8a28

Computerized thesaurus created and updated by humans with computer generated statistics on changing work patterns in requests and documents, Ex: ADICT, SMART, 8a29

Psychometric techniques used to obtain relationship of words to subfield, Factor analyzed to obtain N-dimensional "meaning" space, locate documents in space, Retrieval by locating request in space and computing geometrical distance to near documents, Ex: C-SPACE, M-E, SPACE, P-W SPACE, The order of the above five categories indicate increasing sophistication, complexity, flexibility, ease of use, cost, and hopefully retrieval effectiveness, 8a30

9

AFXDC INFORMATION RETRIEVAL SYSTEM

9a

a

9b

White Paper Study

9c

by

9d
Duane Stone
9e
John McNamara

9f
Rome Air Development Center
9g
Griffiss AFB NY
9h

MIKE 4-JUL-74 07:06 30917
Transcript of hard-copy version of Centronics interface requirements

(J30917) 4-JUL-74 07:06; Title: Author(s): Michael T. Bedford/MIKE;
Distribution: /MEH MIKE IMM; Sub-Collections: NIC; Clerk: MIKE;

MIKE 4-JUL-74 07:06 30917

Transcript of hard-copy version of Centronics interface requirements

Martin, Inez prepared this for you; sorry it was so light in arriving, but I thought she had sent it, and she thought I had....

Transcript of hard-copy version of Centronics interface requirements

RS-232 INTERFACE OPTION FOR CENTRONICS PRINTERS 1

The Centronics RS-232 interface is designed to interface a type 202 Dataphone or equivalent directly to any Centronics printer. This interface uses a single character parity check with a choice of even, odd, or no parity. Reverse channel is used to control the interaction between the printer and the Dataphone. The interface is supplied with a connecting cable that is pin for pin compatible with a type 202 Dataphone. Baud rates for the Centronics RS-232 interface can be selected from a range of 110 to 9600 bps. 2

Transmitting Sequence 2a

Once the call has been established, either manually or with the automatic calling unit, the transmitter starts the data transmission with a Start of Message (SOM) code. An SOM must precede every line of data or every command that is transmitted. Next, the data is transmitted serially using one start bit, seven data bits, one parity bit, and one or more stop bits. If the data is to be printed, the line is terminated with carriage return (CR). After the carriage return or control function is transmitted, an End of Message (EOM) code is transmitted. The transmitter must then wait for the reverse channel to go high indicating an acknowledge from the printer. If the acknowledge level is not received by the transmitter, within four seconds after EOM has been transmitted, a parity error may be assumed and the line or function may be retransmitted. If the acknowledge level is received, the transmitter waits until the reverse channel line goes low and then transmits the next line of data. 2a1

Receiving Sequence 2b

The interface accepts serial input data from the data set, assembles the received data into 8-bit characters (seven data bits and one parity bi), checks the parity of the received data and transfers the assembled character in parallel to the printer. Signal levels between the interface and the data set conform to RS-232 standards. Signal levels between the interface and printer are TTL compatible. 2b1

A reverse channel indication to the data set, controlled by the received data (EOM code) and the status of the printer, prohibits data transmission whenever the printer is not able to accept new data. The absence of a reverse channel response to a data transmission indicates that a parity error was detected in the received data. 2b2

Programming notes 2c

When the RS-232 interface is used, any transmitted control character which could cause a busy condition (e.g., LF, FF, CR, etc.) must be immediately followed by an EOM. The reason for this is a BUSY signal from the printer does not activate Reverse Channel, but only extends Reverse Channel, if it was previously activated. 2c1

Without a Reverse Channel response, the data set receives no indication that the printer has gone busy and further data transmissions could result in a loss of data. 2c2

An EOM (with no parity errors in the preceding message) will activate Reverse Channel. 2c3

In the model 102A printer, a busy condition can also be caused by an Elongated Character code (octal 0 16), because the carriage must return to the left margin before printing elongated characters. As a result, in a 102A with a RS-232 interface, each octal 0 16 code must also be followed by an EOM. 2c4

The Reverse Channel signal to the data set is at least 200 milliseconds long and remains active as long as the printer busy condition exists. After going inactive, Reverse Channel cannot be activated by a new EOM for another 200 milliseconds. This delay is generated on the interface board. As a result, new data should not be transmitted for at least 200 milliseconds after Reverse Channel goes inactive. 2c5

Physical Description 2d

The RS-232 interface consists of a single printed circuit board and cable assembly contained in the printer enclosure. The printed circuit board plugs into the interface slot at the rear of the printer. The cable assembly consists of a 10-foot cable with a small etched card (fingerboard) connector at one end and a 25-pin connector at the other end. The fingerboard plugs into a connector on the right side of the interface card, and the 25-pin connector plugs into the data set. A connector plate and strain relief bushing is also included which allows the cable to attach to the speaker bracket at the rear of the printer. 2d1

NOTE: When ordering a Centronics RS-232 interface, specify baud rate and odd, even or no parity. Any baud rate from 110 to 9600 is available. 2d2

MIKE 4-JUL-74 09:48 30918

this is a test of the keyword concept

(J30918) 4-JUL-74 09:48; Title: Author(s): Michael T. Bedford/MIKE;
Distribution: /MIKE; Sub-Collections: NIC; Clerk: MIKE;

MIKE 4-JUL-74 09:48 30918

this is a test of the keyword concept

TITLE:
COMMENT:
AUTHOR(S):MIKE
DISTRIBUTION:
SUBCOLLECTION:
CLERK:MIKE
GO.

(J30919) 4-JUL-74 09:56; Title: Author(s): Michael T. Bedford/MIKE ; Sub-Collections: NIC; Clerk: MIKE ;

j test

PIW 8-JUL-74 07:46 30920

Meeting iwith S Sanyal, July 5th, 1974.

(J30920) 8-JUL-74 07:46; Title: Author(s): Phil I. Weintraub/PIW;
Distribution: /; Sub-Collections: NIC; Clerk: PIW;
Origin: <WEINTRAUB>BNR.NLS;1, 8-JUL-74 07:36 PIW ;

Meeting iwith S Sanyal, July 5th, 1974,

Met with Shanker Sanyal over Conference T,V, on July 5th to discuss the status of the Information Retrieval projects, in particular, to discuss what has been done for us up to now and what remains to be done in the remainder ofthe year, When I asked Shanker for a copy of the status report on the program, he mentioned that it would be available for us when he will come to Montreal to meet with Larry and I on July 12th,When asked how much of the $140k has been spent so far this year, Shanker mentioned that he would have a better fix on the exact amount by the middle of this week; he did mention, however, that between 50-60% of the money has been spend, 1

When we got on the topic of what has been done for us so far this year, he answers seemed evasive,The main output this year has been the movie guiede report, of which the revised draft will be issued shortly; in fact, a copy will be brought to the meeting on July 12th when Shanker and Paul Likker will come down to Montreal to put on a presentation on visual retrieval,We will also have an opportunit to review the movi guide report recommendations and decide what additional researc will be done from here on it and for 1975, 2

Some work has been done in Fuzzy set theory; that project, right now, however, is at a standstill, Some work ha been done in the formulation of information centres; no work is being done in that area now for lacl of funds, When I asked Shanker whethe or not his group will use he behavorial research lab when completed, he replied that they have nom no plans to; he also mentioned that no case money is being charged to the construction of the lab, I asked Shanker where the money is comming from to build the la; he commented that he did not know, 3

In short, the main work done so far is the movie guide project, and the wor bein done if Fram File Video by Paul Likke, here he designed the software and is not working o designing the hardware; additonal lab research is being planned in this area, 4

When I asked Shanker as to what is being planned for the remainder of 1974, he mentioned that he is hoping that some of the recommendations in the movie guide report will be accepted, I told him that simila projects to movie-guide would most probably not be accepted, 5

I told Shanker of my interest in the Intra-Urban area, in particular the remote-working area, I mentioned that perhaps we sould consider for 1975 some lab or aual expeiments in that area, 6

The meeting was concluded with a confirmation of the meeting to be held on July 12th, 7

RJC 8-JUL-74 08:11 30921

Tickler for the Month of June 1974

(J30921) 8-JUL-74 08:11; Title: Author(s): Roberta J. Carrier/RJC;
Distribution: /RJC RBP; Sub-Collections: NIC; Clerk: RJC;

RJC 8-JUL-74 08:11 30921

Tickler for the Month of June 1974

(jem2) 3 June - Monday 1

A-119 - 0900-1200 - R & D Computer Facility - Building For IS Personnel 1a

News Brief items due into Becky Today,(KJOURNAL, 19533, 1;w) 1b

Bobbie: Personnel Strength Rpt, due, 1c

(jet2) 4 June - Tuesday 2

Due Date: ISIM/ISIS - Re: Defense Community Service Program 2a

1300 hrs, Branch Chief's Meeting 2b

(jew2) 5 June - Wednesday 3

Due Date - ISI - Verification of Telephone Listing from Sections, 3a

ISC Confessions 0830 hrs, 3b

SAY FAREWELL - 1800 - 2000 hrs, GAFB Officers Club $3,00 per person Stand-up Buffet Pay as you go Happy hour prices first hour Tickets may be obtained by contacting M, Kobos by 31 May 74, 3c

(jeth2) 6 June - Thursday 4

0830 hrs, Branch Chief's Meeting 4a

Laboratory Activity Reports due today: Bucciero must have them by 1000, ISM must have them by 1100, and DOT must have them by 1600,(KJOURNAL, 19513,1;w) 4b

(jef2) 7 June - Friday 5

Timecards due today 5a

Bobbie: Travel figures due by noon, 5b

(jem3) 10 June - Monday 6

TITLE: USAF/AFSC Software Program
Schedule Should go Like This:
Week of 10 June Informal Documentation
Week of 17-24 - Final Documentation
Week of 24 June "FORMAL" Coordination Week
Require Plan into DDR&E by 5 July 6a

Management Assessment review (IS), 6b

RJC 8-JUL-74 08:11 30921

Tickler for the Month of June 1974

(jet3) 11 June - Tuesday 7

1300 hrs, Branch Chief's Meeting 7a

(jew3) 12 June - Wednesday 8

Al Barnum - TDY 8a

Col Krutz - TDY 8b

Maj Stinson - TDY 8c

F, Tomaini - Leave PM 8d

D, Loreto - Leave PM 8e

R, Dondero - Acting Division Chief 8f

ISF Confessions 0830 hrs, 8g

(jeth3) 13 June - Thursday 9

Maj Stinson - TDY 9a

Due Date - ISIM/ISIS - Listing of Technical Papers (Required for inclusion of RADC Annual Accomplishment Report) - Completed 9b

0830 hrs, Branch Chief's Meeting 9c

Laboratory Activity Reports due today: Bucciero must have them by 1000, ISM must have them by 1100, and DOT must have them by 1600,(KJOURNAL, 19513,1:w) 9d

Due Date - ISIM/ISIS - Request for input to TIP Panel 1976 program w/1 attach formal/proposal sheet, - Completed - Negative 9e

Due Date - ISIM/ISIS Lab directors fund Fy-75 Proj, proposals, Completed 9f

(jef3) 14 June - Friday 10

Due Date - ISIM/ISIS - Preface for General Section, RADC Annual Accomplishment Report - Submit 1000-2000 word - doubled-spaced Preface 10a

ISIM - LaForge - Bridge Report 10b

Bobbie: Travel figures due by noon, 10c

Tickler for the Month of June 1974

(jem4) 17 June - Monday 11

TITLE: USAF/AFSC Software Program
Schedule Should go Like This:
Week of 17-24 - Final Documentation
Week of 24 June "FORMAL" Coordination Week
Require Plan into DDR&E by 5 July 11a

Due Date - ISI/Tom - Cont, F30602-72-C-0326 Info Ret Res w/UC, 11b

Due - ISIM/ISIS - Nominations for the Junior Officer Speaker's Bureau COMPLETED 11c

(jet4) 18 June - Tuesday 12

Due Date - ISIM/McNamara - Determination of Final Invention Rpt, F30602-72-C-0281 with Syracuse University - completed 12a

Due Date - ISIM/ISIS - Re: AFIT Student Research - Completed 12b

1300 hrs, Branch Chief's Meeting 12c

Collect topic write-ups today by noon for Confessions, 12d

R & T Selection of the Month is due in ISI, (KJOURNAL, 19531, 1;w) 12e

(jew4) 19 June - Wednesday 13

Due Date - ISIM/D, Stone - Sys 921A (93390101) Data Handl Support Air Staff - Completed 13a

Due Date -ISIM/Daughtry - Determination of Final Invention - F30602-73-C-0198-PRC - completed 13b

ISI Confessions 0830 hrs, 13c

Due Date - ISIM/ISIS - AFSC Director of Science & Tech Lab Civilian Career Dev Program - Completed 13d

(jeth4) 20 June - Thursday 14

Mr, Draper from Air Force Auditing Agency will be visiting John McNamara, 14a

Due Date - ISIM/ISIS/ISC - Draft Plan - Advanced Computer Technology 14b

0830 hrs, Branch Chief's Meeting 14c

Tickler for the Month of June 1974

Laboratory Activity Reports due today: Bucciero must have them by 1000, ISM must have them by 1100, and DOT must have them by 1600,(KJOURNAL, 19513,1:w) 14d

Due Date - ISIM/ISIS - Number of personnel attending proposed presentation by Bell Northern Research of Canadian Bell System 14e

(jef4) 21 June - Friday 15

Due Date - ISIM/ISIS - GRI Suggestion #74-1039, "Form for Requesting Commercial Information" - Please submit comments,Completed 15a

Mr, Draper from Air Force Auditing Agency will be visiting John McNamara, 15b

Due Date - ISIM - Unsol, Prop, DO197-74 "GCOS/MULTICS File Transfer Facility (Honeywell) - Completed 15c

Due Date - ISIM/D, Stone - Negative Interim Report on inventions - F30602-72-C-0313-SRI - Completed 15d

Timecards due today 15e

Bobbie: Travel figures due by noon, 15f

(jem5) 24 June - Monday 16

TPO Overview Chart & Technical Area Write-Up 16a

TITLE: USAF/AFSC Software Program
Schedule Should go Like This:
Week of 24 June "FORMAL" Coordination Week
Require Plan into DDR&E by 5 July 16b

(jet5) 25 June - Tuesday 17

1300 hrs, Branch Chief's Meeting 17a

(jew5) 26 June - Wednesday 18

0830 - ISF Confessions! 18a

(jeth5) 27 June - Thursday 19

Laboratory Activity Reports due today: Bucciero must have them by 1000, ISM must have them by 1100, and DOT must have them by 1600,(KJOURNAL, 19513,1:w) 19a

Tickler for the Month of June 1974

1600 hrs, - Officers Commander's Call at the Officers Club 19b

(jef5) 28 June - Friday 20

Branch Chiefs Meeting - 1030 hrs, 20a

Leave for Margaret - 4 or 8 Hrs -- ISI 20b

Wine and cheese party - Charlie Breece - $2,50 per person - Display Facility - 1700 Hrs, - see Marilyn Rossi X7009, Tickets NLT 22 June, 20c

IBM coming to see demonstration - Contact Point - Duane L, Stone - Fred Lupino, J, Naughton and Frank Finnegan are the visitors, 20d

JOVIAL Manual--COM Statement of Work

(J30922) 8-JUL-74 11:05; Title: Author(s): Duane L. Stone/DLS; Distribution: /JCN EJK RN2 JLM FJT TJB2; Sub-Collections: RADC; Clerk: DLS;

DLS 8-JUL-74 11:05 30922

JOVIAL Manual--COM Statement of Work

Unless there are changes up-line, this will be the SOW for the JOVIAL manual job,,,Project 5550, eng, change to 0076 (Workshop Utility Service),

JOVIAL Manual--COM Statement of Work

The contractor shall provide engineering services and high-quality Computer Output to Microfilm (COM) capability to support the production of the JOVIAL J73 Programming Language Specification document. The textual content of the document has been input to NLS and resides in files on the Office-1 computer. The NLS Output Processor subsystem and the Data Dissemination Systems' COM device will be used to obtain the output. 1

The document contains approximately 1200 typewritten pages. Pilot runs indicate a 35% reduction in the number of pages, due to the proportionally spaced type obtained from the COM device. The document requires frequent type font and size changes and contains many tables and equations. Due to the complexity of the task, it is expected that at least 2 proof runs will be necessary before the final run is made to produce camera ready copy. 1a

PF 9-JUL-74 11:27 30923

Cross Impact

(J30923) 9-JUL-74 11:27; Title: Author(s): Phil Feldman/PF;
Distribution: /LHD; Sub-Collections: NIC; Clerk: PF;

Cross Impact

Re:Terrault's letter to Anderson on Cross Impact 1

1)The program referred to is Murray Turoff's version which is the main cross-impact version. 2

2)The agreement to trade rather than sell the program was made partially because Bell owns the software and partially because DREE was not prepared to pay out the money. 3

3)Though Bell could sell the program to future clients it can line up, since DREE has been kept waiting for several months already, it appears that it would be best to let this agreement take place. 4

MIKE 9-JUL-74 13:00 30924

memo to KSH to keep him posted re SEARS; RCS-WFL memo, and BNR work on data set for rotary-dial input

(J30924) 9-JUL-74 13:00; Title: Author(s): Michael T. Bedford/MIKE; Distribution: /LHD MIKE; Sub-Collections: NIC; Clerk: MIKE;

MIKE 9-JUL-74 13:00 30924

memo to KSH to keep him posted re SEARS; RCS-WFL memo, and BNR work on data set for rotary-dial input

how does this look....to long ?

memo to KSH to keep him posted re SEARS; RCS-WFL memo, and BNR work on data set for rotary-dial input

TO : K.S. Hoyle (Assistant Vice-President - Planning)
FROM : M.T. Bedford (Supervisor - Business Planning)
RE : recent developments in the Sears Automated Order Service project. 1

Chairman Scrivener recently (mid June) requested information from Walter Light on 1.) the impact of the the Sears AOS project (and other like it) on the introduction of TouchTone; 2.) our policy regarding supplying names of TouchTone subscribers to organizations such as Sears; and 3.) the nature and extent of Bell Canada's cooperations with Sears in this venture. 2

The request took the form of a memo to Light, which was directed to Roth, and thence to McBrearty. I supplied Tim Edge (from McB's group) wth all sorts of background data on our involvement with Sears, stressing the fact that everything we did (meetings, proposals, etc.) was cleared with Andy MacMahon's groups in advance (specifically, with Geoff Weeks of that group). Tim prepared the memo, which McB, reworded to make it look even less as if the Toronto Area CC Mktg. people had somehow lost favor in Sears' eyes. 3

McBrearty and Roth presented this cleaned up response to Light, but at the same time they pointed out that perhaps he should have referred it to Krupski who could have chased down the CC Mktg. people in Toronto for a response. This is in fact what Light decided to do. He has routed the Scrivener request to Krupski. (McBrearty was concerned that it might get back to the CC people that the request had originally slid down the H.Q. chute; he asked us to sort of downplay this fact if it ever comes back to us.) 4

This interest expressed by the senior executives in the Sears AOS experience is further exemplified in deGrandpre's intention to demonstrate the Sears AOS in to a groups of financial analysits at a luncheon meeting in Toronto (early June, I suspect), as part of a "wired city is here today" address. The demonstration was called off at the last minute when one of the datasets or the computer itself refused to cooperate. 5

Regarding the development of a receiver-decoder for rotary dial signaling (actually a data set that would answer a called number, detect clicks in the line from a rotary dial being operated at the calling number, and converting these clicks to a machine readable code), I met with Sears Maurice Anderson and their National Communications Manager Tony Tyler on July 8. With me were Mr. Sanyal from BNR Systems Engineering and two representatives from BNR Customer Apparatus. They demonstrated a very rough prototype of this data set, and the Sears people were qite impressed with the initiative we had shown and with our work to date. They have

memo to KSH to keep him posted re SEARS; RCS-WFL memo, and BNR work on data set for rotary-dial input

proposed that Custmer Apparatus continue to develop the dataset to the point that Sears could use it to test customer reaction to the rotary dial form of input, We estimated that this would take another two to three months work on BNR's part, and we felt it important to stress to Sears that this would not be a perfected dataset that Norther might consider manufacturing, since its whole reason for being would be to permit Sears to evaluate customer reaction to it, and at that same time, permit us to introduce a prototype device into a real-world situation much earlier than would be the case if normal prototype operating characteristics had to be achieved first, 6

What we are saying with the Sears people is that we both have an opportunity to investigate the feasibility of rotary-dial end-to-end signaling with a minimum investment in time and money, Regarding the funding of this prototype, I expect that the hardware development costs would be shared by Systems Engineering (the information retrieval case ?) and Customer Apparatus, The evaluation of customer reaction to the rotary-dialing aspect would be conducted by Sears and made available to us, 7

BNR's work on this project can be justified from two different points of view, In the first place, they're cooperation with Sears will keep them in touch with one of the most advanced systems of its kind in North America, They will develop a better understanding of the problems involved in designing such a network, and they will have access to Sears' data on users' reactions to the different elements of the service, Second, they will be developing a technology (rotary-dial end-to-end signaling) that could be a potential money-maker for Northern in the event that automated systems such as this evolve faster than Bell Canada is able to provide Touch-Tone service to potential users, 8

test fir gord millard

(J30926) 10-JUL-74 10:37; Title: Author(s): Michael T. Bedford/MIKE;
Distribution: /MIKE; Sub-Collections: NIC; Clerk: MIKE;

test fir gord millard

provision for a private work space for individual conferees 1

Murray approached this idea (which is the key to the Englebart approach to "intellect augmentation" when he suggested the capability of starting a message, leaving the conference, and then coming back at a later date to 1,) complete the message, and 2,) enter it into the conference proceedings, 1a

With this capability, you would be able to prepare several messages at one time, and distribute them to selected conferences at later dates; also, you would be able to enter a series of messages (memos, letters, minutes of meetings, agendas, etc.) in this same workspace for your won use, 1b

Mitre-Tip Resource Notebook Entry

(J30927) 10-JUL-74 12:02; Title: Author(s): Jean Iseli/JI;
Distribution: /JAKE; Keywords: mitre-tip resource notebook;
Sub-Collections: MITRE-TIP; Clerk: JI;
Origin: <HELP>MITRE-TIP.NLS;1, 10-JUL-74 11:25 JI ;

Mitre-Tip Resource Notebook Entry

(MITRE-TIP) MITRE Corporation
National Systems Design Dept. 1

Choose one by typing, for ex.: s[how] personnel CR 1a

(FUNCTION) 1b

TIP HOST 145 IMP 17/HOST 2 1b1

(ADDRESS) 1c

MITRE Corporation
National Systems Design Dept., W185
Westgate Research Park
McLean, Virginia 22101
Phone: (703) 790-6000 1c1

(PERSONNEL) 1d

(LIAISON)
Jean Iseli (JI) (703) 790-6373/6371/6318
Michael A. Padlipsky (703) 790-6000 1d1

(INTERESTS) 1e

MITRE is participating in all facits of network development for federal, state, and local government agencies and in the transfer of network technology thereto. MITRE is also active in the development of computer assisted instruction systems and in their adaptation to network usage. MITRE is actively conducting experiments with interactive cable television systems and performing R&D in their subsumed technology. 1e1

JI 11-JUL-74 08:31 30928

Request of Journal Mail change

(J30928) 11-JUL-74 08:31; Title: Author(s): Jean Iseli/JI;
Distribution: /JCN(fyi) MLK; Sub-Collections: NIC; Clerk: JI;

JI 11-JUL-74 08:31 30928

Request of Journal Mail change

Marcia -

Coould you please change the appropriate ident records so that I receive my journal mail in <help>ji.nls at Office-1, Thanks,,,Jean 1

MIKE 15-JUL-74 05:35 3093

historical flashback ......

6-MAR-74 1127-PDT NAPKE: nothing
Distribution: BEDFORD
Received at: 6-MAR-74 11:27:27 1

this is a nothing message to see if i can send meassages!!!!!!!!! 1a

MIKE 15-JUL-74 05:35 30930

historical flashback ......

I was looking through my old messages, deleting a lot of them, and came across this....

MIKE 15-JUL-74 05:35 30930

historical flashback .....

(J30930) 15-JUL-74 05:35; Title: Author(s): Michael T. Bedford/MIKE;
Distribution: /PAN; Sub-Collections: NIC; Clerk: MIKE;

File Transfer - The Hard Way

(J30931) 16-JUL-74 11:31; Title: Author(s): Edmund J. Kennedy/EJK;
Distribution: /; Sub-Collections: RADC; Clerk: EJK;
Origin: <KENNEDY>FORROGER.NLS;1, 12-JUL-74 09:18 EJK ;

EJK 16-JUL-74 11:31 30931

File Transfer - The Hard Way

One area of cooperative endeavor that is truly 'shared' is the preparation of the annual AFSC Technology Plan. Inputs from many sources are incorporated into a major report. Each section of the report is prepared by several people, often at different physical locations. The several contributions must be brought together, consolidated into a cohesive whole and structured in accordance with very rigid standards. 1

Under normal conditions this means that a final draft, in hard copy, must be transported to the person responsible for the whole section. Normally a typed copy is mailed or handcarried, or transmitted by special pouch. The time required for deliveryranges from several hours to several days. Upon receipt, since it is a draft hard-copy it it always necessary to rekey the copy. This is true whether it is done on a typewriter, an IBM MTST, or on a terminal interfaced with a computer using NLS, Multics or one of the many other options. 2

Recently the ARPANET was used to expedite delivery by going directly to the MIT-Multics machine and printing out a copy of a part of one TPO that had been prepared at ESD using Multics. 3

At about 1730 on 21 Jun I received a call from Maj. Bailey at ESD inquiring if Roger Panara had been able to read the file in the MIT-Multics computer. I said that he had managed to read it out and print a copy on one of our on-line terminals. I also indicated that it was too bad that the file could not be shifted over to NLS, so that we here at Rome could manipulate the material, edit, and print out a good final copy on one of our Tycoms. 4

I asked him if he knew how this might be done. He referred me to Lt. Karger. We explored some possibilities, which was difficult since I know nothing of Multics and he was unfamiliar with NLS. As a last resort I asked him if he could send me the file as a message as I knew they could use the ARPANET to send messages. After a ltle trial and error I received the following file in the form of a message. 5

THE ORIGINAL MESSAGE: 6

> 06/21/74 1737-edt Karger,Druid at MIT-Multics: Net mail from site MIT-MULTICS

File Transfer - The Hard Way

Distribution: KENNEDY
Received at: 21-JUN-74 14:40:46 6a

```
,m4 7
,ll 58
,he S%Date%$DRAFT$bailey-devel-plan,runoff$
,na
,ds
,ce 1
ADP SYSTEM SECURITY
,sp 2
P__r_e_f_a_c_e
,sp
```

This summary plan has been prepared as a talk write-up as directed by RADC message R051935Z JUN 74, subject: PE 63728F, Advanced Computer Technology. As such, this summary assumes the reader already has a thorough understanding of the history and technical approach for this development task.

```
,sp
I__n_t_r_o_d_u_c_t_i_o_n
,sp
```

The objective of this advanced development task is to develop security technology for modern AF computer-based systems and, consequently, to make possible secure sharing of resources and data bases. By resources, we refer to the hardware/software resources of modern ADP systems, which represent a major capital investment for modern AF systems. By data bases we refer to that data which, because of its cost of collection or because it is critical to decision making, has become a major AF asset. The data bases can be either integrated, that is on a single ADP system, or network, that is on multiple ADP systems usually geographically distributed.

```
,sp 2
R__e_q_u_i_r_e_m_e_n_t_s
,sp
```

This section summarizes the current knowledge of computer security requirements of major Air Force ADP users. While it is not exhaustive, it does indicate the major problems that have been encountered to date, and from it, trends in future requirements can be inferred.

```
,sp
```

It should be noted in this introduction that computer security requirements have not yet made themselves

apparent by the occurrence of hostile penetrations directed against computers processing classified data. The reason for this lack is not that such penetrations are impossible, but that current policies dictate the operation of computers in modes that preclude such penetrations. 6b

In particular, computers are required to be operated in a "system high" security environment with all users, terminals, physical areas, and communications cleared for all information in the system. Recent policy modifications have offered ADP managers the option of weakening these restrictions, but most installations have declined to implement the modifications, believing them inconsistent with their responsibilities for protecting classified information.

.sp

The following paragraphs address the impact of computer security on system costs and on operational capabilities.

.sp

COST IMPACTS

.sp

The cost impacts of computer security have been reflected in expenditures for increased protection, additional equipment, and inefficient system utilization. Typical of the installations that have required increased protection is the Air Force Data Services Center at the Pentagon. There, additional personnel clearances, vaulted areas, and secure communications have been required to allow users to do unclassified processing on computers that handle classified data bases. The cost of securing each remote site (exclusive of terminal equipment) has been estimated by AFDSC at $50,000. At SAC, additional SIOP clearances and area protection were required for personnel of the 4000th Support Group when the Group was to receive its computer support from the SAC WWMCCS ADPE.

.sp

Additional equipment has been required by computer users that were required to provide responsive support to user communities of varying clearance levels. At AFDSC, a time-sharing system (an HIS 635) was acquired to provide unclassified computing services to AFDSC's users in open office areas. This computer was acquired to supplement the classified

processing systems (with secure remote terminals)
mentioned in the paragraph above. 6c

At SAC a new system (also an HIS 635) was acquired to support
administrative and financial applications
classified up to secret, rather than put those applications on
the SAC WWMCCS equipment.
In addition, one of the two SAC WWMCCS dual processors was
split into two single processor systems so that
development, on-line support and planning applications, each of
differing sensitivity, could each have its own
computers.
A third WWMCCS processor is now planned at MAC, resulting from
the need for MAC to provide responsive
support to Top Secret crisis management applications.
The cost of the added equipment mentioned above is
approximately $6 million (estimated at $2 million for each
635 and $1 million for each dual processor split).
Additional Air Force WWMCCS (and other) computer facilities can
be expected to require similar additions of
equipment as major classified processing applications become
fully operational.
.sp
Inefficient equipment utilization is reflected in a
phenomenon of classified processing
systems known as the "color change".
In a color change, all work of one classification (or
compartment) is completed, print queues are drained,
and media dismounted.
Then system memories are cleared, new media (including the
operating system residence) are mounted, and a version
of the system brought up to process the new classification.
The actual time required to perform the change of media and
clear and restart the system varies from
twenty to forty-five minutes.
The color change may be propogated over two to three hours
processing in refusal to accept long jobs and savings
of files on backup tapes.
Color changes are usually used in those cases where
responsiveness and workload do not demand that a
computer be dedicated to a given classification.
Thus SAC, with its multiplicity of WWMCCS computers, performs
several color changes each day. 6d

MAC and the SAC intelligence computer (a 360/85) also perform
color changes as do many smaller WWMCCS installations.
These changes can easily require ten to twenty-five per cent of

a system's processing capacity,
.ft
Assuming system in use ten hours per day, two color changes at 1/2 hour each, and 50% system degradation for an hour around each change,
.ft
.sp
OPERATIONAL IMPACTS
.sp
In general, it appears that operational requirements for secure computers are met, either by adding equipment to provide a computer of the required level, or by clearing all users for access to all information processed,
Occasionally, however, a requirement makes itself felt,
The following paragraphs discuss two such requirements,
.sp
During the October War, MAC was required to fly an airlift of military equipment to Israel,
Owing to the sensitive nature of the airlift and international situation, MAC classified the airlift operation,
It was then found that the MAC computer configuration was so oriented toward unclassified operation that it could not readily support the top secret requirement,
It was also found that the management of the operation was virtually impossible without the full support of computer for unclassified processing,
This forced MAC to use extraordinary processing measures thereby putting the operation in jeopardy,
.sp
A second class of requirement concerns the integration of intelligence and operations data,
Such integration is required for responsive force management, but must be done in such a way as not to jeopardize intelligence sources,
In this case, it is often not possible to clear all system users for the intelligence data,
Thus manual intervention is used -- a cleared intelligence officer hands a subset of the data to the operations element,
As automated integration of such data is required, this option becomes unacceptable, and a direct 6e

solution to the multilevel security problem is required,
.sp
SUMMARY
.sp

The paragraphs above have summarized major impacts of the requirement for computer security.
The cost impacts may run to ten to twenty-five percent or more of the cost of Air Force computer installations processing classified data -- perhaps $25 to $100 million per year.
Operationally, most requirements are met by dollar expenditures, but a significant subset is arising that require real time information sharing and cannot be met even by this means.

.sp 2

T__e_c_h_n_i_c_a_l A__p_p_r_o_a_c_h

.sp

The technical approach being taken under this ADP system security task has two key features.

.sp

a. It addresses the fundamental security issues raised by inclusion of computers in information processing.

.sp

b. It focuses on a positive approach to providing technological solutions -- the security kernel.

.sp

In terms of addressing fundamental issues, we note that classically, information is protected by external techniques such as physical barriers, personnel clearances, administrative procedures, and COMSEC (encryption, TEMPEST).
None of these address the capability of computer to provide, essentially simultaneous sharing of both resources and information.
The focus, therefore, in this development task is internal controls for sharing and the technology issue is their effectiveness.

.sp

The security kernel approach is a radical departure from other approaches to computer security. It asserts

.sp

- internal controls must be designed into the system.
- internal controls must be proven effective a priori, i.e., before they are put into use.
- internal controls must be separate from rest of the system -- "a kernel".

.sp

The security kernel approach begins with a precise definition of internal security, i.e. a model, which describes 6f

.sp

-what objects are to be protected,
-who are these objects exposed to,
-under what conditions can they be accessed,

,sp
The model then guides and constrains the design and implementation of the security portion of the system.
Once the implementation of a security kernel is complete, it must be certified that it correctly and completely implements the model.
With this approach we immediately note a significant property
,sp

-only the security kernel affects internal security,
-no other internal portion of the system can effect the security of information or the integrity of the internal security controls themselves,

,sp 2
A__c_h_i_e_v_e_m_e_n_t_s
,sp
There have been a number of significant achievements and milestones on this task to date.
These are primarily in the areas of fundamental understanding and approach validation.
However the insight gained is having an immediate payoff in terms of guiding users and developers in appropriate directions for true ADP system multilevel security.
,sp

First, fundamental security concepts have been established.
In particular, the reference monitor concept discussed in ESD-TR-73-51 is being applied.
In addition, two types of security models have been developed, a finite state model (ESD-TR-73-278), and a layered model (ESD-TR-74-117).
The development of models was a major milestone -- one critical to initiation of the security kernel approach.
Second, the security kernel approach to internal security controls was identified.
In particular, the security design principles of
,sp

(1) complete mediation
(2) isolation
(3) small and simple

,sp
were formulated (MCI-73-1).

Third, the technical feasibility of the security kernel has been validated. This validation consisted of 6g

a feasibility demonstration, a design and implementation of a security kernel on a PDP-11/45 minicomputer.
The result, using such techniques as structured programming and a higher order language, is a security kernel which consists of about 500 lines of code.
The design is documented and available for unlimited distribution in ESD-TR-73-294 as are all the other products being produced under this task. This validation was the second major milestone.
It is the key reason for continuing to press forward with this task.

,sp 2

T__e_c_h_n_o_l_o_g_y T__r_a_n_s_f_e_r

,sp

In addition to the success in the development effort, there has been considerable success in identifying technology transfer areas.
New capabilities have been provided to system designers.
Automated "sanitization" of outputs from multilevel data bases is being demonstrated using the PDP-11/45.
AABNCP will now have the technology needed to share multilevel data in realtime.
WWMCCS can now consider secure networking of its ADPE using either secure general purpose processor or secure front end processors.
Intelligence can now conceptually be integrated with command/control information, e.g. IDHS & WWMCCS.

,sp

We have also been able to respond rapidly to user needs because of the availability of fundamental concepts.
The AFDSC in the Pentagon needed a two-level system to operate in controlled environment.
The modeling work done at Case Western Reserve University was used to guide the design of security enhancements to the AFDSC Multics
to provide access features appropriate to the military environment.

,sp

In the area of simpler, more reliable system design, SAC requires a single secure, survivable communication system to replace
current systems. With a security kernel, a less complex design and implementation for the communication processor is possible because 6h

the access controls are all within the security kernel instead of being diffused throughout the software,

.sp

Finally, lower system costs are now possible for such systems as MAC's Integrated Management System (MACIMS) because a single integrated system can be used for processing both classified and unclassified data, where as the current hardware/software base forces the processing to be split, therefore requiring additional and duplicative hardware and software (SAC had to procure for approximately $1,000,000 of extra ADPE in order to meet their security requirements), Additional operation and maintenance cost are above and beyond the investment cost and contribute to an appreciable increase in life cycle cost,

.sp

There have been a number of products which have been produced to assist and describe the technology transfer efforts, These are listed below:

.sp

.nf

Developments Summary	(MCI-74-1)
Secure DBMS Design Issues	(MCI-74-2)
Multics Evaluation	(ESD-TR-73-256)
Multics Security Design Analysis	(ESD-TR-74-176)
Secure Multilevel Data Base System	(MWP-5679)
Minicomputer Security Control System	(MTP-142)
Concepts for Secure I/O	(ESD-TR-74-113)
Architectures for Secure Computing	(MTR-2772)

.sp

.fi

F_Y__7_5_ P__l_a_n_s

.sp

In FY75, these are the anticipated results, based on the planned funding level, A methodology for certifying a security kernel will be established, The initial application of this methodology will be the PDP-11/45 security kernel, For a target large scale general purpose system there will be (1) a definition of security kernel for the ARPA supported Multics system at MIT; (2) a study of the operating system design issues raised by including a security kernel -- the

Multics operating system is the target; (3) a study of the effort required to integrate a security kernel into a currently available, modern, useful general purpose computer -- again Multics is the target,
A RADC contractual effort will provide a model for a secure DMS,
There will be an audit and surveillance concept established for operation within a secure system,
The performance requirements for a low cost secure office terminal will be defined,
Finally, feasibility of multiplexed encryption for a central computer will be studied and functional requirements identified,
,sp

This task interfaces and interacts with a number of other projects concerned with security in ADP systems,
First, there is a direct interface with ARPA's information processing program,
The operating system security at MIT under project MAC is a Joint ARPA - AF project,
The AF has engineering responsibility for the project as well as contributing equally with ARPA in terms of funding support,
With industry, there is also a direct interface and interaction with Honeywell's corporate security project - Project Guardian - through a cost-sharing contract ($200K in FY74),
This is in line with the DOD encouragement of industry participation in projects of mutual benefit,
This Joint AF - ARPA industry project will continue in FY75,
,sp

O__t_h_e_r S__u_p_p_o_r_t _a_n_d C__o_o_r_d_i_n_a_t_i_o_n
,sp

In addition to the AF - ARPA - Honeywell project, in which depending on the ADP security task from both funds and engineering direction, technical staff members siton the IBM-TRW Review Committee,
This committee is reviewing the government's secure data processing requirement for IBM,
With JCS (WWMCCS), the Air Force has members on the JTSA WWMCCS Security Test Team and has reviewed the results of the recently completed SDC R&D study with JTSA to assure 6j

complementary ADP security development programs,
With NSA, the Air Force through the System Program Office, has a direct interface on the SATIN IV network security requirements, and has participated in review of their R&D contracts,
,sp

General liaison by past personnel has established a wide range of contacts.
These include the Army (Computer Command, Intelligence System Support Detachment),
the Navy (ONR, NELC, and NAVELEX) continuing to review after program 22-23 May 1974.
Also included are DIA and NBS.
Personnel have also participated in IR&D reviews of industry projects.

.sp
M__a_j_o_r P__r_o_b_l_e_m A__r_e_a_s
.sp

The major problem in this ADP security program today is not technological barriers, but lack of commitment to the project objectives to demonstrate the technology for secure computing.

.sp

First, requirements for internal controls are not universally recognized -- users are still projecting functional requirements for
sharing without recognizing that only internal security controls can provide that capability.

.sp

Second, there are no procedures for users to obtain technical support.
In the Air Force, some policy makers have not recognized the need for users to have technical support to define and evaluate their ADP security problems.
Many users remain dangerously ignorant.

.sp

Finally, and most important, a funding discontinuity exists.
PE 63728F support is phasing out in FY76, while PE 64740F cannot provide support to maintain the required level for the continuing efforts.

.sp
O__t_h_e_r P__r_o_g_r_a_m_s
.sp

There are numerous Air Force organizations and programs which have directed tasks that are critically dependent on the recommended program level.
The SATIN IV Program Office is in need of effective security controls for SATIN IV Communications Processors; the Air Force 6k

Data Automation Agency is looking at architectural requirements for secure front end processors; AF WWMCCS users are evaluating the utility of a secure job stream separator; The MACIMS Program Office has a requirement for a crisis management

capability where there are sudden increases in classified processing; The ARPA program for a secure Multics isdependent on joing sponsorship with the Air Force; ESD (Honeywell is a contribution as well) is contributing mission support (MITRE Line program) to this program, and AF Data Services Center in the Pentagon is procuring a two-level Multics system with security enhancement based on this development task.

.sp

Because these efforts are part of a cohesive ADP system security program, these organizations and programs are willing to contribute funds to support additional special efforts which are dependent on the advanced development. These contributions for FY74 and FY75 are shown in Figure 1. The ability to obtain these additional funding leverage is directly dependent on continuing the program at its recommended level.

.bp

.nf

	F_Y_7_4_	F_Y_7_5_
SATIN IV PO		$200,000
AFDAA	$ 95,000	$100,000
AF WWMCCS	$ 25,000	$ 20,000
MACIMS PO	$ 45,000	UNK
ARPA	$200,000	UNK
Honeywell	$200,000	UNK
ESD	$500,000	$550,000
AFDSC	_s_1_5_0_,_0_0_0__	_s_4_5_0_,_0_0_0__
TOTAL	$1,215,000	$1,320,000

.sp 4

.ce

FIGURE 1, SUPPLEMENTAL FUNDS

.fi

.bp

P__a_y-_0__f_f

.sp

The pay-off for the development task is large. First, projected operational capabilities can become possible. WWMCCS can finally obtain their stated goal of secure

multilevel processing,
AABNCP can have it projected secured multilevel ADP capability, 61

MACIMS can process both classified and unclassified data
simultaneously as they require,
Other ADP
concepts and systems projecting resource and classified data
sharing, become reasonable,
These include:
.sp
Study of Automation of Logistics (STALOG)
.sp
Support of AF ADP Requirements Thru the 1980's (SADPR-85)
.sp
AFSC Computer Network (AFSCNET)
.sp
SAC Automated Total Information Network (SATIN IV)
.sp
AWACS Intelligence Integrations
.sp
Since internal security controls are essentially impossible to
add on, designers of these systems must decide in
the planning phase whether there is a requirement for them,
.sp
Other benefits mentioned previously include:
.sp
(1) Major cost reductions -- estimates of $100,000,000 in
costs, have been attributed to lack of secure
sharing capability,
.sp
(2) Simpler systems -- SATIN
.sp
(3) New capabilities -- "sanitization"
.sp
(4) Technology to respond to users -- this means
on-the-shelf so that response can be rapid and effective,
.bp
C__o_s_t S__u_m_m_a_r_y
.sp
.nf
E__f_f_o_r_t_s FY: P__r_i_o_r 7_4_
7_5_ 7_6_
.sp
Study Panel 60
.sp
Security Kernel Dem 100 20
.sp
General Purpose Kernel 70 100 400 260

```
,sp
Front End Processor                          36     150
,sp
General Purpose Implementation               120    200
,sp
DMS                                  24      50
,sp
Audit/Surveillance                           50
,sp
Secure Terminal                              50
,sp
Multiplex Encryption                         ____   ____   ___50_0_
____
,sp
                        230      560     950    260
,bp
Program Schedule (AFSC Form 103)
,sp                                                                  6m


   3 General Purpose
     Computer
   5 Kernel Demonstra-
     tion                2      73      X          (1 Jul 74)
,sp
   6 GP Kernel           7      73      X      0    (1 Jul 79)
,sp
   7 Front End Proc-
     essor       7     73      X      0    (1 Jul 83)
,sp
   8 GP Implementation   5      74      X      0    (1 Jul 80)
,sp
  10 Environment
,sp
  12 DMS                 4      74      X      0    (1 Jul 80)
,sp
  13 Audit/Surveillance      0  (1 Jul 74)   0    (1 Jul 80)
,sp
  14 Secure Terminal         0 (1 Jul 74)    0    (1 Jul 80)
,sp
  15 Multiplexed Encryp-
     tion                    0 (1 Jul 74)    0    (1 Jul 80)
,bp                                                                  6n
```

It took a matter of seconds for me to receive the file (including the time at MIT to input the necessary commands). It was a matter of only a minute or so to create the NLS file and INMES the material. 7

Of course the method used to transfer the file resulted in the Multics commands used to format the report being included in the text as well as anything that was added by the sndmsg operation itself. It was therefore necessary for me to edit the text. According to the records, already imbedded in the text, the editing took an elapsed time of: 8

24 Jun 74 - 1348 to 1522	174 minutes	8a
27 jun 74 - 1103 to 1442	339 minutes	8b
28 Jun 74 - 1411 to 1458	47 minutes	8c
TOTAL TIME	560 minutes 9 hours	8d

The relation between elapsed time and actual time used is very indefinite except in one respect. We can only be certain that it took NO MORE than 560 minutes. It is easily possible to load the file, edit one statement, go home for a long lunch, come back and edit another statement. The record only shows the time at wich the statement was edited. 9

The actual time to edit is estimated at about three hours. 10

THE EDITED FILE: 11

After editing the file looked like the following: 12

ADP SYSTEM SECURITY 12a

Preface 12a1

This summary plan has been prepared as a talk write-up as directed by RADC message R051935Z JUN 74, subject: PE 63728F, Advanced Computer Technology. As such, this summary assumes the reader already has a thorough understanding of

the history and technical approach for this development task, 12a2

The objective of this advanced development task is to develop security technology for modern AF computer-based systems and, consequently, to make possible secure sharing of resources and data bases. By resources, we refer to the hardware/software resources of modern ADP systems, which represent a major capital investment for modern AF systems. By data bases we refer to that data which, because of its cost of collection or because it is critical to decision making, has become a major AF asset. The data bases can be either integrated, that is on a single ADP system, or network, that is on multiple ADP systems usually geographically distributed, 12a3

This section summarizes the current knowledge of computer security requirements of major Air Force ADP users. While it is not exhaustive, it does indicate the major problems that have been encountered to date, and from it, trends in future requirements can be inferred, 12a4

It should be noted in this introduction that computer security requirements have not yet made themselves apparent by the occurrence of hostile penetrations directed against computers processing classified data. The reason for this lack is not that such penetrations are impossible, but that current policies dictate the operation of computers in modes that preclude such penetrations, 12a5

In particular, computers are required to be operated in a "system high" security environment with all users, terminals, physical areas, and communications cleared for all information in the system. Recent policy modifications have offered ADP managers the option of weakening these restrictions, but most installations have declined to implement the modifications, believing them inconsistent with their responsibilities for protecting classified information, 12a6

The following paragraphs address the impact of computer security on system costs and on operational capabilities, 12a7

COST IMPACTS 12b

The cost impacts of computer security have been reflected in expenditures for increased protection, additional equipment, and inefficient system utilization. Typical of the

installations that have required increased protection is the Air Force Data Services Center at the Pentagon. There, additional personnel clearances, vaulted areas, and secure communications have been required to allow users to do unclassified processing on computers that handle classified data bases. The cost of securing each remote site (exclusive of terminal equipment) has been estimated by AFDSC at $50,000. At SAC, additional SIOP clearances and area protection were required for personnel of the 4000th Support Group when the Group was to receive its computer support from the SAC WWMCCS ADPE. 12b1

Additional equipment has been required by computer users that were required to provide responsive support to user communities of varying clearance levels. At AFDSC, a time-sharing system (an HIS 635) was acquired to provide unclassified computing services to AFDSC's users in open office areas. This computer was acquired to supplement the classified processing systems (with secure remote terminals) mentioned in the paragraph above. 12b2

At SAC a new system (also an HIS 635) was acquired to support administrative and financial applications classified up to secret, rather than put those applications on the SAC WWMCCS equipment. In addition, one of the two SAC WWMCCS dual processors was split into two single processor systems so that development, on-line support and planning applications, each of differing sensitivity, could each have its own computers. A third WWMCCS processor is now planned at MAC, resulting from the need for MAC to provide responsive support to Top Secret crisis management applications. The cost of the added equipment mentioned above is approximately $6 million (estimated at $2 million for each 635 and $1 million for each dual processor split). Additional Air Force WWMCCS (and other) computer facilities can be expected to require similar additions of equipment as major classified processing applications become fully operational. 12b3

Inefficient equipment utilization is reflected in a phenomenon of classified processing systems known as the "color change". In a color change, all work of one classification (or compartment) is completed, print queues are drained, and media dismounted. Then system memories are cleared, new media (including the operating system residence) are mounted, and a version of the system brought up to process the new classification. The actual time required to perform the change of media and clear and restart the system varies from twenty to forty-five minutes.

The color change may be propogated over two to three hours processing in refusal to accept long jobs and savings of files on backup tapes. Color changes are usually used in those cases where responsiveness and workload do not demand that a computer be dedicated to a given classification. Thus SAC, with its multiplicity of WWMCCS computers, performs several color changes each day. 12b4

MAC and the SAC intelligence computer (a 360/85) also perform color changes as do many smaller WWMCCS installations. These changes can easily require ten to twenty-five per cent of a system's processing capacity. ,ft Assuming system in use ten hours per day, two color changes at 1/2 hour each, and 50% system degradation for an hour around each change. 12b5

OPERATIONAL IMPACTS 12c

In general, it appears that operational requirements for secure computers are met, either by adding equipment to provide a computer of the required level, or by clearing all users for access to all information processed. Occasionally, however, a requirement makes itself felt. The following paragraphs discuss two such requirements. 12c1

During the October War, MAC was required to fly an airlift of military equipment to Israel. Owing to the sensitive nature of the airlift and international situation, MAC classified the airlift operation. It was then found that the MAC computer configuration was so oriented toward unclassified operation that it could not readily support the top secret requirement. It was also found that the management of the operation was virtually impossible without the full support of computer for unclassified processing. This forced MAC to use extraordinary processing measures thereby putting the operation in jeopardy. 12c2

A second class of requirement concerns the integration of intelligence and operations data. Such integration is required for responsive force management, but must be done in such a way as not to jeopardize intelligence sources. In this case, it is often not possible to clear all system users for the intelligence data. Thus manual intervention is used -- a cleared intelligence officer hands a subset of the data to the operations element. As automated integration of such data is required, this option becomes unacceptable, and a direct solution to the multilevel security problem is required. 12c3

SUMMARY 12d

The paragraphs above have summarized major impacts of the requirement for computer security. The cost impacts may run to ten to twenty=five percent or more of the cost of Air Force computer installations processing classified data == perhaps $25 to $100 million per year. Operationally, most requirements are met by dollar expenditures, but a significant subset is arising that require real time information sharing and cannot be met even by this means. 12d1

Technical Appreach 12d2

The technical approach being taken under this ADP system security task has two key features. 12d3

a. It addresses the fundamental security issues raised by inclusion of computers in information processing. 12d3a

b. It focuses on a positive approach to providing technological solutions == the security kernel. 12d3b

In terms of addressing fundamental issues, we note that classically, information is protected by external techniques such as physical barriers, personnel clearances, administrative procedures, and COMSEC (encryption, TEMPEST). None of these address the capability of computer to provide, essentially simultaneous sharing of both resources and information. The focus, therefore, in this development task is internal controls for sharing and the technology issue is their effectiveness. 12d4

The security kernel approach is a radical departure from other approaches to computer security. It asserts 12d5

=what objects are to be protected. 12d5a

=who are these objects exposed to. 12d5b

=under what conditions can they be accessed. 12d5c

=internal controls must be designed into the system. 12d5d

=internal controls must be proven effective a priori,i.e., before they are put into use. 12d5e

=internal controls must be separate from rest of the system == "a kernel". 12d5f 12d5g

The security kernel approach begins with a precise definition of internal security, i.e, a model, which describes 12d6

The model then guides and constrains the design and implementation of the security portion of the system. Once the implementation of a security kernel is complete, it must be certified that it correctly and completely implements the model, With this approach we immediately note a significant property 12d7

-only the security kernel affects internal security, 12d7a

-no other internal portion of the system can effect the security of information or the integrity of the internal security controls themselves, 12d7b

There have been a number of significant achievements and milestones on this task to date, These are primarily in the areas of fundamental understanding and approach validation, However the insight gained is having an immediate payoff in terms of guiding users and developers in appropriate directions for true ADP system multilevel security, 12d8

First, fundamental security concepts have been established, In particular, the reference monitor concept discussed in ESD-TR-73-51 is being applied, In addition, two types of security models have been developed, a finite state model (ESD-TR-73-278), and a layered model (ESD-TR-74-117), The development of models was a major milestone -- one critical to initiation of the security kernel approach, 12d8a

Second, the security kernel approach to internal security controls was identified, In particular, the security design principles of 12d8b

(1) complete mediation

(2) isolation

(3) small and simple were formulated (MCI-73-1),

Third, the technical feasibility of the security kernel has been validated, This validation consisted of a feasibility demonstration, a design and implementation of a security kernel on a PDP-11/45 minicomputer, The result, using such techniques as structured programming and a higher order language, is a security kernel which

consists of about 500 lines of code. The design is documented and available for unlimited distribution in ESD-TR-73-294 as are all the other products being produced under this task. This validation was the second major milestone. 12d8c

It is the key reason for continuing to press forward with this task. 12d8d

In addition to the success in the development effort, there has been considerable success in identifying technology transfer areas. New capabilities have been provided to system designers. Automated "sanitization" of outputs from multilevel data bases is being demonstrated using the PDP-11/45. AABNCP will now have the technology needed to share multilevel data in realtime. WWMCCS can now consider secure networking of its ADPE using either secure general purpose processor or secure front end processors. Intelligence can now conceptually be integrated with command/control information, e.g. IDHS & WWMCCS. 12d9

We have also been able to respond rapidly to user needs because of the availability of fundamental concepts. The AFDSC in the Pentagon needed a two-level system to operate in controlled environment. The modeling work done at Case Western Reserve University was used to guide the design of security enhancements to the AFDSC Multics to provide access features appropriate to the military environment. 12d10

In the area of simpler, more reliable system design, SAC requires a single secure, survivable communication system to replace current systems. With a security kernel, a less complex design and implementation for the communication processor is possible becausethe access controls are all within the security kernel instead of being diffused throughout the software. 12d11

Finally, lower system costs are now possible for such systems as MAC's Integrated Management System (MACIMS) because a single integrated system can be used for processing both classified and unclassified data, where as the current hardware/software base forces the processing to be split, therefore requiring additional and duplicative hardware and software (SAC had to procure for approximately $1,000,000 of extra ADPE in order to meet their security requirements). Additional operation and maintenance cost are above and beyond the investment cost and contribute to an appreciable increase in life cycle cost. 12d12

There have been a number of products which have been produced to assist and describe the technology transfer efforts. These are listed below: 12d13

Developments Summary	(MCI-74-1)	12d13a
Secure DBMS Design Issues	(MCI-74-2)	12d13b
Multics Evaluation	(ESD-TR-73-256)	12d13c
Multics Security Design Analysis	(ESD-TR-74-176)	12d13d
Secure Multilevel Data Base System	(MWP-5679)	12d13e
Minicomputer Security Control System	(MTP-142)	12d13f
Concepts for Secure I/O	(ESD-TR-74-113)	12d13g
Architectures for Secure Computing	(MTR-2772)	12d13h

In FY75, these are the anticipated results, based on the planned funding level. A methodology for certifying a security kernel will be established. 12d14

The initial application of this methodology will be the PDP-11/45 security kernel. For a target large scale general purpose system there will be (1) a definition of security kernel for the ARPA supported Multics system at MIT; (2) a study of the operating system design issues raised by including a security kernel -- the Multics operating system is the target; (3) a study of the effort required to integrate a security kernel into a currently available, modern, useful general purpose computer -- again Multics is the target. 12d15

A RADC contractual effort will provide a model for a secure DMS. There will be an audit and surveillance concept established for operation within a secure system. The performance requirements for a low cost secure office terminal will be defined. Finally, feasibility of multiplexed encryption for a central computer will be studied and functional requirements identified. 12d16

This task interfaces and interacts with a number of other projects concerned with security in ADP systems. First, there is a direct interface with ARPA's information processing program. The operating system security at MIT under Project MAC is a Joint ARPA - AF project. The AF has engineering responsibility for the project as well as

contributing equally with ARPA in terms of funding support, With industry, there is also a direct interface and interaction with Honeywell's corporate security project - Project Guardian - through a cost-sharing contract ($200K in FY74), This is in line with the DOD encouragement of industry participation in projects of mutual benefit, This Joint AF - ARPA industry project will continue in FY75, 12d17

In addition to the AF - ARPA - Honeywell project, in which depending on the ADP security task from both funds and engineering direction, technical staff members sitoh the IBM-TRW Review Committee, This committee is reviewing the government's secure data processing requirement for IBM, With JCS (WWMCCS), the Air Force has members on the JTSA WWMCCS Security Test Team and has reviewed the results of the recently completed SDC R&D study with JTSA to assure complementary ADP security development programs, With NSA, the Air Force through the System Program Office, has a direct interface on the SATIN IV network security requirements, and has participated in review of their R&D contracts, 12d18

General liaison by past personnel has established a wide range of contacts, These include the Army (Computer Command, Intelligence System Support Detachment), the Navy (ONR, NELC, and NAVELEX) continuing to review after program 22-23 May 1974, Also included are DIA and NBS, Personnel have also participated in IR&D reviews of industry projects, 12d19

The major problem in this ADP security program today is not technological barriers, but lack of commitment to the project objectives to demonstrate the technology for secure computing, 12d20

First, requirements for internal controls are not universally recognized -- users are still projecting functional requirements for sharing without recognizing that only internal security controls can provide that capability, 12d20a

Second, there are no procedures for users to obtain technical support, In the Air Force, some policy makers have not recognized the need for users to have technical support to define and evaluate their ADP security problems, Many users remain dangerously ignorant, 12d20b

Finally, and most important, a funding discontinuity exists, 12d20c

PE 63728F support is phasing out in FY76, while PE 64740F cannot provide support to maintain the required level for the continuing efforts. 12d21

There are numerous Air Force organizations and programs which have directed tasks that are critically dependent on the recommended program level. The SATIN IV Program Office is in need of effective security controls for SATIN IV Communications Processors; the Air Force 12d22

Data Automation Agency is looking at architectural requirements for secure front end processors; AF WWMCCS users are evaluating the utility of a secure job stream separator; The MACIMS Program Office has a requirement for a crisis management capability where there are sudden increases in classified processing; The ARPA program for a secure Multics is dependent on joing sponsorship with the Air Force; ESD (Honeywell is a contribution as well) is contributing mission support (MITRE Line program) to this program, and AF Data Services Center in the Pentagon is procuring a two-level Multics system with security enhancement based on this development task. 12d23

Because these efforts are part of a cohesive ADP system security program, these organizations and programs are willing to contribute funds to support additional special efforts which are dependent on the advanced development. These contributions for FY74 and FY75 are shown in Figure 1. The ability to obtain these additional funding leverage is directly dependent on continuing the program at its recommended level. 12d24

SATIN IV PO	$200,000		12d25
AFDAA	$ 95,000	$100,000	12d26
AF WWMCCS	$ 25,000	$ 20,000	12d27
MACIMS PO	$ 45,000	UNK	12d28
ARPA	$200,000	UNK	12d29
Honeywell	$200,000	UNK	12d30
ESD	$500,000	$550,000	12d31
AFDSC	$150,00	0$450,000	12d32
TOTAL	$1,215,000	$1,320,000	12d33

FIGURE 1, SUPPLEMENTAL FUNDS 12d34

The pay-off for the development task is large, First, projected operational capabilities can become possible, WWMCCS can finally obtain their stated goal of secure multilevel processing, AABNCP can have it projected secured multilevel ADP capability, 12d35

MACIMS can process both classified and unclassified data simultaneously as they require, Other ADP concepts and systems projecting resource and classified data sharing, become reasonable, These include: 12d36

Study of Automation of Logistics (STALOG) 12d36a

Support of AF ADP Requirements Thru the 1980's (SADPR-85) 12d36b

AFSC Computer Network (AFSCNET) 12d36c

SAC Automated Total Information Network (SATIN IV) 12d36d

AWACS Intelligence Integrations 12d36e

Since internal security controls are essentially impossible to add on, designers of these systems must decide in the planning phase whether there is a requirement for them, 12d37

Other benefits mentioned previously include: 12d38

(1) Major cost reductions -- estimates of $100,000,000 in costs, have been attributed to lack of secure sharing capability, 12d38a

(2) Simpler systems -- SATIN 12d38b

(3) New capabilities -- "sanitization" 12d38c

(4) Technology to respond to users -- this means on-the-shelf so that response can be rapid and effective, 12d38d

Cost Summary 12d39

Efforts	FY:	Prior	74	75	76		12d40
Study Panel		60					12d41
Security Kernel Dem			100	20			12d42
General PurPose Kernel		70	100	400	260		12d43

Front End Processor		36	150			12d44
General Purpose Implementation		120	200			12d45
DMS		24	50			12d46
Audit/Surveillance			50			12d47
Secure Terminal		50				12d48
Multiplex Encryption	50	230	560	950	260	12d49

Program Schedule (AFSC Form 103) 12d50

System No: Project 5550 Task 09 12d51

Subsystem: ADP System Security 12d52

Type: Master 12d53

As of: 20 June 1974 12d54

2 Line Sym	1 Panel of Experts	Prior Dates Mo	) Yr			
		102	X			12d54a
3 General Purpose Computer						12d54b
5 Kernel Demonstration		2	73	X	(1 Jul 74)	12d54c
6 GP Kernel	7	73	X	0	(1 Jul 79)	12d54d
7 Front End Processor	7	73	X	0	(1 Jul 83)	12d54e
8 GP Implementation	5	74	X	0	(1 Jul 80)	12d54f
10 Environment						12d54g
12 DMS		4	74	X	0 (1 Jul 80)	12d54h
13 Audit/Surveillance		0	(1 Jul 74)	0	(1 Jul 80)	12d54i
14 Secure Terminal		0	(1 Jul 74)	0	(1 Jul 80)	12d54j

15 Multiplexed Encryption 0 (1 Jul 74) 0 (1 Jul 80)
12d54k

This is not perfect copy and I do not want to spend more time on it. However a comparison between what I did and what I found was done without my foreknowledge is interesting. 13

Due to the urgency of getting this part of the report into a form where it could be edited and modified without continual retyping, Bobbie Carrier volunteered to work on Saturday inputting the report into the NLS. She kept records of how long it took her. This was done because of her own interest in finishing the job and going home and partly because of payroll record keeping. 14

It took her two and one half hours to type the report on a teletype terminal and about one hour to edit it on an Imlac. Thus in this comparison of woman versus machine, woman triumphed by about 45 minutes. 15

Reasonably then, we would like to transfer the files from the MIT-Multics to the Office-1 NLS in a more direct manner and ideally without the need for all the editing. This will be attempted in the near future. If successful, the whole operation can probably be completed in a matter of minutes. 16

Split Screen Commands

(J30932) 18-JUL-74 11:48; Title: Author(s): N. Dean Meyer/NDM;
Distribution: /MDK JCN RLL SRL JHB; Sub-Collections: SRI-ARC; Clerk:
NDM;
Origin: <MEYER>BOUNDARY.NLS;3, 18-JUL-74 09:51 NDM ;

Split Screen Commands

I would like to offer the following criticisms of the proposals for the syntax of the boundary control commands and a suggestion: 1

Criticisms: 2

Split and Split-window have the disadvantage of 2a

1) referring to an entity different than the Move Boundary command, and 2a1

2) forcing the user to learn a new command verb as well as a new entity. 2a2

When someone is looking for a command which does something, (after hearing us tout the consistency of NLS) he will probably try command verbs with which he is familiar. This suggestion only requires one new word, the entity "Boundary", and no new verbs. 2b

I miss the option of deciding where the split occurs. I seldom want it dead center. 2c

Moving the boundary off the screen to delete a boundary is non-intuitive. 2d

I propose three commands: 3

Insert Boundary (Horizontally / Vertically) at (BUG / Center of BUG) using window BUG CONFIRM [note this still offers the split at center as an option] 3a

Move Boundary from BUG to BUG CONFIRM [as now exists] 3b

Delete Boundary at BUG keeping view at BUG CONFIRM 3c

I am not committed to these noise words. I recognize the disadvantage of the few extra characters of command specification for the experienced user, but stress the consistent and intuitive aspects of our command syntax. 4

An alternative might be to make up completely new command verbs, instead of half using editing verbs and half not. 4a

Maybe we could think of just one new command verb with three (or whatever) nouns. Can't think of anything graceful at the moment. 4b

RJC 22-JUL-74 07:10 30936

SPEAKER

(J30936) 22-JUL-74 07:10; Title: Author(s): Roberta J. Carrier/RJC;
Distribution: /RADC; Sub-Collections: NIC RADC; Clerk: RJC;

RJC 22-JUL-74 07:10 30936

SPEAKER

Dr, Pennington, SDC, 24 July - 0900 hrs, - Conf, Rm 1A Re: Software Productivity and Cost Estimation - Focal Point Robinson 1