

OPD/SYSTEMS DEVELOPMENT

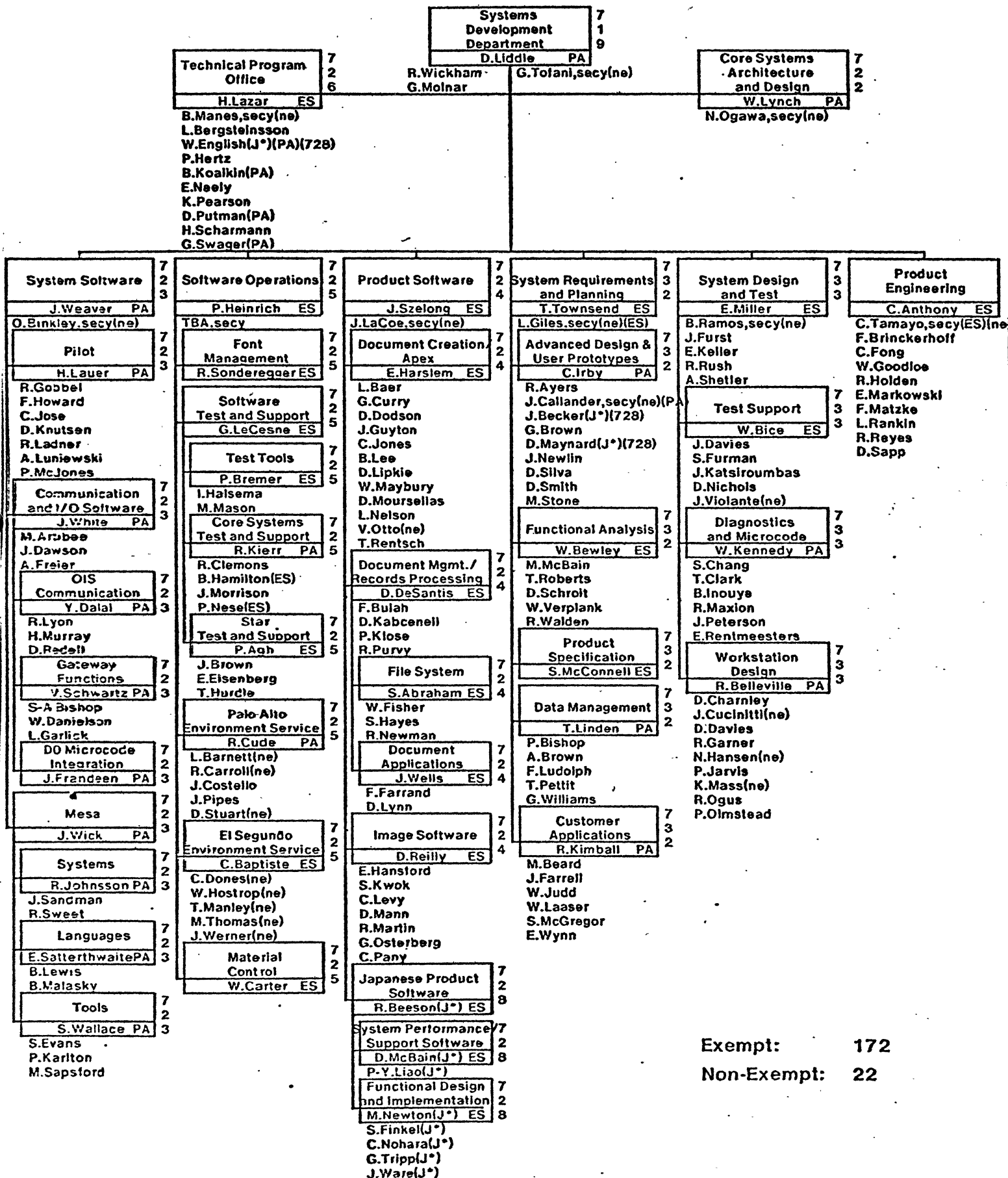
SOFTWARE DEVELOPMENT DISCUSSION

"As presented"
except does not
include Performance
Stuff

TECHNICAL REVIEW GROUP
EL SEGUNDO, CA.
MARCH 11, 1980
D. E. LIDDLE

OFFICE PRODUCTS DIVISION Systems Development Department

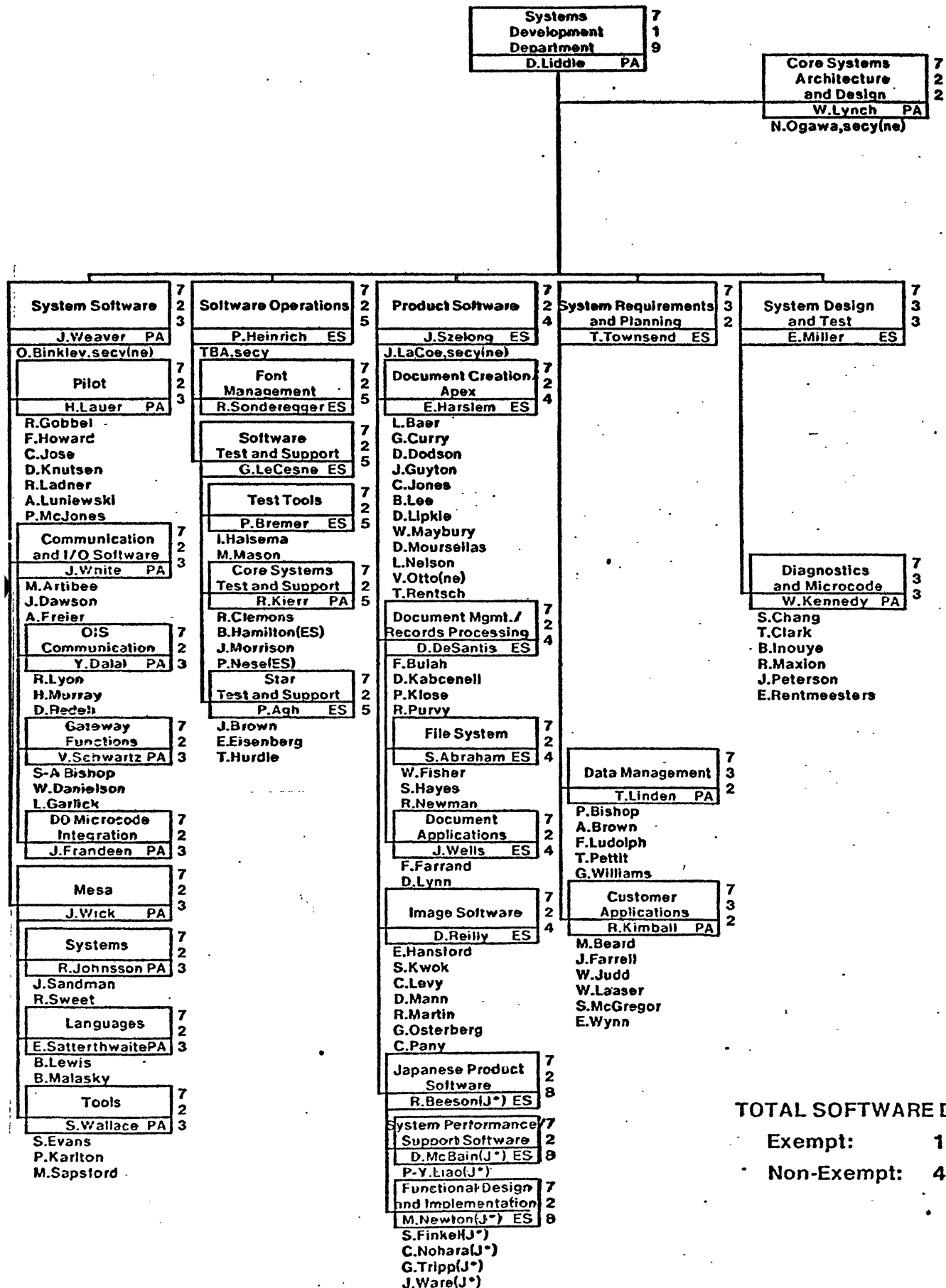
El Segundo (ES) and Palo Alto (PA)



OFFICE PRODUCTS DIVISION

Systems Development Department

El Segundo (ES) and Palo Alto (PA)



TOTAL SOFTWARE DEVELOPMENT:

Exempt: 112

Non-Exempt: 4

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Systems Development Department	7 1 9
D.Liddle PA	

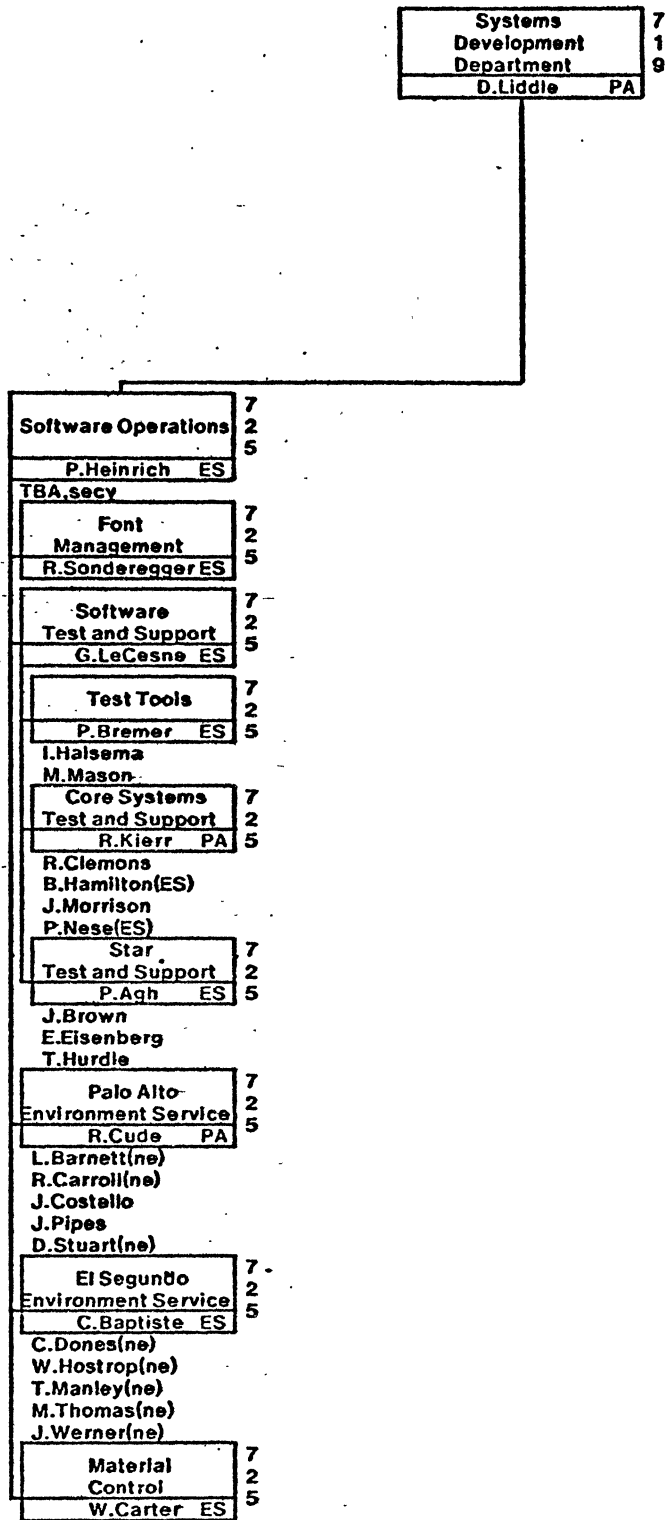
Core Systems Architecture and Design	7 2 2
W.Lynch PA	
N.Ogawa,secy(ne)	

System Software	7 2 3
J.Weaver PA	
O.Binkley,secy(ne)	
Pilot	7 2 3
H.Lauer PA	
R.Gobbel F.Howard C.Jose D.Knutson R.Ladner A.Luniewski P.McJones	
Communication and I/O Software	7 2 3
J.White PA	
M.Artibee J.Dawson A.Freier	
OIS Communication	7 2 3
Y.Dalal PA	
R.Lyon H.Murray D.Redell	
Gateway Functions	7 2 3
V.Schwartz PA	
S-A Bishop W.Danielson L.Garlick	
DO Microcode Integration	7 2 3
J.Frandeen PA	
Mesa	7 2 3
J.Wick PA	
Systems	7 2 3
R.Johnsson PA	
J.Sandman R.Sweet	
Languages	7 2 3
E.Satterthwaite PA	
B.Lewis B.Malasky	
Tools	7 2 3
S.Wallace PA	
S.Evans P.Karlton M.Sapsford	

CORE SOFTWARE DEVELOPMENT:
 Exempt: 34
 Non-Exempt: 2

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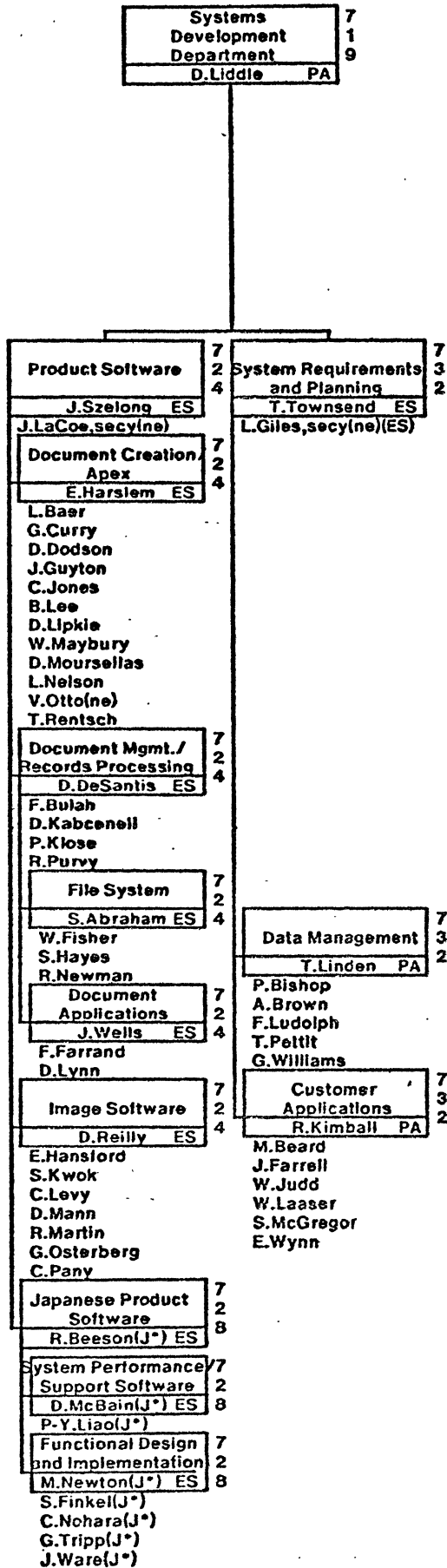
SOFTWARE ENVIRONMENT SUPPORT:

Exempt: 19

Non-Exempt: 8

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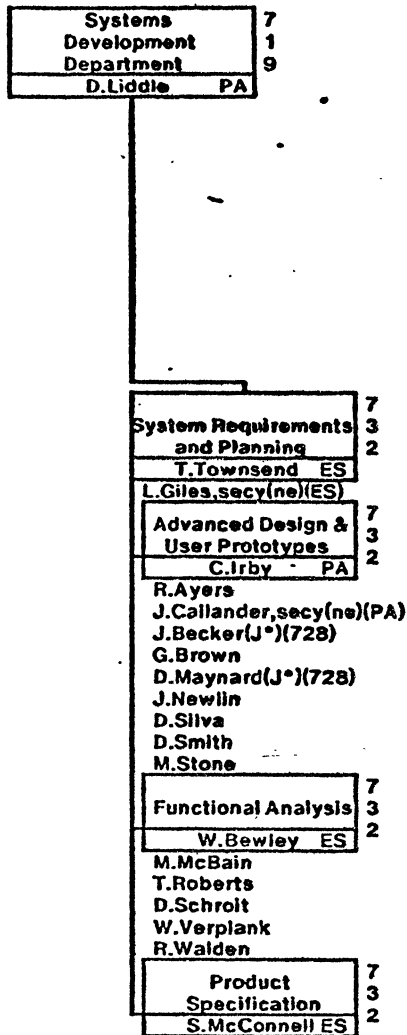
STAR SOFTWARE DEVELOPMENT:

Exempt: 55

Non-Exempt: 3

**OFFICE PRODUCTS DIVISION
Systems Development Department**

El Segundo (ES) and Palo Alto (PA)



Exempt: 17
Non-Exempt: 2

OPD Workstation Mix

	1979	1980		1981	
	2H	1H	2H	1H	2H
Dandelion			25	55	100
D0	13	38	123	123	123
Alto: OPD	160	255	245	185	140
Displaced (cum. total)		10	35	80	
Total	173	293	393	363	363

El Segundo Site Characteristics

	Now	Planned
Users	450	ca. 650
Workstations	350	600
ISV (3:1)	\$17.5 M	\$30.0 M

Servers (OPD & Public)

Printers	2	10
File	5 (2 B Bytes)	7 (3 B Bytes)
Gateway	2	5
ISV (3:1)	\$.75 M	\$2.5 M

Printer throughput

Average	200,000	600,000
Peak	550,000	1,200,000

Peter Heinrich

SDD/Software Operations

Core Software Development Process

Presentation Overview

Release Planning
Requirements
Tasks

Implementation
Directory Organization
Update Cycle
Testing
Resources and Constraints
Documentation

System Test
Preparation
Entry
Roles
Change Requests
Schedule

Release
Preparation
Materials
Support
Maintenance

What Is Core Software?

Currently Released: 301,380

Mesa 122,557

Compiler	39,868
Binder	7,025
Microcode	5,986
Run-time System	18,467
Debugger	26,617
Pup & FTP	18,418
Utilities	6,176

Tools 40,034

Tools Environment	14,171
Development Librarian	12,126
Action Request System	11,235
Tools	2,502
Clock, Delver, FSP, Profile, SendMessage, Text	

Teak 138,789

Pilot (Including Othello)	29,582
Pilot Test Package	15,099
StartPilot	4,754
CoPilot	36,869
Tajo	992
Microcode	7,336
(Diagnostics)	12,929
Common Software	31,228
Gateway Functions	7,546
ATVMS	4,006
FTP	14,157
Other	5,519

...

Amargosa Requirements

General

Device Face Retrofits (D0)

SA4000 booting
UTVFC

Tor

CIOS:

OIS communication over phone lines:

Adaptive retransmission to support phone lines

OISCP/RS232C Transporter with HDLC Framing

RS232C Manager: Network Address to Phone Number

RS232C Network driver

Pilot:

Floppy disk tasks:

Floppy disk volume

Germ: Floppy disk

Othello: Floppy disk formatting

(Floppy disk booting?)

Othello Procedural interfaces
(Scavenger?)

...

...

Amargosa Requirements

...

Amargosa D0 Hardware Configuration

8G D0 Processor

SA4000/ RDC

UTVFC

UTLF

Level III Keyboard

3 Button Mouse

Ethernet

DFDC (or equivalent)

MIOC

EPROM

(TMS1000?)

SA800 or SA850 (optional)

Umbilical Alto (optional)

Printers (optional):

Mark IID Char Printer

Diablo 1750 Char Printer

Beach Char Printer

Communications (optional):

X-Wire

RS232C

RS368

Aux Media Devices (Magcard, Castape etc.?)

Foreign Devices (access through RS232):

IBM OS 6

Xerox 850/Rodeo

IBM CMC-2

(TTY?)

...

Release Planning

Tasks

Number:

System:

Subject:

Priority:

Description:

Manager:

Submitter:

Subsystem:

Status:

Difficulty:

References:

Implementor:

Priority

- 1 Absolutely
- 2 Hopefully
- 3 Perhaps
- 4 Unlikely

Difficulty

- 1 Easy (work-day)
- 2 Moderate (work-week)
- 3 Difficult (work-month)
- 4 Hard (work, work, ...)

Relation to Change Requests

Relation to Requirements

Relation to Work Plans

Release Definition

AR/LEW 1-3

AR/LEW 1-3

AR/LEW 1-3

Checkin! Checkin&out! Checkin&Exam! Checkout! Examine! Defaults!

UseQL Next! Number: 124 Got! Put! File:

Number: 124

System: {Core} Subsystem: {Pilot}

Subject: Multi-pack volumes

Keywords:

Assigned To: Status: {}

Priority: {Unlikely} Difficulty: {Moderate}

Manager: Release:

Disposition:

Description: The Pilot Functional Spec calls for logical volumes which can span a number of physical volumes. This permits large files and collections of files to be stored or transported on small volumes, particularly floppy disks.

References:

SndMsg

AR
Submit

AR
Update

ARSort

Empty
Window

Profile

Tool
Manager

Task #	System Software/Mesa Task Name	Event #								Dependencies	Total Work Wks
			RJ	BL	BM	JS	ES	RS	JW		
4.0	Amargosa										10
	RDC Booting, Design		2							EPROM microcode	2
	UTVFC Microcode		3							Seven UTVFC Boards	3
	Debugger Backstop?		1			1				?	2
	Performance Counter					2				Feedback	2
	Post Mortem Debug?				2	1				?	3
	Loader/Unloader					2				Directory	2
	FileStream Rewrite					2					2
6.0	Mesa/Tools									(see following forms)	
5.0	Calaveras										15
	Disable Aborts					1					1
	Fault Notification		2			2				State Vector Allocation	4
	Non-resident Frames		2			2				Fault Notification, Traps	4
	State Vector Allocation		1			1					2
	Traps		2			2					4
6.0	Mokelumne										6
	Multiple MDSs		1			1				PSB Format	2
	PSB Format		2			2					4
7.0	Mesa/Tools										34
	Entry Vector Packing		1			1					2
	Frame Formats		1								1
	Global Frame Table					1					1
	Instruc. Set Analysis		10					10			20
	PrincOps Instruct. Set							8		Instruction Set Analysis	8
	Stack Depth		1					1		Instruction Set Analysis	2
7.0	Rubicon										
	Other										61
	Alto Emulation		8							EPROM, UTVFC	8
	Cedar						23	2			25
	Dandelion Emulator		5			5				EM, SDT/WD (Garner)	10
	Floating Point							2		CSL Working Group	2
	IO PrincOps								8	Device Faces	8
	Processor PrincOps								8		8
Total Work Weeks			42	0	2	26	23	23	16		132

Pilot update cycle -- incremental integration

- **Check out sources from Librarian**
- **Fetch consistent version of Pilot for testing**
- **Update and test sources**
- **Fetch latest version, rebind, retest**
- **Check out Pilot.lock, for exclusive right to update <WPilot>**
- **Fetch latest version, rebind, retest again**
- **Check in sources and new objects**
- **Check in Pilot.lock**

Testing During Development

- **Pilot Test Package (current ~ 15,000 lines)**
~ two dozen specific tests and exercisers.

must run successfully before checking in changes to WPilot.

random number exercisers run overnight / over weekend.

- **CoPilot (37,000 lines)**
a real client of Pilot.

used for (nearly) all debugging of Core Software.

must run reliably enough to support implementors at all times.

- **Othello**
used extensively during implementation.

exercises various files system functions

Resources / Constraints for development Pilot and Core Software

- **60-80 hours /day of availability of final hardware configuration.**
- **Final configuration must be proven operational six weeks before entry to System Test.**
- **For mandatory devices at least six instances required for development of proven configuration.**
- **Duplicate / Triplicate configurations are essential (i.e., exactly alike).**

System Test Clients

need at least as much hardware resources as developers.

Implementation Loop

Plan

Design

Interface

Implementation

Unit Test

Debugging

Integration

System Test

Release

System Test

Preparation

Entry

System Test

Roles

Developers

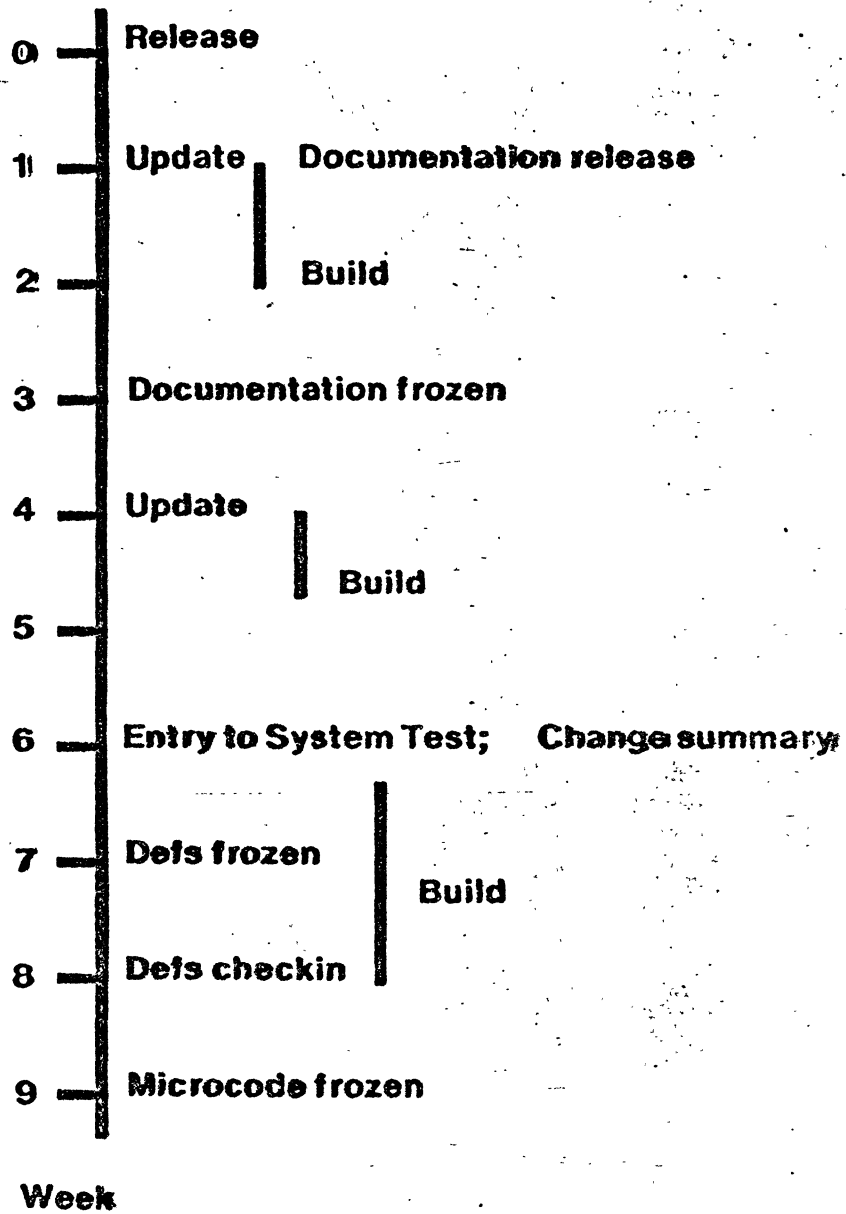
Clients

Change Requests

Schedule

3153	Morrison	Open	CoPilot	CoPilot doesn't use existing defs bcds.
3180	Inelson	Open	CoPilot	!StringTooLong on Trace All Entries.
3208	Morrison	Open	CoPilot	Uncaught signal 13601B (in Traps) from CoPilot
3209	Morrison	Open	CoPilot	Doc: CoPilot Signal 13601B not listed in CoPilot.signals.
2840	Morrison	New	CoPilot	Userscreen command failed
3100	LNelson	New	CoPilot	Uncaught Signal 40205B in DebugContext
1614	Lauer	Open	DCS	Unbundle DCS and Product Common Software
3241	Guyton	Open	DCS	Missing Pup Defs
2722	garlick	Open	Diagnostics	Inability to boot from 3100 when Altoboot.bt not contiguous
2749	Kennedy	Open	Diagnostics	Option to run Mechanic
3165	NICHOLS	Open	Diagnostics	Diagnostics
1699	Schwartz	Open	I/O	Re-visit RS232C buffer strategy
2428	Linda Howard	Open	I/O	All processes go to sleep with interrupts off
2666	Morrison	Open	I/O	UTLF mouse cursor splotch
2858	Kennedy	Open	I/O	Infinite loop in EtherNet Microcode
3090	telark	Open	I/O	OUTPUT microinstructions
3098	Morrison	Open	I/O	Display bounces
3152	Morrison	Open	I/O	D0 Keyboard noise
1467	Johnsson	Open	Microcode	Overflow in indexed pair long instructions
2430	danielson	Open	Microcode	Initialize doesn't ignore device modifier bits
2482	Chang	Open	Microcode	Bad Device ID on Empty Slot
2737	McJones	Open	Microcode	Detecting missing synch byte on SA4000
3081	Johnsson	Open	Microcode	LP instruction may fail if MDS # 0
3199	Morrison	Open	Microcode	The previous version of microcode doesn't work,
3248	Johnsson	Open	Microcode	Fault handler T17Restore doesn't reload Result
3253	Murray	Open	Microcode	Ethernet sending
3256	Johnsson	Open	Microcode	Implement UTVFC microcode
2481	Schwartz	Open	Othello	Othello messages need fixing
2762	Inelson	Open	Othello	Othello does not respond to lost connection
2820	McJones	Open	Othello	Othello vs. "Access denied"
2859	Morrison	Open	Othello	Othello hangs (repeatably) during Fetch
2959	Knutsen	Open	Othello	DPI offline reported as "Not Pilot Volume"
3101	Bishop	Open	Othello	reducing typing
3104	LNelson	Open	Othello	Creating Physical volume frequently fails the first time.
3105	LNelson	Open	Othello	First fetch after creating physical volume hangs up.
3114	LNelson	Open	Othello	Fetch fails immediately after Erasing logical volume.
3147	klose	Open	Othello	Othello bug
3200	Morrison	Open	Othello	The "latest" Othello prints an old version number.
3203	Morrison	Open	Othello	Online Dp1 --> Error[nonPilotPhysicalVol] when Dp1 not ready
3205	Morrison	Open	Othello	Othello hung while fetching a boot file.
3208	Nese	Open	Othello	Othello Got Lost
3207	Nese	Open	Othello	Othello Got Lost #2
3217	FRANDEEM	Open	Othello	Double disk Alto system in the D0
3227	harslem	Open	Othello	Othello bugs
3252	Murray	Open	Othello	Pup Echo User
2738	Schwartz	Fixed	Othello	Othello's Fetch fails for non-boot files
1395	Bishop	Open	Other	Glossary of FS
1809	Lauer	Open	Other	Upgrade Filter and Database documentation

System Test Schedule



7 January 79

Software Release Description

Name of Product: Pilot: The OIS Control Program

Version Number: 3.0

Date: December 17, 1979

Brief Description: Operating system and support software for OIS development.

Basic Documentation Package: [Iris/Isis]<Pilot>Doc>Pilot30.press

Changes to Using Programs Required?

Yes

No

- Changes Described In: [Iris/Isis]<Pilot>Doc>ChangeSummary.memo

Changes to Operating Procedures Required?

Yes

No

- Changes Described In: [Iris/Isis]<Pilot>Doc>HowToUsePilot.memo

Design Documentation:

Pilot: The OIS Control Program Functional Specification, Version 2.2 (October 1978); Pilot: The OIS Control Program Design Specification, Version 1.1 (March 1978); [Iris/Isis]<Pilot>Doc>ChangeSummary.memo.

Summary Of Testing Procedure:

- Test Plan Description: six week system test by client programmers from Star and Tor projects; direct testing by Core Systems Test and Support
- Number of Regression Tests Run: four (CoPilot, Othello, Tajo, TestPackage)
- Products Tested With New Release: Star and Tor

Number of Problem Reports Fixed: 420

Number of Known Problems Not Fixed: 139

Size of Product: Source Lines 86,304 Bytes On Disk 350,700 (Alto) 591,100 (Pilot)

Describe How to Obtain A Copy of the Software Product:

See: [Iris/Isis]<Pilot>Doc>Release.memo & HowToUsePilot.memo.

Special Configuration Restrictions: DO! with 192K memory, Shugart SA-4000 & RDC, IUTFP display controller & UTLF Display, Ethernet, RS232C connections, Model 31 Disk & IRDC. (see [Iris/Isis]<Pilot>Doc>Release.memo)

Program Author(s): H. Lauer (manager), M. Artibee, P. Bishop, S. Bishop, Y. Dalal, B. Danielson, J. Frandeen, A. Freier, L. Garlick, R. Gobbel, F. Howard, T. Horsley, R. Johnsson, C. Jose, P. Karlton, D. Knutsen, B. Ladner, P. McJones, H. Murray, D. Redell, J. Sandman, V. Schwartz, J. White, J. Wick

Approved: Manager _____

Cost-Center Manager _____

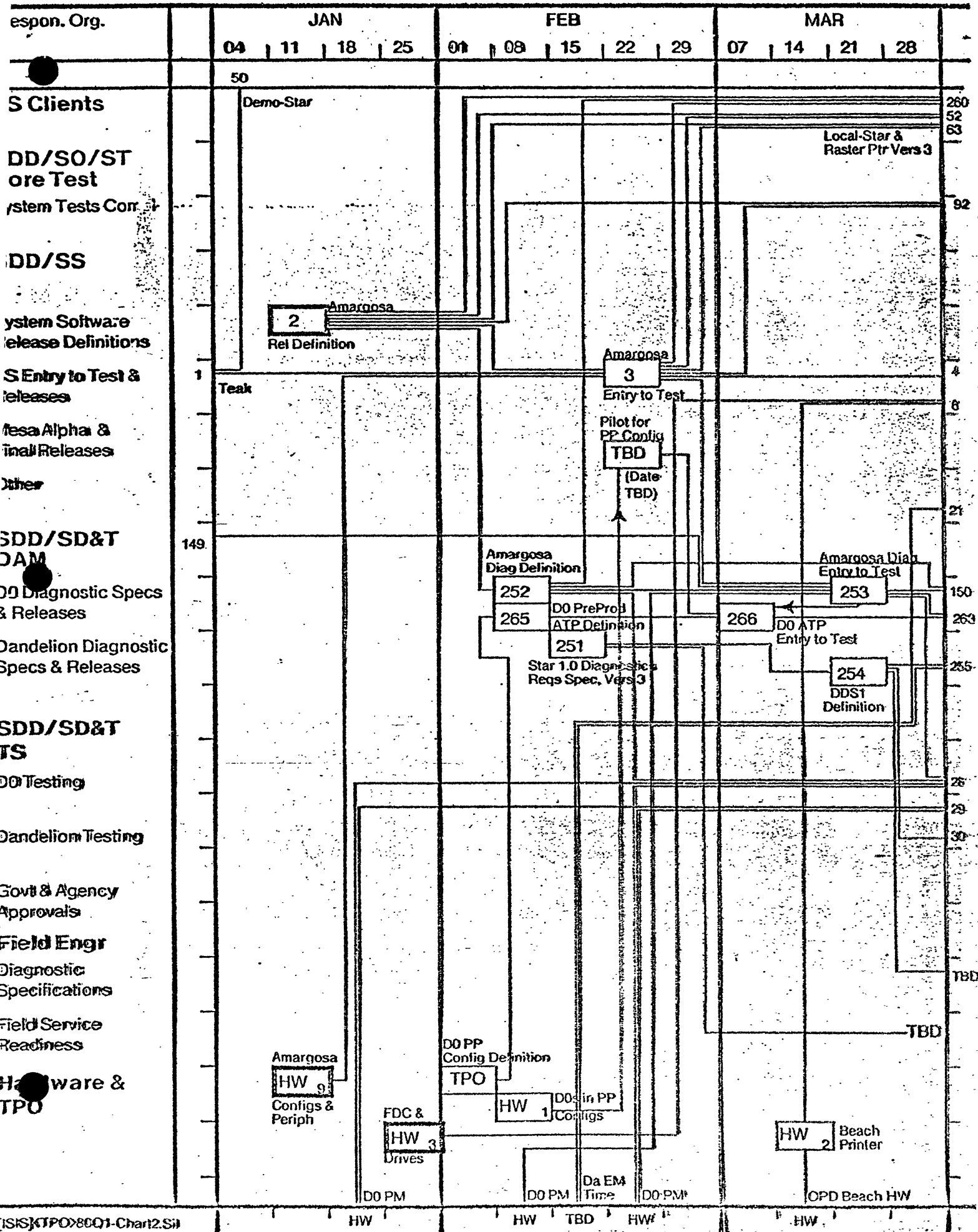
Test Results

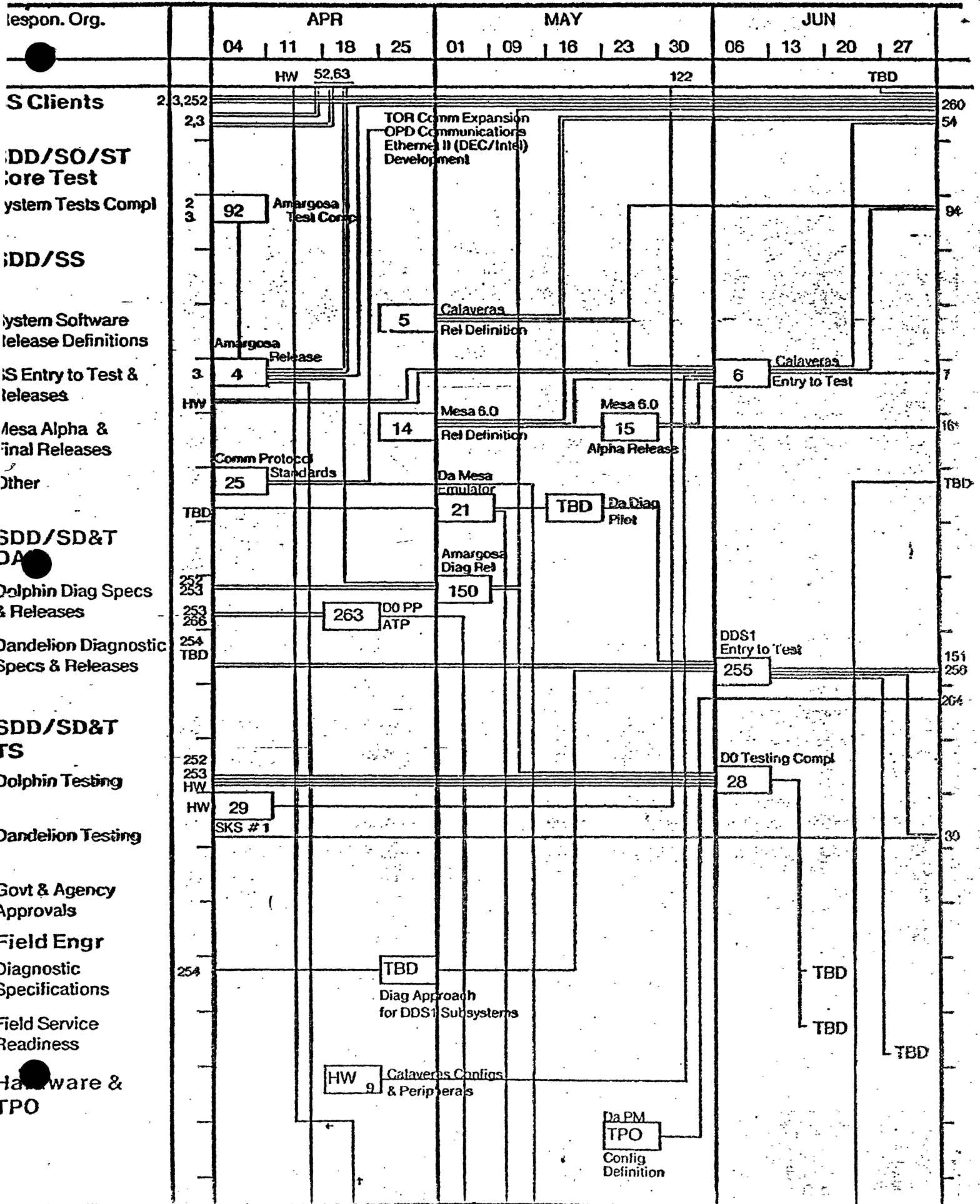
Sources of Change Requests (ARs)

	<u>Core Software</u>	<u>Product Software</u>
<u>Developers</u>	30	35
<u>Alpha Users/Client Testers</u>	10	5
<u>Software Testers</u>	3	3

Change Requests Submitted

<u>System</u>	<u>by ST</u>	<u>by Others</u>
Teak (10/29/79 - 12/12/79)	84	172
Amargosa (12/13/79 - 2/17/80)	49	138
(2/18/80 - 3/9/80)	37	90
Vega (7/17/79 - 8/31/79)	22	30
Auriga (2/7/80 - 3/10/80)	50	81

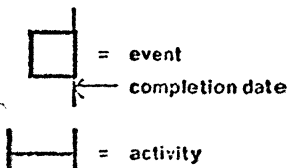




Preliminary Disco Schedule

	Feb 11 18 25	Mar 03 10 17 24 31	Apr 07 14 21 28	May 05 12 19 26	June 02 09 16 23 30	July 07 14 21 28	Aug 04 11 18 24
Dandelion HW available		EM 1	LM 2	EM 3	PPM 2	PPM 3	PPM 5, PPM 6
Microcode	Xfer RJ	WSimple RJ					
	Process JS	Read/Write DC					
	Jump, Load, Store, Arith. BG						
		kbd/mouse RO					
Mesa				Alpha Mesa 5		Mesa 6	
Pilot (Dolphin)		Amigaos Release		Calaveras Test		Calaveras Release	
Pilot (Dandelion)			FH	Utility Pilot Test Othello	Pilot CoPilot		
ATVMS (Dolphin)						PB	
ATVMS (Dandelion)							
Star (Dolphin)				Eyes Test			
Star (Dandelion)						LN, JG	
LSEP	check out microcode assist PO	Raven IOT w. PJ	Raven on EM PJ	(1)		LSEP av.	
	LSEP Face Spell PJ		LSEP Face Impl PJ				
Image Software (Dandelion)				tests on Raven: + EM CP	Primitive Marking		
Image Software (Dolphin)					Raster 3		Raster 4
Image Software (Alto)		Raster 2			Raster 3		Raster 4
Diagnostics		RM, TC			DPS 1 Test		

Key:



(1) Banc buffer to machine primitive machine control

Workstation Design:

- BG = Bob Garner
- DC = Don Charnley
- PJ = Pitts Jarvis
- PO = Pat Olmstead
- RO = Roy Ogus

Mesa:

- JS = Jim Sandman
- RJ = Richard Johnson

Pilot:

- FH = Forrest Howard
- BL = Bob Ladner

Star Integration:

- JG = Jim Guyton
- LN = LeRoy Nelson

Image Software:

- CL = Charlie Levy
- SK = Steve Kwok
- CP = Claude Pany

Diagnostics:

- RM = Roy Maxlon
- TC = Tom Clark

Data Management:

- PB = Peter Bishop

Mesa Systems

March 1979

<u>Project</u>	<u>People</u>	<u>Modules</u>	<u>Source K lines</u>	<u>Object K bytes</u>
Mesa 5.0	7	293	100	366
Tools 4.1	4	76	26	102
DeskTop	5	134	42	175
Oak	20	390	48	211
Star 7.1	30	297	55	154
Teak	27	420	129	508

Pioneer, Xenia, Laurel, Juniper, Express, etc.

Teak Statistics Summary

March 1980

	<u>Source</u> <u>K lines</u>	<u>Object</u> <u>K bytes</u>	<u>Doc</u> <u>pages</u>	<u>CRs</u>	<u>Lines</u> <u>per Year</u>
Mesacode	121	484	140	555	4646
Microcode	8	24	20	85	2368

CRs = cumulative number of change requests (open and closed)

Mesa Statistics Summary

March 1980

<u>Version</u>	<u>Source K lines</u>	<u>Object K bytes</u>	<u>Doc pages</u>	<u>CRs</u>	<u>Lines per Year</u>
3.0 10/77	68	245	248	312	5590
4.0 5/78	86	326	418	445	6990
4.1 10/78	89	336	421	799	3879
5.0 4/79	100	366	431	1308	7597

CRs = cumulative number of change requests (open and closed)

STAR 11.0 (AURIGA) STATISTICS

<u>CONFIG.</u>	<u>SOURCE LINES</u>	<u>CODE BYTES</u>	<u>DEFS MODULES</u>	<u>CODE MODULES</u>
STORAGE	29,597	80,222	65	52
PRESS PRINT	5,715	12,692	16	16
WORKSTATION	51,665	147,112	107	105
CONTROL	<u>82</u>	<u>74</u>	<u>1</u>	<u>1</u>
STAR (TOTAL)	87,059	240,100	189	174

DESIGN AND IMPLEMENTATION WORK MONTHS 254
EXPENDED THROUGH AURIGA

STAR 1.0 SIZE ESTIMATES

<u>CONFIG.</u>	<u>SOURCE LINES</u>	<u>CODE BYTES</u>	<u>DEFS. MODULES</u>	<u>CODE MODULES</u>
STORAGE	45,000	120,000	100	80
PRINTING	25,000	60,000	50	45
WORKSTATION	75,000	220,000	150	150
OTHER*	<u>30,000</u>	<u>70,000</u>	<u>60</u>	<u>55</u>
STAR (TOTAL)	175,000	470,000	360	330

ESTIMATED DESIGN, IMPLEMENTATION AND PRODUCT
SOFTWARE TESTING WORK MONTHS 610

* INCLUDES ADDITIONAL CONFIGS. TO SUPPORT FUNCTION
SUCH AS:

ELECTRONIC MAIL
NON-STAR SYSTEM INTERFACES
TERMINAL EMULATION

StarOnPilotConfig

PILOT

PCSConfig

DirectoryImpl
StringsA
StringsB
StringsImplA
StringsImplB
StorageImpl

Pup
VMS

STAR CONFIG

StorageConfig

SfsConfig
SupportConfig
RpNucleusConfig
RpApplConfig

PressPrintConfig

PressPrintQueueConfig
PressPrinterServiceConfig
PressPrintCommonConfig

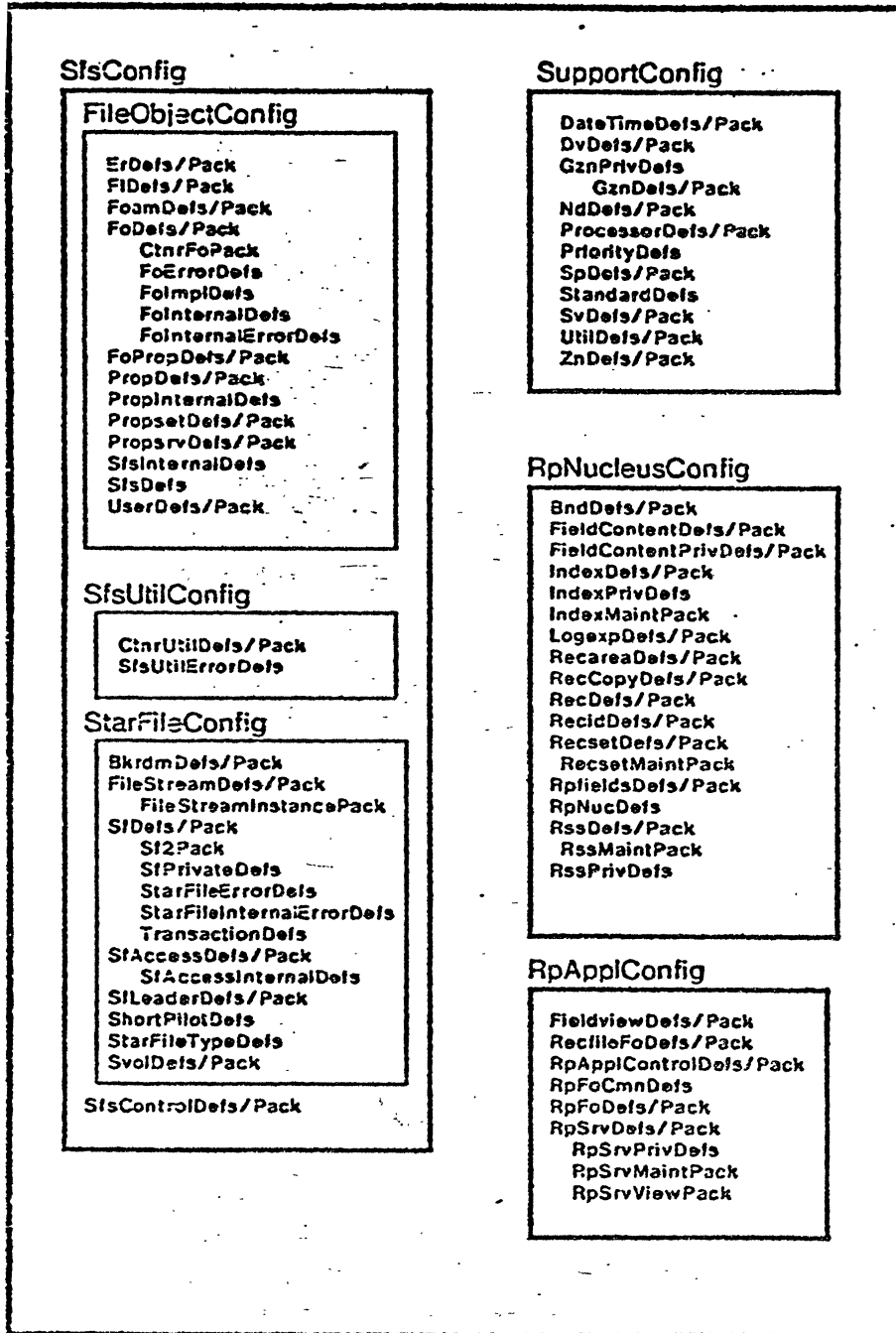
WorkstationConfig

EditConfig
NotificationConfig
WindowManagerConfig

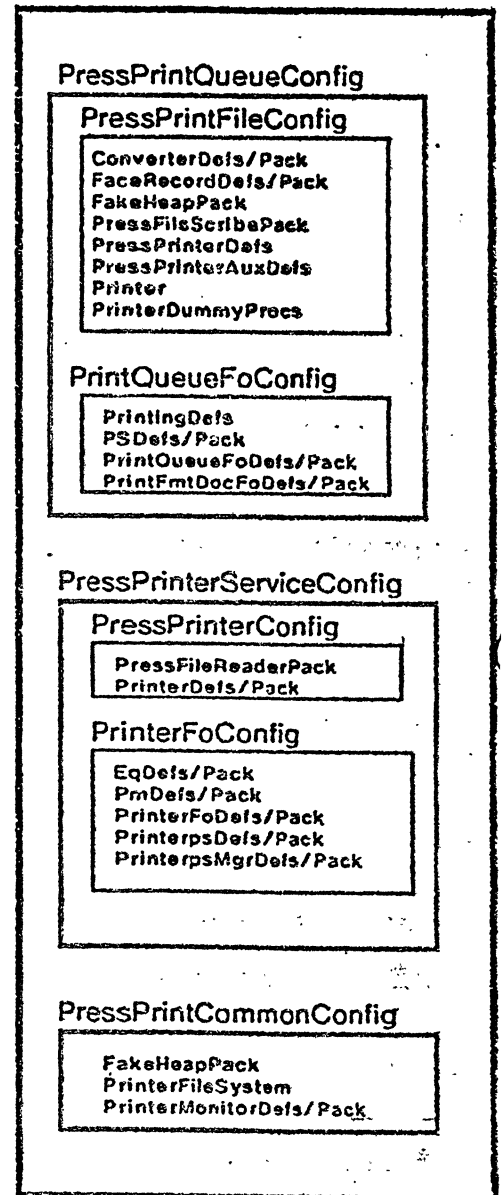
StarControlDefs/Pack

STAR STRUCTURE

StorageConfig



PressPrintConfig



STAR STRUCTURE

EditConfig

DocSupportConfig

DocumentFoDels/Pack
SearchDels/Pack

DuConfig

AttrDels/Pack
DuAggrPack
DuAttrPack
DuCompactPack
DuControlDels/Pack
DuDels/Pack
DuEditDels/Pack
DuFileDels/Pack
DuHdrPack
DuLinePack
DuMiscPack
DuNamePack
DuPageDels/Pack
DuParPack
DuPrivateDels
DuPtDels
DuPushPack
DuRegionDels/Pack
DurunDels
DuSectorDels
DuStartStopPack
DuUtilDels
StyleDels/Pack
TextAttrDels/Pack

FrameConfig

FrameAuxPack
FrameSchemaDels
FrameSchema1Pack
FrameSchema2Pack
FrameSchema3Pack
GSchemaDels/Pack
LineGSchemaDels/Pack

TableConfig

TableDels
TableAuxPack
TableSchemaDels/Pack
TableUtilDels/Pack
TcolSchemaDels/Pack
TrowListSchemaDels/Pack
TrowSchemaDels/Pack

TextConfig

CharpsDels/Pack
DtDels/Pack
DtEditDels/Pack
DtPropsDels/Pack
DtPmgrDels/Pack
DtSumDels/Pack
DispFlndels/Pack
DocPrintDels/Pack
DocWideDels
DocWishDels/Pack
DuSchemaDels/Pack
Flndels/Pack
CaretDels
FlpsMgrDels/Pack
ParapsDels/Pack
ParListSchemaDels/Pack
TabsetpsDels/Pack
TextEditDels
TextEdit1Pack
TextEdit2Pack
TextEdit3Pack
TextEdit4Pack
TextSchemaDels/Pack

NotificationConfig

DisplayConfig

AreaDels/Pack
DispDels/Pack
DispPrivDels/Pack
MatrkeDels/Pack
RgnDels/Pack,
RonullIPack

InputConfig

InputControlDels/Pack
McDels
NlrDels/Pack
NqDels/Pack
NrDels/Pack
NtDels
TestControlDels/Pack
UIHDels/Pack
UndoDels

MenuConfig

CenteringSchemaDels/Pack
FillerschemaDels/Pack
MenuSchemaDels/Pack
MiSchemaDels/Pack
MouseMenuDels/Pack
MsgMiSchemaDels/Pack
MsgSchemaDels/Pack
RoundedSchemaDels/pack
RoundMiSchemaDels/Pack
ScrollDels/Pack

SchemaConfig

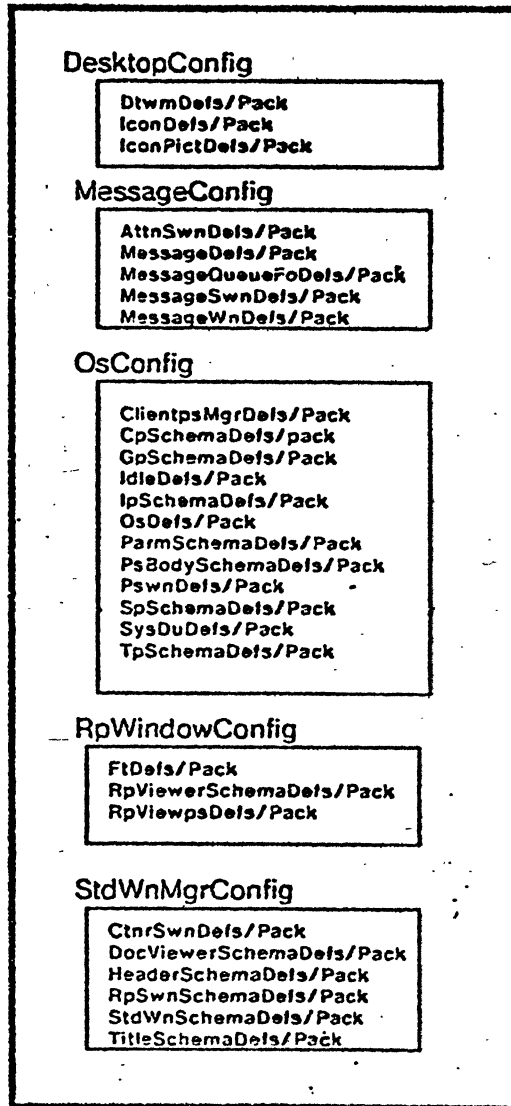
ContendersDels/Pack
DebugSchemaPack
ListSchemaDels/Pack
SchemaDels/
 Schema1Pack
 Schema2Pack
ViewerSchemaDels/Pack

TraitConfig

TraitAnalysisDels/Pack
TraitGlobalDels
TraitDels

STAR STRUCTURE

WindowManagerConfig



OIS NETWORK SERVICES OVERVIEW

AVAILABLE VIA ETHERNET OR RS232/449 COMMUNICATION I/F.

ENABLED BY OIS SERVERS AND STAR WORKSTATION SERVICES.

EXPORTED BY STAR WORKSTATIONS AND OIS TERMINAL SERVER TO DIGITAL TERMINALS, INTELLIGENT TERMINALS, AND VARIOUS EDP HOSTS.

STAGING:

860 CLASS (4Q80) - INITIALLY PROVIDED FOR EXTENDED 860 FILING, CHARACTER PRINTING, AND FOR POINT-TO-POINT TRANSFERS.

STAR CLASS (2Q81) - PROVIDED AS PART OF STAR ARCHITECTURE OF SERVICES AND SERVERS TO OTHER STAR WORKSTATIONS.

UNIVERSAL CLASS (4Q81) - EXTENDS STAR CLASS SERVICES/SERVERS TO DT'S AND IT'S. ADDS LARGE FILE SERVERS AND TERMINAL SERVER IN 1981.

OIS NETWORK SERVICES OVERVIEW

OIS NETWORK SERVICES PROVIDE NEW FACILITIES AND APPLICATIONS
FOR LOW COST WORKSTATIONS AND TERMINALS,

AND

THEY ENABLE ACCESS TO OIS NETWORK RESOURCES INCLUDING:

RESOURCES (LOCAL/REMOTE)

LSEP'S, MSEP'S, ETC.
OIS LARGE FILE SERVERS
FILE CONTAINERS AT STAR WS's
COMMUNICATION GATEWAY I/F's
OTHER DEVICES & I/F'S
(PHOTOCOMP, SCANNERS, MEDIA)

APPLICATION AREAS

DOCUMENT PREPARATION/REVISION
DOCUMENT HANDLING
DATA ENTRY & INFO RETRIEVAL
BUSINESS TRANSACTIONS & REP'T GEN.
ELECTRONIC MAIL

OIS NETWORK SERVICES OVERVIEW

DOCUMENT PREPARATION, REVISION, AND FORMATTING AIDS:

BASIC CONVERSION FACILITIES

COARSE FORMATTING CONTROLS

CONTENT EDITING OF PROFESSIONALLY FORMATTED DOCUMENTS

STYLES

LONG DOCUMENT AIDS

DICTIONARY BASED PROCESSES (SPELLING, HYPHENATION, ETC.)

MULTIPLE AUTHOR DOCUMENT PREPARATION AIDS

MERGING OF TEXT AND DATA BASE INFORMATION

DATA CAPTURE FOR:

AUTOMATED TABLE GENERATION

AUTOMATED GRAPH GENERATION

AUTOMATED EQUATION/FORMULA GENERATION

AUTOMATED GENERATION OF FRONT MATTER, BIBLIO'S, INDEXES, REF'S.

"DESKTOP" SUPPORT (WORK IN PROGRESS, DIRECTORY, ETC.)

OIS NETWORK SERVICES OVERVIEW

DOCUMENT HANDLING FACILITIES:

NETWORK FILING

WORK-IN-PROGRESS STORAGE

SECURITY AND BACKUP

CONCURRENT FILE SHARING, SEARCHING, CROSS REFERENCE

INTER/INTRA NETWORK DOCUMENT DISTRIBUTION

CONVERSION TO FOREIGN FORMATS AND I/F'S

LOCAL/REMOTE PRINTING

OIS NETWORK SERVICES OVERVIEW

DATA ENTRY AND INFORMATION RETRIEVAL FACILITIES:

DATA ENTRY, REVISION, AND VALIDATION

CROSS-FORM FILL IN EXPRESSIONS

VIEWS AND QUERIES INTO RELATIONAL DATA BASES BY
LINK, GROUP, SUMMARY OPERATORS

APPLICATION TRANSACTION EXECUTION

BACKUP/RECOVERY OF RECORD FILES

AUDIT TRAIL FOR RECORD FILE ACTIONS

CONCURRENT ACCESS/UPDATE OF RECORD FILES

EXTENSIVE REPORT GENERATION WITHOUT TRADITIONAL
PROGRAMMING

ACCESS TO CONVERTED EDP RECORD FILE INFORMATION

OIS NETWORK SERVICES OVERVIEW

ELECTRONIC MAIL FACILITIES:

PROVIDES DISTRIBUTION OF DOCUMENTS, RECORD FILES, AND
MESSAGES WITHIN NETWORK

DISTRIBUTION LISTS, NETWORK ROUTING CONTROLS

SEQUENTIAL ROUTING CONTROLS

DOCUMENT TRACING

ANSWER AND FORWARDING FACILITIES

OIS NETWORK SERVICES OVERVIEW

OTHER UTILITIES AND APPLICATIONS:

DOWN LOADING OF INTELLIGENT TERMINAL SOFTWARE AND
FONTS

ACCESS TO STAR EDP INTERFACE FACILITIES/INFORMATION
(STANDARD OIS MEDIA FORMATS, PROGRAMMED CONVERSION, CUSP)

HELP FILES

ADMINISTRATIVE AIDS

PERSONAL CALENDARS
TICKLER AND SUSPENSE FILING
TELEPHONE DIRECTORS
PROJECT MANAGEMENT TOOLS

Legend:

- = Performed at Workstation
- A = Major Advancement
- B = Utility Level or Comparable to What Is Available Today from WP Vendors

FACILITY	860 Class			900 Class			Universal								
	(4Q30)			(2Q81)			4Q31			82			83-85		
	DT	IT	900	DT	IT	900	DT	IT	900	DT	IT	900	DT	IT	900
Communications															
o Gateway (Protocols, Routing, Store/Fwd.)		B				B	A	A	A						
o Inter-Network Services						A	A	A	A						
- Multiple Directories										A	A	A			
- Clearing House															
o Format Conversions, OPD & Foreign Systems		B				-			B	A	A	A			
o Document Transfer		B				A	A	A	A						
o Mail/Message System		B				A	B	B	A	A	A	A			
o Network Mgmt.						A									
o Scanned Images (CCITTG2,G3)												A	A		
File System															
o Document File Mgmt.		B				A	A	A	A						
- Security, Access															
- Retrieval Methods															
- Filing Methods															
- Distributed/Networked															
- Back-Up/Recovery, Integrity															
- Text/Data/Graphics/Images															
o Data Base Mgmt.						A	B	B	A	A+	A+	A+			
- Security, Access															
- Sharing, Control															
- Retrieval, Processing															
- Data Entry, Processing															
- Distributed															
- Back-Up/Recovery, Integrity															
- Virtual Record Files															
o Maintenance		B				A	A	A	A						
Text/Graphics Printing/Doc. Prep.															
o Merge and Print (Forms, etc.)						A	B	B	A						
o Document Printing (Slave Printing)						A	B	B	A						
o Blind Document Formatting (Operator Embedded Commands)										A	A	-			
o Transcription (Automatic Embedded Commands)						-	B	B	-						
o Queue Mgmt.						A	B	B	A						
o Security/Integrity						B	B	B	B	A	A	A			
o Scanned Images										A	B	A	A	A	A
o Automated Table Generation						A			A	A	A	A	A	A	A
o Automated Graph Generation						A			A	A	B	B	A	A	A
o Automated Equation Generation									A	A	B	B	A	A	A
Dissimilar Device Integration															
- Device Recognition							B	B	-	A	A	-			
- Format Conversion															
- Interpretation/Mgmt.															
- Light Editing															
Utilities															
o DP Services (Invoking Execution in Another Computer)										A	A	A			
o DP Std. Lang. Support/Exec.											-	A			
o Administrative Aids (Scheduling)							B	B	B	A	A	A			
- Pers./Group Calendars															
- Tickler															
- Telephone Directories															
- Project Mgmt.															
o Boot		B				A		A							
o Diagnostics						B				A	A	A			