A Workstation Environment for Software Engineering

Susan J. Voigt

Computer Science and Applications Branch

Analysis and Computation Division

NASA Langley Research Center

THE SOFTWARE PROBLEM

THERE ARE THREE FUNDAMENTAL PROBLEMS WITH SOFTWARE:

1. IT IS FREQUENTLY <u>NOT</u> <u>SATISFACTORY</u> TO THOSE WHO HAVE TO USE IT.

2. IT IS GENERALLY <u>TOO</u> <u>COSTLY</u> IN DEVELOPMENT AND OPERATION.

3. IT IS TOO OFTEN <u>NOT</u> MAINTAINABLE, <u>NOT</u> PORTABLE, AND <u>NOT</u> REUSABLE.

LANGLEY SOFTWARE ENGINEERING GROUP

PAST EXPERIENCE WITH

- SOFTWARE DEVELOPMENT

- SOFTWARE MAINTENANCE

- SOFTWARE PROCUREMENT

- TOOL EVALUATION

SPECIFIC TOOL DEVELOPMENTS

- IVTS

- MYSTRO

- SYNTAX-DIRECTED EDITORS

- NOTES FILE

EIGHTEEN MONTHS EXPERIENCE WITH UNIX-BASED WORKSTATION

OUR CONCLUSION

GOOD SOFTWARE ENGINEERING

IS THE

ANSWER

AND

A PERSONAL, UNIX-BASED WORKSTATION

IS THE

VEHICLE

WHY DO WE NEED SOFTWARE ENGINEERING?

- FOR CONSISTENT AND SUBSTANTIAL IMPROVEMENT IN SOFTWARE QUALITY.

- FOR CONSISTENT AND SUBSTANTIAL REDUCTION IN SOFTWARE DEVELOPMENT AND LIFE-CYCLE COSTS

  o SOFTWARE TESTING COSTS

  o SOFTWARE MAINTENANCE COSTS

- GOAL: CONSISTENT DEVELOPMENT OF "MAINTENANCE FREE SOFTWARE"

WHY CHOOSE UNIX?

"Small is Beautiful" Philosophy

o VAST COLLECTION OF UTILITIES AND TOOLS THAT CAN BE USED TO BUILD
   COMPLEX SOFTWARE FUNCTIONS

o POWERFUL, PROGRAMABLE "SHELL" COMMAND LANGUAGES
   (FOREGROUND, BACKGROUND, CONTROL STRUCTURES)

o LANGUAGE FLEXIBILITY (C, FORTRAN 77, PASCAL)
   (LINK OBJECT FILES FROM DIFFERENT COMPILERS, COMMON DEBUGGERS)

ADDITIONAL KEY FEATURES OF UNIX

o POPULAR, MACHINE INDEPENDENT OPERATING SYSTEM, WRITTEN IN C
   (MICROS TO SUPERCOMPUTERS)

o SIMPLE HIERARCHICAL FILE SYSTEM

o COMPATIBLE I/O FOR FILES, DEVICES, AND PROCESSES

o NETWORKING CAPABILITIES (INTER-PROCESS AND INTER-MACHINE)

UNIX TOOLS THAT HELP SOFTWARE ENGINEERS

o   LINE AND SCREEN EDITORS (ED, EX, VI, SED)

o   PIPES AND FILTERS (SHARED DATA BETWEEN PROCESSES)

o   UTILITIES (LEARN, MAN, SPELL, DIFF, GREP, . . .)

o   DOCUMENTATION: TEXT FORMATTING AND TYPESETTING
    (NROFF, TROFF, EQN, TBL, . . .)

o   COMMUNICATION (MAIL, NEWS, NETWORK ACCESS, . . .)

o   SOFTWARE DEVELOPMENT SUPPORT TOOLS
    (ADB, SDB, SCCS, MAKE, LEX, YACC, . . .)

SOFTWARE LIFE-CYCLE ENGINEERING TECHNOLOGY

OBJECTIVE: TO DEFINE, ESTABLISH, AND DEMONSTRATE A PROTOTYPE ENVIRONMENT TO SUPPORT THE SOFTWARE ENGINEERING LIFE CYCLE

E. H. SENN, K. A. SMITH, S. J. VOIGT

RTOP: 505-37-13

SOFTWARE ENGINEERING WORKSTATION ENVIRONMENT

o PRESENT SYSTEM

- CALLAN UNISTAR 200 DESKTOP MICROPROCESSOR M68000 CPU,
  1 MB RAM, 43 MB DISK, FLOPPY DISK (FOR BACKUP), MULTI-USER

- UNIX V7 (BERKELEY ENHANCEMENTS) WRITTEN IN "C"

- LANGUAGES: C, FORTRAN, PASCAL, ADA SUBSET

- SDDL/SOFTWARE DESIGN AND DOCUMENTATION LANGUAGE

- SCMS/PROTOTYPE COMMAND LANGUAGE INTERPRETER

o FUTURE SYSTEM

- FILE SERVER AND WORKSTATION, EACH WITH M68010 CPU AND
  2MB RAM, 130 MB CAPACITY DISK, CARTRIDGE TAPE

- UNIX 4.2 BSD SOURCE CODE (LARC MICRO/M680XX SUPPORT)

- SAGA SOFTWARE ENVIRONMENT SUPPORT

    o BASED ON SYNTAX-DIRECTED (LANGUAGE) EDITORS

    o SOURCE CODE/VERSION CONTROL FACILITIES

    o SOFTWARE PROOF MANAGEMENT SUPPORT

FUTURE PLANS

o ACQUIRE ADDITIONAL UNIX WORKSTATIONS TO SUPPORT SOFTWARE
ENGINEERING RESEARCH AND LARC UNIX CONSULTANTS

o FOSTER USE OF UNIX AT LANGLEY

o CONTINUE RESEARCH ACTIVITIES ON UNIX-BASED SOFTWARE SUPPORT
TOOLS

o INFLUENCE AND SUPPORT SPACE STATION SOFTWARE PLANS
(E.G., OPEN FORUM ON SPACE STATION SOFTWARE ISSUES
APRIL 24-25, 1985 AT MSFC WILL BE DOCUMENTED IN NASA CP AND
IEEE SOFTWARE)