Central Intelligence Agency

Washington, D.C. 20505

MEMORANDUM FOR: Chief, Policy and Planning Staff,
Intelligence Community Staff

SUBJECT: Supercomputers

REFERENCE: Your Memorandum, dtd 26 January 1983, Same
Subject, DCI/ICS 83-4224

1. In the Reference, you asked CIA to respond to a set of
questions on supercomputers. Brief answers to these questions
are provided in the attachment.

2. From a CIA perspective, there are two main points we
would like to make concerning supercomputers. First, we are
currently uncertain as to whether we have definite requirements
for a supercomputer capability. In fact, we are investigating
this very issue at this time. We, therefore, have not made a
decision to acquire a supercomputer. We believe that this would
be a costly and complex exercise and are not prepared to proceed
until we are convinced that the benefits outweigh the costs.

3. Second, we are quite concerned about being limited to
foreign sources (presumably Japanese) should we decide to acquire
a supercomputer. Agency policy generally prohibits the use of
foreign ADP resources. This policy is derived from security
concerns only. That is, in our judgment, the use of foreign ADP
resources greatly increases our vulnerability to manipulation by
a hostile intelligence service. Therefore, we believe domestic
sources for supercomputers should be fostered. How to do this,
however, is a complex policy question for which we have no simple
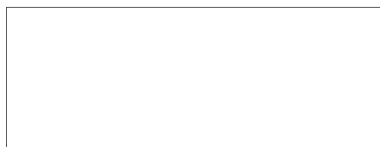answer at this time.

25X1

Executive Director

Attachment: a/s

ES   No-checking

Response in yet?

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EXECUTIVE SECRETARIAT
Routing Slip

TO:			ACTION	INFO	DATE	INITIAL
	1	DCI				
	2	DDCI				
	3	EXDIR		X		
	4	D/ICS				
	5	DDI		X		
	6	DDA		X		
	7	DDO		X		
	8	DDS&T		X		
	9	Chm/NIC				
	10	GC				
	11	IG				
	12	Compt				
	13	D/EEO				
	14	D/Pers				
	15	D/OEA				
	16	C/PAD/OEA				
	17	SA/IA				
	18	AO/DCI				
	19	C/IPD/OIS				
	20	D/ODP	X			
	21					
	22					

SUSPENSE _____4 Feb_____
Date

Remarks:

Please coordinate with all Directorates
and prepare a response for EXDIR's
signature.

Executive Secretary

28 January 1983
Date

3637 (10-81)

25X1

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ROUTING AND RECORD SHEET

SUBJECT: (Optional)

Supercomputers

FROM:

Chief, Policy & Planning Staff
Intelligence Community Staff

EXTENSION

NO.

DATE 26 January 1983

25X1

TO: (Officer designation, room number, and building)	DATE RECEIVED	DATE FORWARDED	OFFICER'S INITIALS	COMMENTS (Number each comment to show from whom to whom. Draw a line across column after each comment.)
1. Executive Director, CIA Rm. 7E-12 Hqs.				
2.				
3.				
4.				
5.				
6.				
7.				
8.				
9.				
10.				
11.				
12.				
13.				
14.				
15.				

FORM 3-62 **610** USE PREVIOUS EDITIONS

☐ SECRET	☐ CONFIDENTIAL	☐ INTERNAL USE ONLY	[X] UNCLASSIFIED

The Director of Central Intelligence

Washington, D.C. 20505

Intelligence Community Staff

DCI/ICS 83-4224
26 January 1983

MEMORANDUM FOR: Director, Defense Intelligence Agency
                 Director, National Security Agency
                 Executive Director, Central Intelligence Agency

VIA: Acting Director, Intelligence Community Staff

25X1

FROM:

                 Chief, Policy & Planning Staff

SUBJECT: Supercomputers

    1. The ad hoc committee on Supercomputers convened by the Office of
Science & Technology Policy (O/S&TP) met on 24 January 1983 to review the many
issues on this subject. The opinions and proposals presented differed
dramatically; consequently, no consensus could be developed. Doug Pewitt,
Assistant Director, O/S&TP, tasked the members to respond to the following
questions by Monday, 7 February 1983.

    A.   Do you currently own and operate or time share a
         supercomputer? How many or how much usage?

    B.   Do you have firm plans to acquire the next generation
         supercomputer? What specs? When? How many? Approximate dollar
         funds per supercomputer?

    C.   Is there a difference in your requirement between a "big number
         cruncher" and an even bigger and more complex AI-based machine?

    D.   Have you identified a US source or sources?

    E.   What impact would a successful Japanese fifth generation and
         supercomputer with the approximate performance characteristics
         have on your agency? (See attachment)

    F.   Is there a role for the federal government in stimulating,
         partially funding, or actually developing the fifth generation
         supercomputer. One body of opinion asserts the US Government
         should only indicate the range of performance characteristic
         desired, the best estimate on quantity required and probable
         time frame for delivery with a tolerable price range.

    G.   Do you have an opinion on the probable success or range of
         performance the Japanese are likely to achieve? Basis for
         opinion?

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DCI
EXEC
REG

2. My assessment is that there is not now a strong commitment for US Government involvement in any aspect of the next supercomputer, nor to any concentrated reaction to the potential Japanese computer project.

3. Please provide me your comments (which may be classified if appropriate) by noon, Monday, 7 February. I will provide them to 25X1 [   ]office and will obtain and circulate all members' comments for your individual review and comment prior to developing an Intelligence 25X1 Community position.

Attachment:
  Japanese Computer Specifications
    (20 Charts)

SUBJECT: Supercomputers

Distribution: (DCI/ICS 83-4224)
     1 - each addressee w/att
     1 - ER w/att
     1 - A-D/ICS w/o att
     1 - ICS Registry w/att
25X1   1 - ICS/Info Handling Committee Staff [   ] w/att
     1 - ICS/PPS Subject (Supercomputers) w/att
     1 - ICS/PPS Chrono w/o att

25X1   DCI/ICS/PPS[   ] (26 Jan 83)

JAPANESE GOALS

JAPANESE GOVERNMENT (MITI) AND COMPUTER INDUSTRY WANT TO BE LEADERS IN SUPER COMPUTING

THREE NATIONAL PROJECTS

- COMPONENTS
- HIGH-SPEED COMPUTER
- FIFTH GENERATION COMPUTER

NUMEROUS INDIVIDUAL COMPANY PROJECTS

COMPUTING

Los Alamos

JAPANESE NATIONAL SUPER-SPEED COMPUTER PROJECT

DURATION: 1982-89

FUNDING: $200M

OBJECTIVES: 10 GIGAFLOPS
1 GIGABYTE OF MEMORY WITH
1.5 GIGABYTE BANDWIDTH
100 MEGAFLOPS IN DISTRIBUTED
PROCESSING

PARTICIPANTS: ETL
FUJITSU
HITACHI
NEC
MITSUBISHI
OKI
TOSHIBA

COMPUTING

Los Alamos

FIFTH GENERATION COMPUTER

COMPUTING

STARTS APRIL 1982

OBJECTIVE: A LARGE, INTELLIGENT COMPUTER SYSTEM
FOR
- LANGUAGE PROCESSING
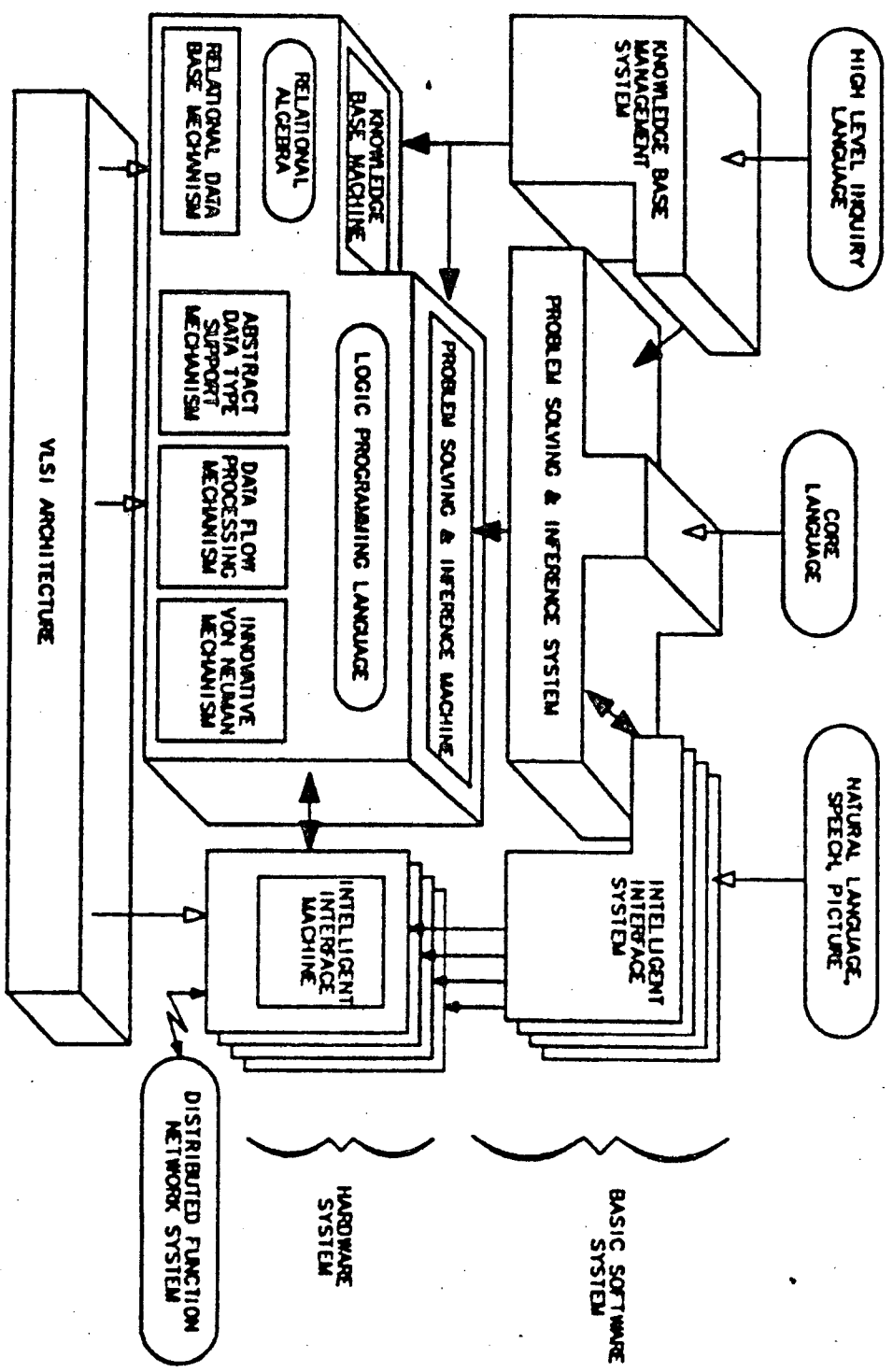- SPEECH AND IMAGE PROCESSING
- EXPERT SYSTEMS

THREE PHASES
- 1ST — 3 YEARS — FUNCTIONAL MODULES
- 2ND — 4 YEARS — BUILD A PROTOTYPE
- 3RD — 3 YEARS — COMPLETE THE SYSTEM
  AND SOFTWARE

$45M OF GOVERNMENT FUNDS FOR FIRST PHASE

Los Alamos

3

COMPUTING

BASIC CONFIGURATION IMAGE OF THE FIFTH GENERATION COMPUTER SYSTEM (JAPANESE)

- HIGH LEVEL INQUIRY LANGUAGE
- KNOWLEDGE BASE MANAGEMENT SYSTEM
- KNOWLEDGE BASE MACHINE
  - RELATIONAL ALGEBRA
  - RELATIONAL DATA BASE MECHANISM
- PROBLEM SOLVING & INFERENCE MACHINE
- LOGIC PROGRAMMING LANGUAGE
  - ABSTRACT DATA TYPE SUPPORT MECHANISM
  - DATA FLOW PROCESSING MECHANISM
  - INNOVATIVE VON NEUMAN MECHANISM
- PROBLEM SOLVING & INFERENCE SYSTEM
- CORE LANGUAGE
- INTELLIGENT INTERFACE SYSTEM
- INTELLIGENT INTERFACE MACHINE
- NATURAL LANGUAGE, SPEECH, PICTURE
- VLSI ARCHITECTURE
- DISTRIBUTED FUNCTION NETWORK SYSTEM
- HARDWARE SYSTEM
- BASIC SOFTWARE SYSTEM

Los Alamos

5TH GENERATION COMPUTER: SPECIFICATIONS

- HIGHER PERFORMANCE LEVEL AT A LOWER COST
- "TRIPARTITE BRAIN"
    1) INTELLIGENT INTERFACE SYSTEM
        - ACCESS THROUGH NATURAL LANGUAGE AND PICTURES
    2) PROBLEM-SOLVING AND INFERENCE SYSTEM
        - HANDLE MANY MORE GENERAL PROBLEM-SOLVING TASKS
          THAN TODAY'S MACHINES
        - BE ABLE TO LEARN, ASSOCIATE, AND INFER
    3) KNOWLEDGE-BASED MANAGEMENT SYSTEM
        - BE ABLE TO UNDERSTAND AND USE STORED INFORMATION
        - "KNOWLEDGE BASES" RATHER THAN "DATABASES"
- EACH OF THE THREE SYSTEMS HAS OWN SPECIALIZED MACHINE WITH VLSI
  ARCHITECTURE
- COMPUTER SIZES TO RANGE FROM MICRO'S TO MAINFRAMES

SOURCE: TOM MANUEL, BYTE, 5/82

5th Generation Computer: Example: Projects and Specifications

- Personal work station
  - perform 2 mips
  - have .5 to 5 megabytes of memory
  - have 100 megabytes of disk storage, with an average access of
    1 millisecond
- "Super high-speed processor"
  - perform 1 to 100 billion floating point operations per second (FLOPS)
  - have 8 to 160 megabytes of memory
- Problem — Solving and inference function
  - perform 100 million to 1 billion logical-inference operations per
    second
      (1 logical inference = 100 to 1000 instructions)
- Natural language processing system
- Knowledge-based management function
  - retrieve 1 unit of knowledge in several seconds from a base of 100
    to 1000 gigabytes

Source: Manuel, Byte, 5/82

5TH GENERATION COMPUTER: EXAMPLE: PROJECTS AND SPECIFICATIONS

- VERY-LARGE-SCALE INTEGRATION TECHNOLOGY
- AT FIRST, HAVE 1 MILLION TRANSISTORS PER CHIP
- EVENTUALLY HAVE 10 MILLION TRANSISTORS PER CHIP
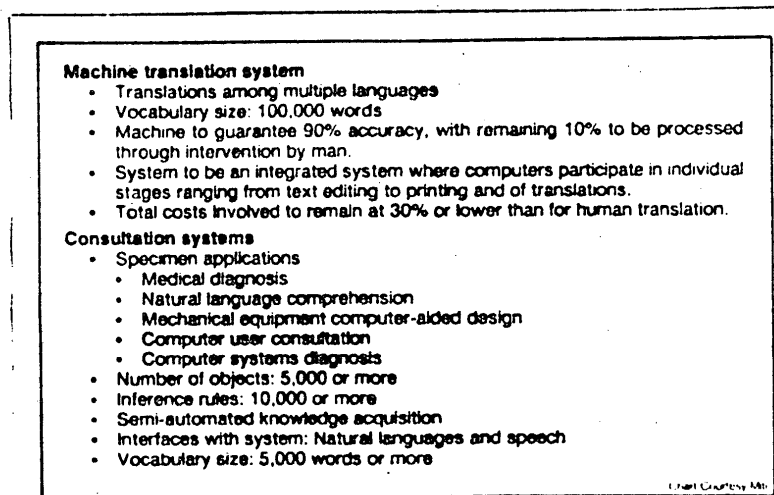
SOURCE: MANUEL, BYTE, 5/82

Machine translation system
- Translations among multiple languages
- Vocabulary size: 100,000 words
- Machine to guarantee 90% accuracy, with remaining 10% to be processed through intervention by man.
- System to be an integrated system where computers participate in individual stages ranging from text editing to printing and of translations.
- Total costs involved to remain at 30% or lower than for human translation.

Consultation systems
- Specimen applications
  - Medical diagnosis
  - Natural language comprehension
  - Mechanical equipment computer-aided design
  - Computer user consultation
  - Computer systems diagnosis
- Number of objects: 5,000 or more
- Inference rules: 10,000 or more
- Semi-automated knowledge acquisition
- Interfaces with system: Natural languages and speech
- Vocabulary size: 5,000 words or more

Figure 1. Subjects and 10-Year Targets for Basic Applications Systems
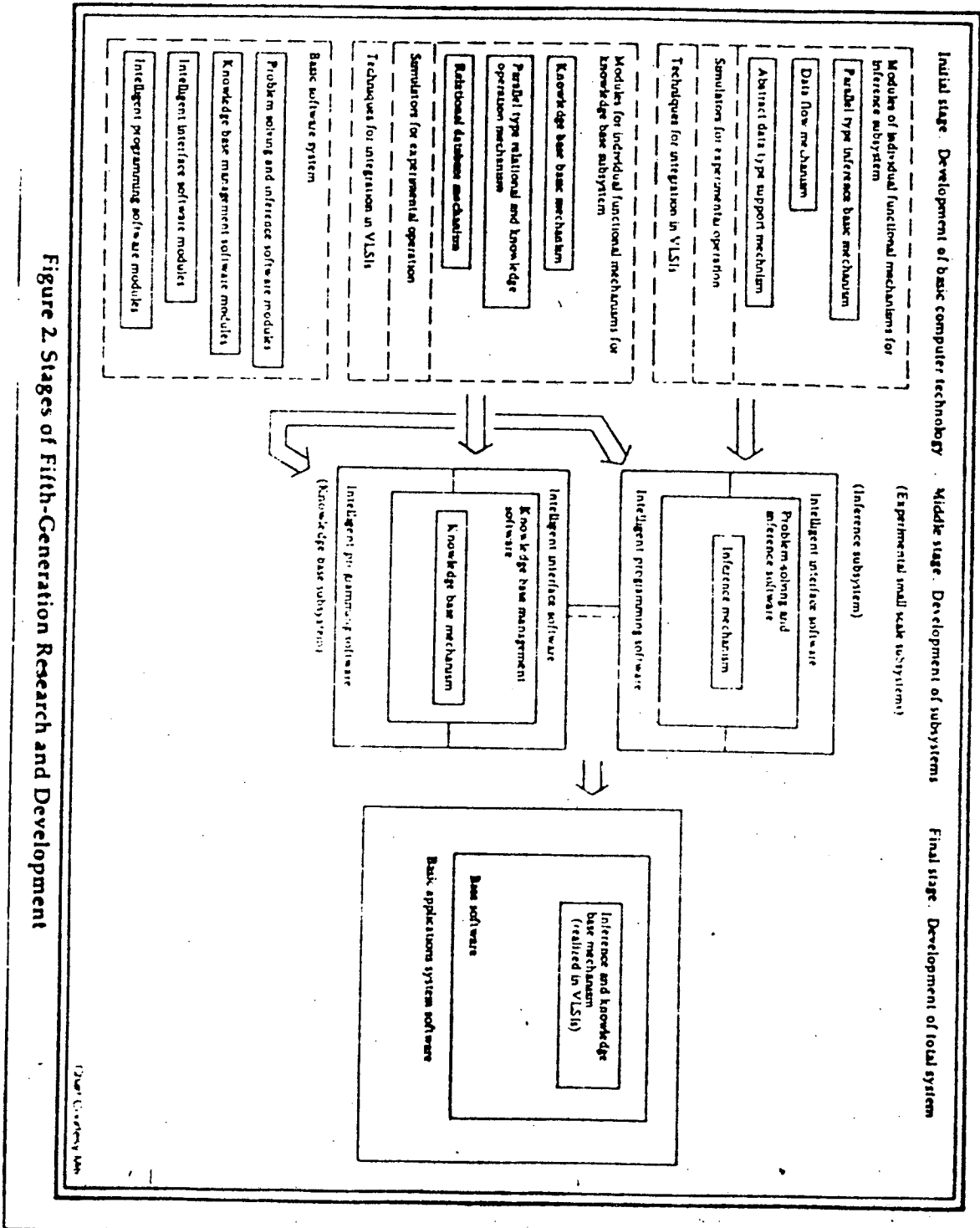
Figure 2. Stages of Fifth-Generation Research and Development

SOURCE: REX MALIK, COMPUTERWORLD/EXTRA
11/17/82, P. 25

5th Generation Computer: New Technologies

- New techniques to be used

  - New architectures like data-flow machines

  - Artificial-intelligence concepts

  - Languages such as LISP and Prolog with machines optimized for them

- Technologies currently excluded from program

  - Examples

    - Gallium Arsenide

    - Josephson Junctions

  - Researchers felt these technologies would not be sufficiently developed for general use by 1990

    - They will be included at some intermediate stage if outside research gains occur

Source: Manuel, BYTE, 5/82

5TH GENERATION COMPUTER: DESIGN AUTOMATION SYSTEM (PAGE 1)

- CONSISTS OF THREE PARTS

  1) SOFTWARE FOR AUTOMATED DESIGN OF VLSI

     - PLAN TO INITIALLY IMPLEMENT HSL (HIERARCHICAL SPECIFICATION LANGUAGE)

     - HSL CONTAINS SEVERAL MODULES INTEGRATED INTO A TOTAL DESIGN SYSTEM

     - CURRENTLY BEING USED AT THE MUSASHINO ELECTRICAL COMMUNICATION LABORATORY OF NIPPON TELEGRAPH AND TELEPHONE PUBLIC CORPORATION

  2) SYSTEM 5G - THE COMPUTER SYSTEM TO RUN IT

     - PLAN TO USE CONVENTIONAL 40 MIPS GENERAL-PURPOSE COMPUTER UNTIL FIRST 5TH GENERATION COMPUTERS ARE AVAILABLE
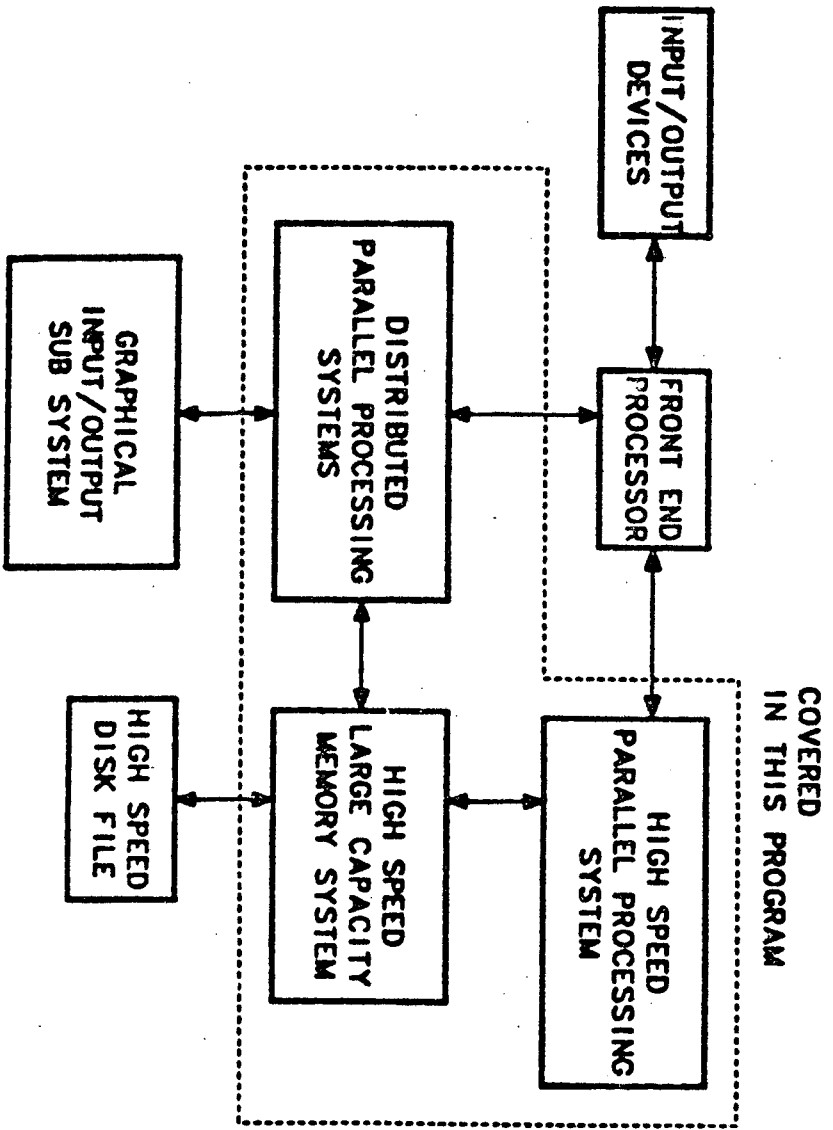
SOURCE: MANUEL, BYTE, 5/82

5TH GENERATION COMPUTER: DESIGN AUTOMATION SYSTEM (PAGE 2)

3) 5G PERSONAL COMPUTER - LOGIC-PROGRAMMING WORK STATION FOR DESIGNERS

- REQUIRES HIGH-SPEED PROCESSING OF VOICE, GRAPHIC, AND DIGITIZED IMAGE INPUT AS WELL AS PERFORMANCE AS A PERSONAL-INTERFACE MACHINE

- NO EXISTING PERSONAL COMPUTER MEETS THESE SPECIFICATIONS

SOURCE: MANUEL, BYTE, 5/82

JAPANESE ULTRA-HIGH-SPEED COMPUTING FACILITY

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INPUT/OUTPUT DEVICES

FRONT END PROCESSOR

DISTRIBUTED PARALLEL PROCESSING SYSTEMS

GRAPHICAL INPUT/OUTPUT SUB SYSTEM

HIGH SPEED PARALLEL PROCESSING SYSTEM

HIGH SPEED LARGE CAPACITY MEMORY SYSTEM

HIGH SPEED DISK FILE

COVERED IN THIS PROGRAM

ADVANCES ARE REQUIRED IN

COMPONENTS

ARCHITECTURE

ALGORITHMS AND LANGUAGES

COMPUTING

Los Alamos

COMPONENT OBJECTIVES

LOGIC: 3k GATES, 10 ps DELAY (JJ,HEMT)

3k GATES, 30 ps DELAY (GaAs)

MEMORY: 16k bits, 10 ns ACCESS

COMPUTING

Los Alamos

SUMMARY

JAPAN HAS LAUNCHED A NATIONAL PROGRAM TO BECOME A WORLD LEADER IN SUPERCOMPUTERS.

ALL SIX MAJOR JAPANESE VENDORS ARE PARTICIPATING.

THE PROJECT IS LIKELY TO PRODUCE A COMPUTER AND EVEN PARTIAL SUCCESS COULD HAVE FAR REACHING CONSEQUENCES.

COMPUTING

Los Alamos

5TH GENERATION COMPUTER: SOME JAPANESE EXPECTATIONS

BENEFITS TO BE GAINED

- RAISING PRODUCTIVITY IN LOW-PRODUCTIVITY FIELDS
- PRESERVATION OF INTERNATIONAL COMPETITIVE CAPABILITY BY DEVELOPMENT OF NEW TECHNOLOGY
- CONSERVATION OF ENERGY AND RESOURCES
- PROMOTE UTILIZATION OF CAPACITY OF AGING CITIZENS
- INFORMATIONALIZATION OF SOCIETY

SOURCES: SID FERNBACH, BRIEF ON THE JAPANESE COMPUTER INDUSTRY, MAY, 1981

ZEN YAMADA, MEMORANDUM ON RECENT PUBLISHED INFORMATION, MAY 13, 1981

5TH GENERATION COMPUTER: SOME JAPANESE EXPECTATIONS

- FEATURES OF 5TH GENERATION COMPUTER

    - CONSIDERABLE DIVERSITY
    - EMPHASIS ON SPECIALIZATION
    - NON-VON NEUMANN ARCHITECTURE
    - COMPOSITE MICRO-ARCHITECTURE
    - INPUT/OUTPUT OF DAILY LANGUAGES, CHARACTERS, GRAPHS WITH NO
        MODIFICATION
    - SELF-RECOVERING FUNCTION (AUTOMATIC RECOVERY)
    - SELF-PROGRAMMABLE WITH SIMPLE INSTRUCTIONS (NO REQUIREMENT
        FOR HUGE PROGRAMS)
    - FUTURE PROBLEM SOLVING BASED ON RECORDED DATA

SOURCES: SID FERNBACH, BRIEF ON THE
JAPANESE COMPUTER INDUSTRY, MAY, 1981

ZEN YAMADA, MEMORANDUM ON RECENT
PUBLISHED INFORMATION, MAY 13, 1981

5TH GENERATION COMPUTER: SOME JAPANESE EXPECTATIONS

- MAJOR R&D THEMES

    - DEVICE TECHNOLOGY

    - ARCHITECTURE AND HIGH PERFORMANCE PROCESSES

    - DISTRIBUTED FUNCTIONAL SYSTEMS

    - SOFTWARE ENGINEERING

    - INTELLIGENT ROBOTS

    - HIGH RELIABILITY, SECRECY PROTECTION FUNCTION

SOURCES: SID FERNBACH, BRIEF ON THE
JAPANESE COMPUTER INDUSTRY, MAY, 1981

ZEN YAMADA, MEMORANDUM ON RECENT
PUBLISHED INFORMATION, MAY 13, 1981

JAPANESE COMPUTER RESEARCH: SOFTWARE DEVELOPMENT

- "THE ELECTRONIC COMPUTER BASIC TECHNOLOGY DEVELOPMENT ASSOCIATION"
    - COOPERATIVE ASSOCIATION TO DEVELOP SOFTWARE
    - MEMBERS
        - HITACHI
        - TOSHIBA
        - FUJITSU
        - NEC
        - MITSUBISHI
        - OKI
        - MATSUSHITA
        - SHARP
        - NEC - TOSHIBA INFORMATION SYSTEMS
        - COMPUTER DEVELOPMENT LABORATORY

- WILL SPEND $56 M (1981-1986)
    - MITI WILL PROVIDE HALF THE FUNDS

SOURCE: SID FERNBACH, BRIEF REPORT ON THE JAPANESE COMPUTER INDUSTRY, MAY, 1981