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ภาคผนวก

TABLE 1

OUTPUT FROM PROGRAMMING AND RUNNING A SAMPLE PROBLEM ON A TIME-SHARING SERVICE
(Computer responses in color)

Typewriter printout
(not given)
HELLO
UOFM SCH BUS

Comments
Answering code after dialing
User command to request service

ON AT 15:48 FRI. 06-14-68

USER NUMBER -- P53437
SYSTEM -- BASIC
NEW OR OLD?
NEW NAME -- DEPR
READY.

Request for user identification number
Inquiry as to language to be used
Is it a new program or one previously saved?
We will call the program DEPR
Computer is ready to accept program

```
10 PRINT "ENTER THE VALUES OF N.C.S."
15 INPUT N.C.S.
20 PRINT
25 PRINT "YEAR", "DEPRECIATION", "BALANCE"
30 LET R = C
35 LET F = N * (N + 1)/2
40 FOR I = N TO 1 STEP -1.0
45 LET D = (1/F) * (O - S)
50 LET R = R - D
55 PRINT I, D, R
60 NEXT I
65 END
```

Program to compute depreciation
and underpreciated balance using
sum-of-years-digits method

RUN

DEPR 15:51 FRI 06-14-68
ENTER THE VALUES OF N.C.S.
?5, 9348.00. 1100.00

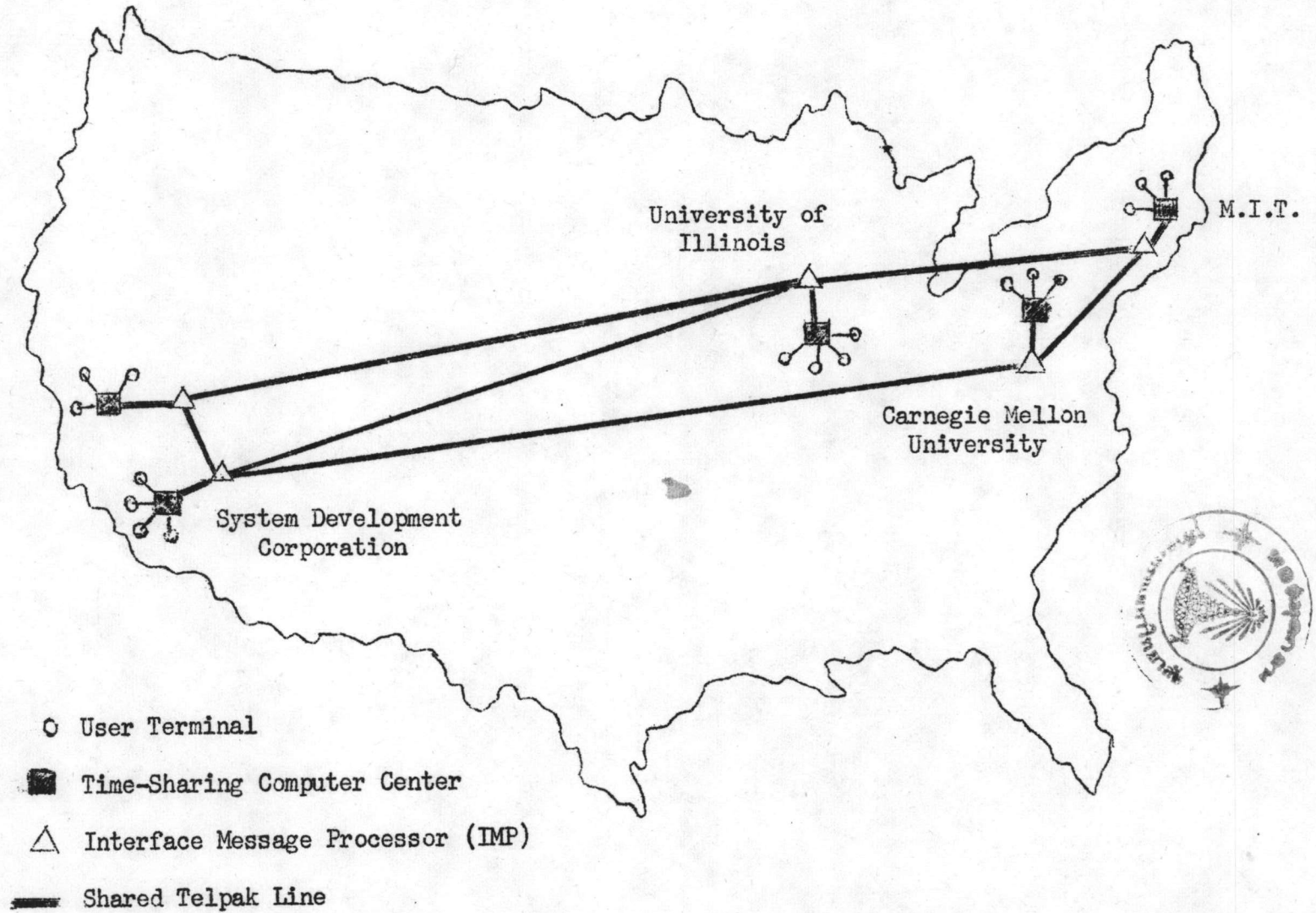
User input
of data

YEAR	DEPRECIATION	BALANCE
5	2749.33	6598.67
4	2199.47	4399.2
3	1649.6	2749.6
2	1099.73	1649.87
1	549.867	1100.

Computer
printout
of answer

TIME: 2 SECS.

TABLE 2 (Continued)



The Arpa Network (Greatly Simplified)

TABLE 2

TIME-SHARING COMPUTER CENTERS TO BE INTERCONNECTED
BY THE ARPA NETWORK

<u>Organization</u>	<u>Site Location</u>	<u>Computers</u>
Carnegie-Mellon University	Pittsburgh, Pennsylvania	UNIVAC 1108, IBM 360/67, G-21
Dartmouth College	Hanover, New Hampshire	GE 635
Harvard University	Cambridge, Massachusetts	SDS 940, IBM 360/50, DEC PDP-1
Massachusetts Institute of Technology	Cambridge, Massachusetts	IBM 7094, DEC PDP-6/10, GE 645
Stanford University	Stanford, California	DEC PDP -6/10
University of California at Berkeley	Berkeley, California	SDS-940, SCC 6700
University of California at Los Angeles	Los Angeles, California	SDS Sigma -7
University of California at Santa Barbara	Santa Barbara, California	IBM 360/50
University of Illinois	Urbana, Illinois	Burroughs B-6500/ILLIAC IV
University of Michigan	Ann Arbor, Michigan	IBM 360/67
University of Utah	Salt Lake City, Utah	UNIVAC 1108
Washington University	St. Louis, Missouri	Special Equipment
Advanced Research Projects Agency	Washington, D.C.	DEC 338
Bell Telephone Laboratories	Murray Hill, New Jersey	GE 645
Bolt Beranek & Newman, Inc.	Van Nuys, California	SDS 940, DEC PDP-10
M.I.T. Lincoln Laboratory	Cambridge, Massachusetts	TX-2, IBM 360/67
RAND Corporation	Santa Monica, California	DEC PDP-6, IBM 1800
Stanford Research Institute	Palo Alto, California	SDS 940 (2)
System Development Corporation	Santa Monica, California	IBM 360/50-65

TABLE 3

CURRENTLY AVAILABLE COMMON CARRIER COMMUNICATIONS
OFFERINGS USEFUL FOR DATA TRANSMISSION

<u>National switched networks</u>	<u>Data transfer rate in bits per second</u>
Telegraph grade	
TWX (AT & T Tariff F.C.C. No. 133)	45-150
Telex (W.U. Tariff F.C.C. No. 240)	50
Voice grade	
Message toll telephone (AT & T Tariff F.C.C.No.263)	1,200-2,000
WATS (AT & T Tariff F.C.C. No. 259)	1,200-2,000
Broadband exchange (W.U. Tariff F.C.C. No. 246)	1,200-2,400
Dataphone 50 (AT & T)	50,000
<u>National leased network (AT & T Tariff F.C.C. No.260, W.U. Tariff F.C.C. No. 237)</u>	
Telegraph grade	45-180
Voice grade	1,200-9,600
Broadband	
12 voice channels (Series 8000)	50,000
60 voice channels (TELPAK C)	250,000
240 voice channels (TELPAK D)	500,000

One of the factors limiting the data transfer rate on a given communications channel is the performance characteristics of the modem interface device at the endpoints of the line. In the near future, commercially available modems will allow data transfer rates of 3,600 bps on switched, voice-grade lines. Modems operating above 4,800 bps on voice-grade lines are infrequently used today because of their high cost and sensitivity to time-varying channel characteristics.

TABLE 4

COMPARISON OF DATA PROCESSING EQUIPMENT OPERATING SPEEDS
WITH AVAILABLE TRANSMISSION LINE SPEEDS

<u>Data processing equipment</u> ¹	<u>Operating speed</u> (bits/sec.)	<u>Available transmission line</u>	<u>Present transmission line speed</u> (bits/sec.)		
Card reader 300 CPM ²	3,200	Voice: switched	2,000		
		leased	2,400		
	600 CPM	6,400	Voice: switched	2,000	
			leased	2,400	
		1000 CPM	10,600	Broadband: leased only	50,000
				Voice: switched	2,000
		leased	2,400		
		Broadband: leased only	50,000		
Card punch 300 CPM	3,200	Voice: switched	2,000		
		leased	2,400		
	500 CPM	5,300	Voice: switched	2,000	
			leased	2,400	
		Paper tape reader	75	Telegraph or Tele- typewriter: switched and leased	110/180
				2,800	Voice: switched
		leased	2,400		
	4,000	Voice: switched	2,000		
		leased	2,400		
		Broadband: leased only	50,000		
	8,000	Voice: switched	2,000		
		leased	2,400		
		Broadband: leased only	50,000		

TABLE 4 (Continued)

<u>Data processing equipment</u> ¹	<u>Operating speed</u> (bits/sec.)	<u>Available transmission line</u>	<u>Present transmission line speed</u> (bits/sec.)
Paper tape punch	75	Telegraph or Teletypewriter: switched and leased	110/180
	800	Voice: switched leased	2,000 2,400
Printer 300 LPM ³ 600 LPM	6,000 to 10,600	Voice: switched leased	2,000 2,400
		Broadband: leased only	50,000
1000 LPM	19,400	Voice: switched leased	2,000 2,400
		Broadband: leased only	50,000
Teletypewriter	45-150	Teletypewriter: switched and leased	45-150
Cathods ray tube	8,000	Voice: switched leased	2,000 2,400
		Broadband: leased only	50,000
Magnetic tape transport	150-3,000	Teletypewriter: switched and leased	110/180
		Voice: switched leased	2,000 2,400
	120,000	Broadband: leased only	50,000
		Broadband (TELPAK C) leased only	250,000

TABLE 4 (Continued)

<u>Data processing equipment</u> ¹	<u>Operating speed</u> (bits/sec.)	<u>Available transmission line</u>	<u>Present transmission line speed</u> (bits/sec.)
Magnetic tape transport (continued)	240,000	Broadband (TELPAK C) leased only	250,000
	480,000	Broadband (TELPAK D) leased only ⁴	500,000
	720,000	Broadband (TELPAK D) leased only ⁴	500,000
	960,000	Broadband (TELPAK D) leased only ⁴	500,000
	1,440,000	Broadband (TELPAK D) leased only ⁴	500,000
	2,720,000	Broadband (TELPAK D) ₄ leased only	500,000
	Disk units	1,248,000	Broadband (TELPAK D) leased only ⁴
2,496,000		Broadband (TELPAK D) leased only ⁴	500,000
Drum units	1,000,000	Broadband (TELPAK D) leased only ⁴	500,000
	8,000,000	Broadband (TELPAK D) leased only ⁴	500,000
Central processors	2,000,000	Broadband (TELPAK D) leased only ⁴	500,000
	6,400,000	Broadband (TELPAK D) leased only ⁴	500,000
	16,000,000	Broadband (TELPAK D) leased only ⁴	500,000

-
1. Includes most commonly used data processing equipment.
 2. CPM: cards per minute
 3. LPM: lines per minute
 4. There is no standard modem tariffed for use with TELPAK D service at this time. Modems for TELPAK D require special order from the common carrier.

TABLE 5

COST ANALYSIS

Preliminary cost/benefit analysis

Estimated initial cost of new computer system		
Cost of site preparation	\$	XX
Analysis and programming of initial applications		XX
Cost of training, parallel operation, etc.		XX
Total one-time costs	\$	<u>XX</u>
Annual estimated operating costs:		
Computer and related equipment rental, including maintenance	\$	XX
Computer personnel		XX
Supplies, power, etc.		XX
		<u>XX</u>
Annual savings (annual operating costs using present system minus annual operating costs expected with new system)		<u>XX</u>
Rate of return (rate at which present value of savings equals present value of one-time investment)		XX%
Other non-cash or intangible savings (list)		

ประวัติการศึกษา

ผู้เขียนวิทยานิพนธ์

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ปัจจุบันตำแหน่งอาจารย์โท วิทยาลัยครูสวนสุนันทา
กรมการฝึกหัดครู กระทรวงศึกษาธิการ