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DATACOMPUTER SUPPORT OF SEISMIC DATA ACTIVITY

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DATACOMPUTER SUPPORT OF SEISMIC DATA ACTIVITY

Quarterly Technical Report

November 1, 1975 to January 31, 1976

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Submitted to:

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Arlington, Virginia 22209

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1. Summary

Under this project CCA is providing seismic data storage and
retrieval services, using the facilities of the Datacomputer
System being developed for ARPA under Contract No. MDA903-74-
C-0225. The seismic data will be received over the Arpanet
in real time, stored, and made available to host computers
on the net for further processing.

To satisfy the requirements, the Datacomputer is being augmented
by a mass memory system having a capacity of 200 billion bits.
Additionally, a small Seismic Input Processor (SIP) is being
implemented to collect data over the network, reformat and
buffer it, and periodically burst it into the Datacomputer.
The SIP hardware will consist of a DEC 11/40 computer with
RP04 disks. The mass memory hardware will consist of an Ampex
TBM system.

Project activity can be divided into four catagories: (1)
SIP development and network bandwidth considerations; (2)
TBM acquisition and integration into the Datacomputer; (3)
coordination with the seismic community; and (4) seismic-data
related Datacomputer development. One section below in this
report is devoted to each of these catagories.

2. The SIP

Seismic array data will be collected from SDAC over the Arpanet,
buffered, and reformatted by the Seismic Input Processor (SIP)
which will retransmit the data to the Datacomputer. The SIP
is equipped with disk storage adequate for 24-hour buffering of a
15 kilobit per second data stream.

2.1 Operations

During this quarter, CCA provided certain SIP services over the
network to SDAC and VSC to assist them in CCP development. The

SIP was mostly operative in a mode where information received from the CCP was stored verbatim on the SIP's disk with no attempt to reformat the data or pass it on to the Datacomputer. This mode was used for checkout of the special CCP-SIP communications protocol.

In November 1975, CCA cooperated with SDAC by providing SIP services for CCP shakedown.

In December 1975, the SIP was made available for CCP testing. At various times special temporary modifications were made in the SIP to simulate errors for the purpose of demonstrating the error recovery and integrity of the CCP-SIP communications checksum and acknowledgement scheme. Also, the SIP was temporarily modified so as to generate some special messages for CCP testing.

In January 1976, the SIP was kept up and listening to the CCP during a special two-day demonstration of the seismic system. Of the seismic data thus stored on the SIP's disk, 1000 data points were extracted and sent to VSC for use in further checkout of CCP-SIP communications and of the CCP.

During this CCP-SIP operational experience, an occasional deadlock was observed in which the SIP was unable to send messages to the CCP, getting incomplete transmition indications from the Arpanet. The initial cause of this deadlock was in some instances traced by BBN to an error in the code for the Pluribus IMP at SDAC. BBN has since corrected this error.

2.2 The Software

The SIP's software can be divided into three sections: (1) the basic SIP operating system, (2) the tasks that manage communications with the CCP by a special protocol and store the information received from it on the SIP's disk, and (3) the NCP and other tasks that manage communications with the Datacomputer

and send to it information retrieved from the SIP's disk.
See Figure 1.

The SIP's operating system was augmented early in this reporting
period by routines for using the RP04 disks. A special disk
directory system was designed.

Variations between the CIP-SIP protocol actually used by the
CCI and the documented protocol were noted or resolved.

In the Datacomputer area of the SIP, the NCP that was developed
as described in last quarter's technical report has been revised
to operate in the SIP system and partially rewritten for improved
error recovery and restart behavior. The revised NCP has suc-
cessfully made and broken network connections, and in January
a brief Datalanguage dialogue with the Datacomputer was achieved.

2.3 The Hardware

All of the required SIP hardware has now been installed. The only
internal SIP problem affected one of the two RP04 disk drives, which
was down for nearly two weeks until repaired by Digital Equipment
Corporation.

3. Coordination with the Seismic Community

Further discussions were held among CCA, SDAC, and VSC concerning
the seismic file descriptions.

VSC and SDAC see a requirement for allowing users to type data-
language requests to the Datacomputer directly. To allow for
such use, some changes were made to the files, including changing
the time code format from packed BCD to ASCII. It was decided
that this format change should be made in the SIP instead of the
CCP or the Datacomputer because it is expected that the SIP will
have some spare processor power and the CCP design has reportedly
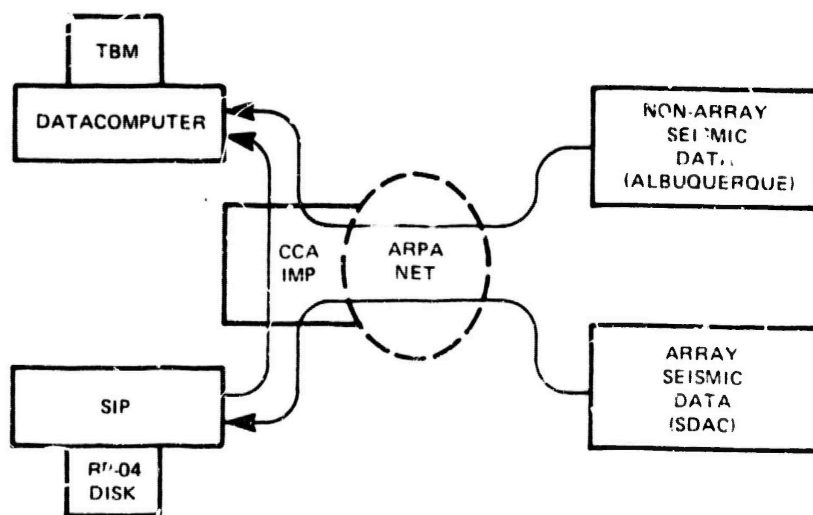been frozen.

Figure 1--Seismic Data Flow

On December 8th a meeting was held at CCA, with representatives
from ARPA-NMRO, VSC, SDAC, and LL-ASG. File formats were finalized,
except for a few details where a range of alternatives and means
of later selection w re picked.

4. The TBM

4.1 Site preparation

From December 8 to December 15, 1975, all computer equipment at
CCA's site was powered down while physical site enhancements were
made in preparation for the installation of the TBM. These
enhancements included plumbing for new air conditioning, instal-
lation of an electrical ground grid, installation of additional
electrical circuit capacity, installation of acoustic ceiling
panels, enlargement of the false flooring, and modification to
the the wall layout.

All computers, including the CCA IMP, were shut down and protected
with plastic sheets, because it was determined that the work might
generate harmful metallic particles and filter-penetrating plaster
dust. The hope was to avoid operational difficulties by this
shut down; however, the operation of the PDP-10 was quite unreliable
for two weeks after December 15th; one failure resulted in loss
of data and the necessity to reload from back-up tape dumps.

In January, the new air conditioner and water chiller were installed
The only site items remaining to be done are installation of sound
baffling and electrical work related to actual installation of the
TBM.

4.2 The Hardware

Ampex, subcontractor to CCA for the TBM, has reported that the
TBM will be shipped in the middle of February, three weeks later
than the previously claimed shipping date of January 26. The
reason given is delays in completing Engineering Change Notice updates
to the Data Storage Section of the TBM.

4.3 The Software

Two elements of TBM-related software were completed this quarter.

(1) A general device test and exercise program called TESTIT. This program runs under TENEX and utilizes the non-standard-device routines in CCA TENEX to interact with TBM, CalComp 2330 type disks, and other devices. The program allows numerous patterns of test activity and test data to be operator-specified.

(2) A program to produce formated printouts of TBM System Control Processor (SCP) dump DECtapes. The SCP is the internal coordinator of the TBM; to diagnose problems in SCP software (supplied by Ampex), core dumps of the SCP are taken on its DECtape units and subsequently printed by the this program.

5. The Datacomputer

Development of Datacomputer software to allow for utilization of the TBM tertiary store has continued. Progress was made on the SDAX routines that coordinate staging of data between TBM and disk and that allow for the simultaneous sharing of a file by an updater and multiple readers.

Glossary

BBN	--	Bolt, Beranek, and Newman, Inc.
CCA	--	Computer Corporation of America
CCP	--	Communications and Control Processor -- at SDAC
DEC	--	Digital Equipment Corporation
IMP	--	Interface Message Processor
LL-ASG	--	Lincoln Laboratories Applied Seismology Group
NCP	--	Network Control Program
SCP	--	System Control Processor -- part of TBM
SDAC	--	Seismic Data Analysis Center -- Alexandria, Virginia
SDAX	--	Special Disk Area Index
SIP	--	Seismic Input Processor -- at CCA
TBM	--	Tera Bit Memory System -- at CCA
VSC	--	Vela Seismological Center -- Alexandria, Virginia

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