

Software problems associated with introduction of new common code

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सार — 1 जनवरी 1982 को सिनॉप्टिक प्रेक्षकों के लिए एक नया सामान्य कोड लागू किया गया। इससे राष्ट्रीय और अन्तर्राष्ट्रीय आदान-प्रदान के निमित्त आंकड़ों को संसाधित करने के लिए वर्तमान यंत्रितर सामग्री को अधिक आधुनिक बनाने की आवश्यकता महसूस हुई। इस शोध-पत्र में दूर-संचार, यंत्रितर सामग्री की समस्याओं और उनके समाधानों तथा शेष बची समस्याओं के संदर्भ में नए कोड का विवेचन किया गया है।

ABSTRACT. A new common code for synoptic observations was introduced on 1 January 1982. This necessitated the update of the existing software for processing the data for national and international exchange. The advantages of the new code with respect to telecommunication, the software problems and solutions associated with it and the problems that still exist have been discussed.

1. Introduction

Meteorological observations are transmitted over Global Telecommunication System (G.T.S.) after coding the observations according to the code set by World Meteorological Organisation (W.M.O.). The new common code (N.C.C.) which was introduced on 1 January 1982 is an improvement over the old one. There is a provision to code maximum weather elements in detail. They are capable of being handled by a telecommunication computer for quick processing as the code is divided into well defined sections with indicator figures. The last section is meant for only national exchange and is to be deleted from the original report for international dissemination. The existing software has to be modified to accomplish this and other allied problems pertaining to increase in number of groups in various sections.

2. New common code (N.C.C.)

N.C.C. is divided into five sections, viz., section 0, 1, 2, 3 & 5 with specific indicator groups 222, 333 and 555 for sections 2, 3 and 5 respectively. There is no indicator figure like 444 (Weather code 1982).

2.1. Section zero is a message descriptor with AAXX in the first group for both manned and automatic land stations followed by another group for date, time and wind indicator. BBXX is used in the case of ship observations. AAXX and BBXX have been newly introduced in N.C.C. in place of MMXX and NNXX in the old code. Wind indicator figure is another addition to indicate the type of measurement of wind, i.e., by instrument, by estimation, in knots or in metres per second. In the case of ship observations,

a different procedure is followed for transmission of message descriptor. The date and time group does not follow BBXX but follows the call sign of individual ship in the text portion of the message. This is because text portion contains observations from different ships and a single wind indicator cannot be given uniformly after BBXX group for the whole message for all the ships as the type of measuring wind may differ from one to another.

2.2. Section 1 of N.C.C. consists of groups indicating visibility wind, dry bulb and dew point temperatures, station or mean sea level pressure, present and past weather and formation of clouds.

2.3. Section 2 of N.C.C. pertains to maritime observations giving direction, period and height of wind waves and swells. Sections 0, 1 and 2 are meant for international exchange.

2.4. Section 3 consists of groups indicating maximum and minimum temperatures, direction and elevation of orographic clouds, pressure changes in 24 hours, amount of precipitation since 0300 GMT observation, base of clouds and any special meteorological phenomenon that may take place. Section 3 is meant for regional exchange.

2.5. Section 5 consists of groups indicating daily total rainfall, cumulative seasonal rainfall and squall phenomenon, if it takes place. This section is meant for national exchange only. The individual station in a National Meteorological Centre report the observations including all sections. But the indicator groups enable a computer to recognise sections and transmit a particular section/sections over a particular network

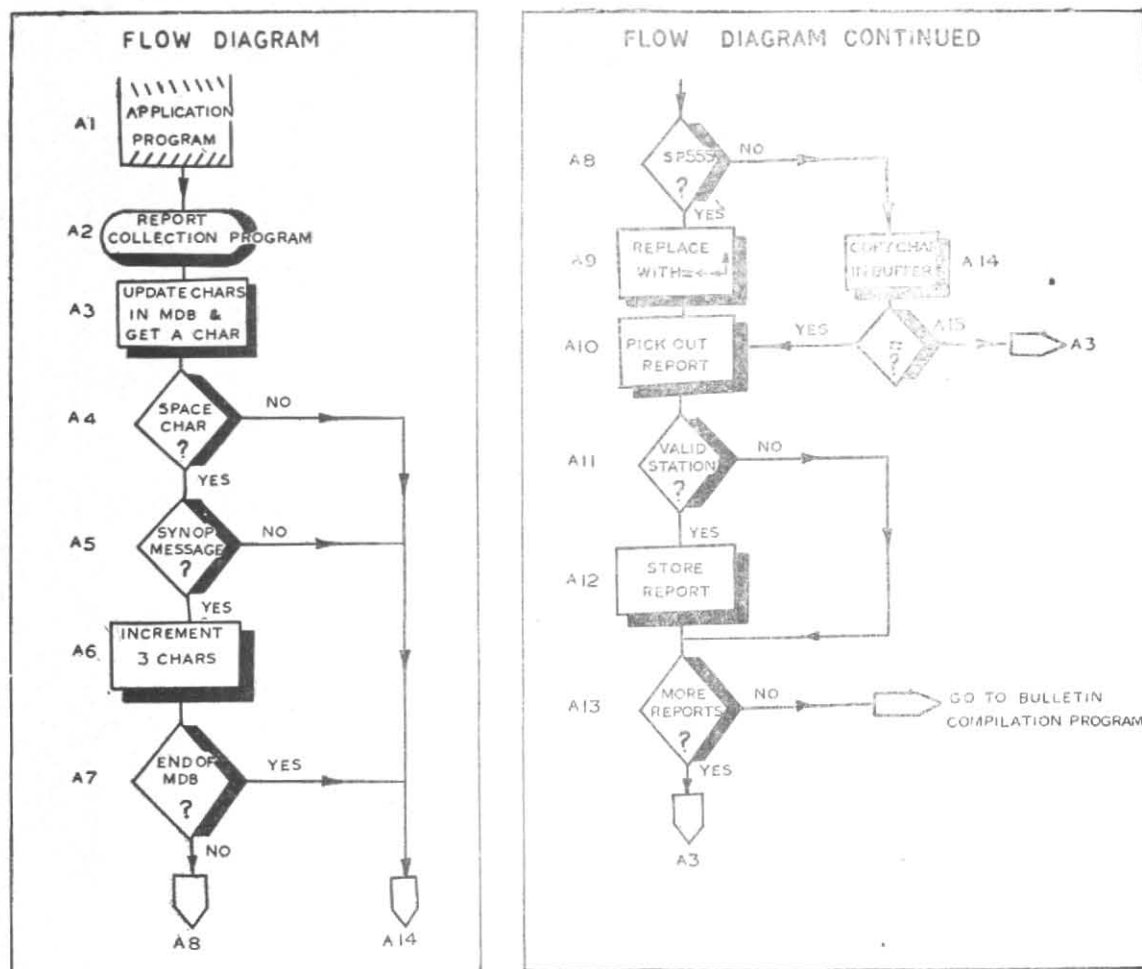


Fig. 1. Flow chart

of telecommunications. In the present computer, sections 0 through 3 are exchanged globally and all the sections are exchanged within the nation.

2.6. A group consists of five figures. An individual group in a section is preceded by one or two fixed indicator figures thus enabling a programmer to approach a particular group in the report for any text processing, if required.

2.7. The total number of groups in N.C.C. is larger than that in old code. The length of a report increases further when a special meteorological phenomenon is reported. This has resulted in some difficulty for the present software, as the layout on memory and disc is fixed.

2.8. An appropriate wind indicator figure is to be given for different messages depending on the type of measurement of wind and, hence, requires change in software.

2.9. If squall takes place, section 5 should be reported in any observation. But section 5 is mandatory

for 0300 GMT observation for reporting daily rainfall. So irrespective of the time of observation, the software has to check all synoptic observations for the existence of indicator figures 555 and delete automatically all the groups following 555 for global dissemination, but retain the report in toto for national dissemination.

3. Existing software for old code

3.1. The software in the telecommunication computer was written according to the then old code. As the online software package is well-knit and each module is interconnected, major software changes pose problems to the software engineers and require careful study of the programs.

Each code whether it is surface, upper air or any other observation is allotted a particular format number and the computer recognises the specific code based on the format number. The SYNOPS, PILOTS & TEMP messages of Indian basic stations are collected and compiled by the system for onward global exchange. The rest of the data are simply analysed for

message format errors and are placed on transmission queues on first-come-first serve basis.

The message descriptors MMXX and AAXX were defined in the software as the former was being reported for land based manned stations and the latter for land based automatic stations. The message descriptor NNXX was defined for ship observations. There was a 4 figure group following message descriptor with a space character in between. This group is redundant and indicates the date and time of observation in hours only.

If the message descriptor is reported wrongly, the whole message from ZCZC to NNNN is rejected by the computer for manual correction. The ship observations are not compiled in the computer automatically as planned initially. They are routed to a local circuit where they are collected and compiled manually and are re-input into computer with international 4-letter location indicator DEMS as the compiling centre. Automatic compilation of ship observations requires major changes in the existing online programs.

3.2. Software modification for message descriptor

3.2.1. The present software consists of a number of program modules. Modification is carried out in the Input Processing Program module by defining AAXX in place of MMXX and BLXX as dummy message descriptor to skip program meant for automatic stations. The message descriptor NNXX defined the purpose for land based manned as well as automatic stations. The message descriptor NNXX defined earlier for ship observations is replaced by BBXX to suit new code.

3.2.2. In the new code a five-figure group follows AAXX. A wind indicator is appended to the original 4 figure group. The wind indicator takes values 0, 1, 3 and 4 depending on whether the wind observation is manual or automatic and whether it is measured in metres per second or knots. In India the wind is measured by instrument and is reported in knots and as such the wind indicator figure is always 4. This wind indicator would have created problems for software engineers, had it been reported separately for separate synoptic observations because in the existing software this particular group after AAXX is not checked for validity and extraction of this wind indicator would be difficult softwarewise. The Bulletin Compilation Program module is modified by defining a fixed number 4. The date and time of observation (4 figures) is extracted from the message and placed to the left of character 4 making a five-figure group. The message descriptor thus constructed is stored at a defined area to be appended later for the modified reports.

3.3. Software modification for stripping section 5

3.3.1. The most difficult software problem in association with N.C.C. is in relation to section 5 which, as stated earlier, contains groups for reporting daily rainfall, seasonal rainfall and squall. This section should not be, therefore, transmitted to international circuits and RTT broadcasts where as it should be transmitted within India. The computer receives synoptic reports for both basic stations meant for global

exchange and non-basic stations for regional and national exchange simultaneously from different regional collecting centres and other stations in India connected to the computer. The computer has to check these various stations, collect the synoptic reports for basic stations only, extract all the sections upto and including section 3, delete section 5, compile the reports in ascending order of station index numbers and transmit to international circuits with a proper report separation character (= sign) at the end of each report. The original reports should not be obliterated and have to be transmitted in toto to national circuits.

3.3.2. The philosophy underlying the stripping of section 5 is to split one report into two reports, the first report ending with section 3 and the second report starting from the group after 555 which would be considered by the computer as five-figure station index number for the rest of the groups. A table of station index number for whom the reports are to be extracted and compiled is held in the computer. Each station number of a synoptic report is compared with that in the table. Any station report beyond this table will not be collected and compiled. Since the immediate group after 555 is always preceded by a figure zero, this group will never be an Indian station index number and thus the rest of groups are ignored. The computer recognises the report separation character (=) as the end of that particular report in the message and looks for the presence of either an alignment function, viz., two carriage returns and a line feed or the end of message, NNNN. If NNNN is not present, the 5-figure group after alignment function is taken as station index number and the cycle continues till NNNN is found.

3.3.3. The flow diagram meant for deleting section 5 is given in the figure. Since each message contains a different number of characters, the temporary area called the Multiplexer Data Block (MDB) holding these data characters is updated for the number of characters in it. Its negative value is stored in an index register which is incremented to check the end of MDB, each time a character is copied into another buffer area to store the report. The contents of MDB are modified when a space character followed by 555 is located. These 4 characters are replaced by = sign, carriage return (←), another carriage return and a line feed (↑). This = sign indicates the end of that particular report for that station number and the remaining 3 characters (Alignment function) indicate the beginning of another report. The software now extracts the reports upto the deliberately placed = sign and looks for station number. Since the group following 555 is not a valid station index number, this artificial report (i.e., all the groups following 555 upto the original = sign of the report) is ignored by the computer. Thus section 5 is automatically deleted by the computer. The extracted reports are passed on to Bulletin Compilation Program module to compile these valid reports into a message for onward transmission to international circuits.

3.3.4. With the above arrangement the computer used to fail now and then giving failure code as memory protect. A memory protect failure occurs when a program approaches an area in the core which

is not available or which should not be approached. On careful debugging it is found that a synoptic message may extend to two or more MDBs and the four-figure group 'space 555' happens to be at the end of MDB or is split into two parts—the first part remaining at the end of one MDB and the second part appearing at the beginning of next MDB. An MDB can hold a maximum of 256 characters. The splitting of this group happens occasionally. While fetching 555 programwise after checking for space, the program counter approaches beyond MDB and the computer fails as 'memory protect'. Also it so happens some times that a PILOT or TEMP message contains three consecutive characters of 5 in a group and the computer faithfully replaces them by report separation signal and alignment function and gets into trouble. The above difficulties were overcome by having proper checks as shown in flow chart. Two checks were introduced; one to check if message in question belongs to synoptic report and the other to check whether program counter is approaching end of MDB. The major problem of stripping section 5 automatically by the computer is thus solved by software.

3.3.5. All the above manipulations are done in a temporary area and the original report is intact on the disc. This original report is transmitted in toto to national circuits.

4. Present status of the system

4.1. While planning software originally the number of groups in a synoptic message were not envisaged to be more than 19 groups and the storage area was

defined accordingly. The compilation program was written based on the maximum number of possible characters in a synoptic report. Any message containing a report with more than 19 groups is rejected in the initial stage itself by the computer and refeed manually upto 19 groups. The recipients get depleted report.

4.2. The check on overlength report could be removed and national circuits would get complete report of more than 19 groups as there is no compilation involved while transmitting to national circuits. But the international circuits would get not more than 19 groups after truncating the report and this report will not contain report separation signal (=). To circumvent the above difficulty, the layout of the storage on the disc and involvement of major online program any rearrangement involves shifting of whole files on the disc and involvement of major online program changes.

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Reference

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