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| WORLD METEOROLOGICAL ORGANIZATION  COMMISSION FOR BASIC SYSTEMS  -----------------------------  FOURTH MEETING OF  INTER-PROGRAMME EXPERT TEAM ON DATA REPRESENTATION MAINTENANCE AND MONITORING  GENEVA, SWITZERLAND, 30 MAY - 3 JUNE 2016 |  | IPET-DRMM-IV / Doc. 3.1 (1)  (16. 5. 2016)  -------------------------  ITEM 3.1  ENGLISH ONLY |

BUFR AND CREX

**Specifying the operands of a multivariate operator**

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**Summary and Purpose of Document**

In cases where a descriptor sequence contains an element descriptor that conveys an operation involving other descriptors in the same sequence, ambiguity may exist on which descriptors convey the related operands. We propose a mechanism to resolve such ambiguity.

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**ACTION PROPOSED**

The meeting is requested to approve the proposal for validation in the context of BUFR Edition 5.

**ANNEXES:**

1.

**DISCUSSION**

At the IPET-DRMM III meeting in Beijing (2015) a requirement was expressed for a means to convey information, within a BUFR sequence, to specify the operands of a given descriptor conveying the result of an operation on two or more fields. For instance, it was explained that some weather radar data may contain the results of a correlation operator, and that the operands of the correlation may vary from one instance to another. It may not be obvious to determine which descriptors convey the operands in each specific case. The mechanism that provides this information must unambiguously identify both the operation and the operands.

We provide two options for discussion in the framework of BUFR Edition 5.

Note that for the purpose of this paper, we use the BUFR Edition 4 convention for bit order.

**PROPOSAL**

We endeavour to provide a generic mechanism to characterize operations and related operands by applying and extending the Data Present Bitmap framework found in BUFR Edition 4.

It is proposed to add a new Table C operator descriptor as per the table below:

|  |  |  |  |
| --- | --- | --- | --- |
| TABLE REFERENCE | OPERAND | OPERATOR NAME | OPERATION DEFINITION |
| F X |
| 2 26 | 000 | Characterization of operation and operands follows | This operator will cause the Data Present Bitmap immediately following to be interpreted as indicating all the element descriptors conveying a given operation and its operands. |
| 2 26 | 255 | Characterization of operation and operands marker operator | This operator shall signify a 1 bit wide data item containing the significance of an element descriptor. The element descriptor subject to the significance is obtained by the application of the data present bit-map associated with the characterization of operation and operands operator.  Data item value = 1 : Operator  Data item value = 0 : Operand |

# Example: Specification of the operation and operands

The operation and operands themselves are depicted by using 2 26 255 one time for each data value indicated to be “present” by the data present bit map. The value in the data section corresponding to each of these descriptors will be a single bit indicating whether it is to be characterized as an operand or as the operation.

Descriptor Data value Comments

ED1 DV1

ED2 DV2

ED3 DV3

ED4 DV4

ED5 DV5

ED6 DV6

ED7 DV7

2 26 000 (no corresponding DV) Characterization of operation and operands follow

2 36 000 (no corresponding DV) Define a data present bit map

1 07 001 (no corresponding DV)

0 31 031 1100001 The data present bit map

2 26 255 O1 A value of 0 indicates the element descriptor ED1 is an operand

2 26 255 O2 A value of 0 indicates the element descriptor ED2 is an operand

2 26 255 O7 A value of 1 indicates the element descriptor ED7 is the operation that was applied to ED1 and ED2