

# ecCodes BUFR encoding

Fortran 90 and Python API – part 2

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# Introduction:

- Fortran 90 and Python subroutines to encode
  - Delayed replication
  - Bit map
- Practical examples

# Encoding delayed replication into a BUFR file

- BUFR delayed replication

- Descriptor starts with 1

1 07 000, 031001

- Followed by operator 031001 or 031002

- The number of repetitions is encoded in the data section.

- Depending of replication value you can set:

inputShortDelayedDescriptorReplicationFactor as 1bit

inputDelayedDescriptorReplicationFactor as 8 bits

inputExtendedDelayedDescriptorReplicationFactor as 16 bits



It must be set, before setting **unexpandedDescriptors**.

# Encoding delayed replication into a BUFR file

Input arguments  
Output arguments

- Setting delayed replication in F90

```
delayedDescriptorReplication=(/numbers of replications/)
```

```
call codes_set(ibufr,'inputDelayedDescriptorReplicationFactor',delayedDescriptorReplication)
```

- Setting delayed replication in Python

```
delayedDescriptorReplication=[numbers of replications]
```

```
codes_set_array(ibufr,'inputDelayedDescriptorReplicationFactor',delayedDescriptorReplication)
```

## Practical 5: Encoding delayed replication into BUFR file

1. Open file in write mode
2. Create new BUFR message from sample
3. Set '**masterTablesVersionNumber**' to 27
4. Set '**numberOfSubsets**' to 1
5. Set **inputDelayedDescriptorReplicationFactor** to 2
6. Set **inputExtendedDelayedDescriptorReplicationFactor** to 4
7. Set **unexpandedDescriptors** to 309052
8. Set values for '**pressure**' and '**windDirection**'
9. '**pack**' the data section
10. Write the created message into the file
11. Release the message
12. Close the output file



### Helpful Tips

`codes_open_file`

`codes_bufr_new_from_samples`

`codes_set`

`codes_set (ibufr,'pack',1)`

`codes_write`

`codes_release`

## Practical 6: Encoding delayed replication into BUFR file

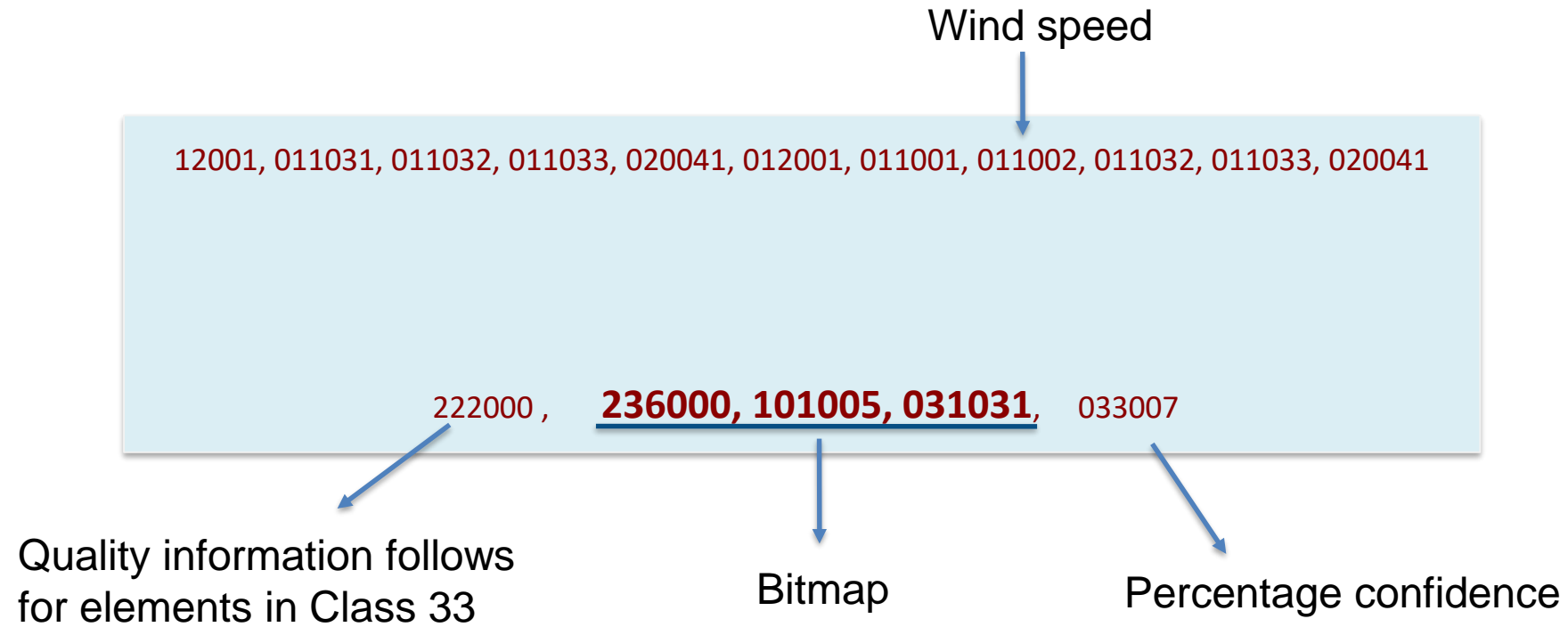
1. Open file in write mode
2. Create new BUFR message from sample
3. Set '**masterTablesVersionNumber**' to 27
4. Set '**numberOfSubsets**' to 2
5. Set **inputDelayedDescriptorReplicationFactor** to (2,3)
6. Set **inputExtendedDelayedDescriptorReplicationFactor** to (4,2)
7. Set **unexpandedDescriptors** to 309052
8. '**pack**' the data section
9. Write the created message into the file
10. Release the message
11. Close the output file



### Helpful Tips

```
codes_open_file
codes_bufc_new_from_samples
codes_set
codes_set (ibufc,'pack',1)
codes_write
codes_release
```

# Encoding bitmap and quality info into a BUFR file



Data present indicator 031031 values

1, 0, 1, 1, 1

# Encoding bitmap and quality info into a BUFR file

- Setting bitmap using F90

```
integer(kind=4), dimension(:), allocatable :: bitmapMask
```

```
if(allocated(bitmapMask)) deallocate(bitmapMask)
```

```
allocate(bitmapMask(5))
```

```
bitmapMask=(/ 1, 0, 1, 1, 1/)
```

```
call codes_set(ibufr,'inputDataPresentIndicator',bitmapMask)
```

- Setting related quality info to the variable

```
call codes_set(ibufr,'windSpeed',value)
```

```
call codes_set(ibufr,'windSpeed->percentConfidence',value)
```



1 → not present  
0 → present



# Encoding bitmap and quality info into a BUFR file

- Setting bitmap using python

```
bitmapMask=[ 1, 0, 1, 1, 1 ]
```

```
codes_set_array(ibufr,'inputDataPresentIndicator',bitmapMask)
```

- Setting related quality info to the variable

```
codes_set(ibufr,'windSpeed',value)
```

```
codes_set(ibufr,'windSpeed->percentConfidence',value)
```



1 → not present  
0 → present

## Practical 7: Encoding bitmap and quality info into a BUFR file

1. Open file in write mode
2. Create new BUFR message from sample
3. Set '**masterTablesVersionNumber**' value
4. Define **bitmapMask** array value
5. Set '**inputDataPresentIndicator**' with values of bitmapMask array
6. Set **unexpandedDescriptors** array
7. Set values for '**windSpeed**' and its '**percentConfidence**'
8. '**pack**' the data section
9. Write the created message into the file
10. Release the message
11. Close the output file
12. Check the new file with bufr\_dump



### Helpful Tips

```
codes_open_file
codes_bufr_new_from_samples
codes_set
codes_set (ibufr,'pack',1)
codes_write
codes_release
```

# References

- ecCodes

<https://software.ecmwf.int/wiki/display/ECC/ecCodes+Home>

- BUFR tables

<https://software.ecmwf.int/wiki/display/ECC/BUFR+tables>

