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# 5.5 Encoding Mutation Annotation

In value templates, it is allowed to add a mutation annotation to parts of the value which is applied during encoding of the annotated part as a post-processing step to the original result produced by the encoder for that part.

***Syntactical Structure***

[ *TemplateInstance* ] (**@mutation** | **@mutation\_o** | **@mutation\_unichar** [ "(" *StringEncoding* ")" ]) *Expression*

***Semantic Description***

The family of mutation annotations **@mutation**, **@mutation\_o** and **@mutation\_unichar** are value templates that can be part of special value templates whose only purpose is to be encoded.

If the mutation annotation keyword occurs to the right of a *TemplateInstance*, then the *Expression* on the right side of the mutation annotation keyword can use the keyword **value** as an implicit formal parameter to reference the encoded value of that *TemplateInstance*. If the *Expression* does not need to reference the encoded value, then the *TemplateInstance* may be omitted.

If the **@mutation** keyword is used, then the **value** keyword refers to an expression of type **bitstring** and the *Expression* shall evaluate to a value of type **bitstring**.

If the **@mutation\_o** keyword is used, then the **value** keyword refers to an expression of type **octetstring** and the *Expression* shall evaluate to a value of type **octetstring**.

If the @**mutation\_unichar** keyword is used, then the **value** keyword refers to an expression of type **universal charstring** and the *Expression* shall evaluate to a value of type **universal charstring**. If a different string encoding than the default “UTF-8” is used for the universal charstring, then this string encoding is given as an additional *StringEncoding* operand in parenthesis after the **@mutation\_unichar** keyword.

When an encoder processes a value template that is a mutation annotation with a *TemplateInstance*, it will first encode that *TemplateInstance* into a sub-message. It will then transform that sub-message into a TTCN-3 string value of the appropriate type (depending on which mutation annotation is used) and then invoke the evaluation of the mutation *Expression*, using the transformed string value as an actual parameter of the formal parameter **value**. The result of the evaluation is transformed back to a sub-message which is then used instead of the original sub-message as part of the resulting message.

When an encoder processes a value template that is a mutation annotation without a *TemplateInstance*, it will evaluate the mutation *Expression* and transform the resulting value to a sub-message which is then used as the part of the message corresponding to the encoded value.

If the **@mutation\_o** keyword is used, the sub-message is transformed into a left-aligned **octetstring** before transformation, so that if the sub-message does not have a bit-length divisible by 8, the appropriate amount of padding bits are the least significant bits of the least significant octet of the **octetstring**. The bit-content of the whole octetstring that is the result of the evaluation will be used as the resulting sub-message.

If the **@mutation\_unichar** keyword is used, the sub-message is transformed depending on the given *StringEncoding* into a **univeral charstring**. The transformed sub-message must be byte-aligned and have a bit-length that is consistent with the given *StringEncoding* and otherwise an error will be produced. The result of the evaluation is a **universal charstring** that is transformed into a sub-message by using the given *StringEncoding* to encode it into a byte-aligned binary representation.

***Restrictions***

1. The only operations allowed on templates using mutation annotations are encoding and sending operations. They shall not be used for matching, decoding or receiving operations.
2. The *Expression* shall conform to the restrictions given in clause 16.4.1 and shall not use any functions with a runs on clause.