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TTCN-3 extension: Advanced Matching

**ETSI Standard**

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# 6 TCI Extensions for the Package

## 6.5 Extensions to clause 8 of ETSI ES 201 873-6, JavaTM language mapping

**Clause 8.3.2.17 TciMatchingTypeType**

This clause is to be extended.

// TCI IDL TciMatchingTypeType

package org.etsi.ttcn.tci;

public interface TciMatchingType {

public final static int TEMPLATE\_LIST = 0 ;

public final static int COMPLEMENTED\_LIST = 1 ;

public final static int ANY\_VALUE = 2 ;

public final static int ANY\_VALUE\_OR\_NONE = 3 ;

public final static int VALUE\_RANGE = 4 ;

public final static int SUBSET = 5 ;

public final static int SUPERSET = 6 ;

public final static int ANY\_ELEMENT = 7 ;

public final static int ANY\_ELEMENTS\_OR\_NONE = 8 ;

public final static int PATTERN = 9 ;

public final static int MATCH\_DECODED\_CONTENT = 10 ;

public final static int OMIT\_TEMPLATE = 11 ;

public final static int DYNAMIC\_MATCHING = 12 ;

public final static int CONJUNCTION = 13 ;

public final static int IMPLICATION = 14 ;

public final static int EXCLUSION = 15 ;

public final static int DISJUNCTION = 16 ;

public final static int REPETITION = 17 ;

}

**Clause 8.3.4.1 Value**

This clause is to be extended.

**Value** is mapped to the following interface:

// TCI IDL Value

package org.etsi.ttcn.tci;

public interface Value {

public Type getType();

public boolean notPresent();

public String getValueEncoding();

public String getValueEncodingVariant();

public String[] getEncodeAttributes();

public String[] getVariantAttributes(String encoding);

public boolean isMatchingSymbol();

public String valueToString ();

public boolean isLazy();

public boolean isFuzzy();

public boolean isEvaluated();

public LengthRestriction getLengthRestriction ();

public LengthRestriction newLengthRestriction ();

public void setLengthRestriction (LengthRestriction restriction);

public boolean isIfPresentEnabled ();

public void setIfPresentEnabled (boolean enabled);

public RangeBoundary getLowerTypeBoundary();

public RangeBoundary getUpperTypeBoundary();

public LengthRestriction getTypeLengthRestriction();

public MatchingMechanism getTypeMatchingMechanism();

public boolean isOptional();

public Mutation getMutation();

}

**Methods:**

* getMutation Returns a mutation annotation if defined for the value.

**Clause 8.3.5.6 DynamicMatch**

This clause is to be added.

**DynamicMatch** is mapped to the following interface:

// TCI IDL DynamicMatch

package org.etsi.ttcn.tci;

public interface DynamicMatch {

public Boolean isFunctionBased ();

public TciBehaviourId getMatchingFunction ();

public void setMatchingFunction (TciBehaviourId functionId);

}

**Methods:**

* isFunctionBased Returns true if the mechanism uses the short-hand notation **@dynamic** *FunctionRef* and false otherwise.
* getMatchingFunction Returns the qualified name of the associated function.
* setMatchingFunction Sets the function associated with the matching mechanism.

**Clause 8.3.5.7 TwoStepMatch**

This clause is to be added.

**TwoStepMatch** is mapped to the following interface:

// TCI IDL TwoStepMatch

package org.etsi.ttcn.tci;

public interface TwoStepMatch {

public Value getPrimaryTemplate ();

public void setPrimaryTemplate (Value primaryTemplate);

public Value getSecondaryTemplate ();

public void setSecondaryTemplate (Value secondaryTemplate);

}

**Methods:**

* getPrimaryTemplate Returns the primary template.
* setPrimaryTemplate Sets the primary template.
* getSecondaryTemplate Returns the secondary template.
* setSecondaryTemplate Sets the secondary template.

**Clause 8.3.5.8 Repetition**

This clause is to be added.

**Repetition** is mapped to the following interface:

// TCI IDL Repetition

package org.etsi.ttcn.tci;

public interface Repetition {

public Value getRepeatedTemplate ();

public void setRepeatedTemplate (Value primaryTemplate);

public LengthRestriction getRepetitionCount ();

public void setRepetitionCount (LengthRestriction repetitionCount);

}

**Methods:**

* getRepeatedTemplate Returns the repeated template.
* setRepeatedTemplate Sets the repeated template.
* getRepetitionCount Returns the repetition count.
* setRepetitionCount Sets the repetition count.

**Clause 8.3.2.21 Mutation**

This clause is to be added.

**Mutation** is mapped to the following interface:

// TCI IDL Mutation

package org.etsi.ttcn.tci;

public interface Mutation {

public boolean isMessageNeeded ();

public TriMessage mutate (TriMessage subMessage);

}

**Methods:**

* isMessageNeeded Returns true if encoded sub-message is required for mutation, false otherwise.
* mutate Returns mutated version of the sub-message.

## 6.6 Extensions to clause 9 of ETSI ES 201 873-6, ANSI C language mapping

**Clause 9.2 Value interfaces**

Table 5 is to be extended.

| TCI IDL Interface | ANSI C representation | Notes and comments |
| --- | --- | --- |
| : |  |  |
| Value | | |
| Mutation getMutation () | Boolean tciIsMutationDefined (Value inst) |  |
| TBoolean  Mutation.isMessageNeeded () | Boolean tciIsMessageNeededForMutation (Value inst) |  |
| TriMessage Mutation.mutate (TriMessage subMessage) | TriMessage tciMutate (Value inst, TriMessage \* subMessage) |  |
| DynamicMatch | | |
| TBoolean isFunctionBased () | Boolean tciIsMatchFunctionBased (Value inst) |  |
| QualifiedName getMatchingFunction() | QualifiedName \* tciGetMatchingFunction (Value inst) |  |
| Void setMatchingFunction (QualifiedName functionId) | void tciSetMatchingFunction(Value inst, QualifiedName functionId) |  |
| **TwoStepMatch** | | |
| Value getPrimaryTemplate() | Value getPrimaryTamplate(Value inst) |  |
| void setPrimaryTemplate(Value template) | void setPrimaryTemplate(Value inst, Value template) |  |
| Value getSecondaryTemplate() | Value getSecondaryTamplate(Value inst) |  |
| void setSecondaryTemplate(Value template) | void setSecondaryTemplate(Value inst, Value template) |  |
| Repetition | | |
| Value getRepeatedTemplate() | Value getRepeatedTemplate(Value inst) |  |
| void setRepeatedTemplate(Value template) | void setRepeatedTemplate(Value inst, Value template) |  |
| LengthRestriction getRepeatedTemplate() | TciLengthRestriction getRepetitionCount(Value inst) |  |
| Void setRepetitionCount (LengthRestriction repetitionCount) | void setRepetitionCount(Value inst, TciLengthRestriction repetitionCount) |  |

## 6.7 Extensions to clause 10 of ETSI ES 201 873-6, C++ language mapping

**Clause 10.5.2.16 TciMatchingTypeType**

This clause is to be extended.

typedef enum

{

TCI\_TEMPLATE\_LIST = 0,

TCI\_COMPLEMENTED\_LIST = 1,

TCI\_ANY\_VALUE = 2,

TCI\_ANY\_VALUE\_OR\_NONE = 3,

TCI\_VALUE\_RANGE = 4,

TCI\_SUBSET = 5,

TCI\_SUPERSET = 6,

TCI\_ANY\_ELEMENT = 7,

TCI\_ANY\_ELEMENTS\_OR\_NONE = 8,

TCI\_PATTERN = 9,

TCI\_MATCH\_DECODED\_CONTENT = 10,

TCI\_OMIT\_TEMPLATE = 11,

TCI\_DYNAMIC\_MATCHING = 12,

TCI\_CONJUNCTION = 13,

TCI\_IMPLICATION = 14,

TCI\_EXCLUSTION = 15,

TCI\_DISJUNCTION = 16,

TCI\_REPETITION = 17

} TciMatchingType;

**Clause 10.5.2.20 Mutation**

This clause is to be added.

Specifies a mutation annotation. It is mapped to the following pure virtual class:

class Mutation {

public:

virtual ~Mutation ();

virtual Tboolean isMessageNeeded () const =0;

virtual TriMessage mutate (const TriMessage \* p\_message) const =0;

virtual Tboolean operator== (const Mutation &p\_mutation) const =0;

virtual Mutation \* clone () const =0;

virtual Tboolean operator< (const Mutation &p\_mutation) const =0;

}

**Methods:**

~Mutation

Destructor

isMessageNeeded

Returns true if encoded sub-message is required for mutation, false otherwise

mutate

Returns mutated version of the sub-message

operator==

Returns true if both objects are equal

clone ()

Returns a copy of the Mutation

operator<

Operator < overload

**Clause 10.5.3.2 Value**

This clause is to be extended.

A value of TciValue represents TTCN-3 values for a given type. It is mapped to the following pure virtual class:

class TciValue {

public:

virtual ~TciValue ();

virtual const TciType & getType () const =0;

virtual const Tstring & getValueEncoding () const =0;

virtual const Tstring & getValueEncodingVariant () const =0;

virtual const std::vector<Tstring\*> & getEncodeAttributes () const =0;

virtual const std::vector<Tstring\*> & getVariantAttributes (const Tstring \* encoding) const =0;

virtual Tboolean notPresent () const =0;

virtual Tboolean isMatchingSymbol () const =0;

virtual const Tstring & valueToString () const =0;

virtual Tboolean isLazy () const =0;

virtual Tboolean isFuzzy () const =0;

virtual Tboolean isEvaluated () const =0;

virtual LengthRestriction \* getLengthRestriction () const = 0;

virtual LengthRestriction \* newLengthRestriction () const = 0;

virtual void setLengthRestriction (const LengthRestriction \* p\_restriction) =0;

virtual Tboolean isIfPresentEnabled () const =0;

virtual void setIfPresentEnabled (Tboolean p\_enabled) =0;

virtual Tboolean isOptional () const =0;

virtual RangeBoundary \* getLowerTypeBoundary() const = 0;

virtual RangeBoundary \* getUpperTypeBoundary() const = 0;

virtual LengthRestriction \* getTypeLengthRestriction() const = 0;

virtual MatchingMechanism \* getTypeMatchingMechanism() const = 0;

virtual Mutation \* getMutation() const = 0;

virtual Tboolean operator== (const TciValue &p\_val) const =0;

virtual TciValue \* clone () const =0;

virtual Tboolean operator< (const TciValue &p\_val) const =0;

}

**Methods:**

* getMutation Returns a mutation annotation if defined for the value.

**Clause 10.5.3.23 DynamicMatch**

This clause is to be added.

TTCN-3 dynamic matching mechanism support. It is mapped to the following pure virtual class:

class DynamicMatch : public virtual MatchingMechanism {

public:

virtual ~DynamicMatch ();

virtual Tboolean isFunctionBased () const =0;

virtual const TciBehaviourId \* getMatchingFunction () const =0;

virtual void setMatchingFunction (const TciBehaviourId & functionId) =0;

virtual Tboolean operator== (const DynamicMatch &p\_dynamicMatch) const =0;

virtual DynamicMatch \* clone () const =0;

virtual Tboolean operator< (const DynamicMatch &p\_content) const =0;

}

**Methods:**

~DynamicMatch

Destructor

isFunctionBased

Returns true if the mechanism uses the short-hand notation **@dynamic** *FunctionRef* and false otherwise

getMatchingFunction

Returns the qualified name of the associated function

setMatchingFunction

Sets the function associated with the matching mechanism

operator==

Returns true if both objects are equal

clone

Return a copy of the matching mechanism

operator<

Operator < overload

**Clause 10.5.3.24 TwoStepMatch**

This clause is to be added.

TTCN-3 implication and exclusion matching mechanism support. It is mapped to the following pure virtual class:

class TwoStepMatch : public virtual MatchingMechanism {

public:

virtual ~TwoStepMatch ();

virtual Value & getPrimaryTemplate () const =0;

virtual void setPrimaryTemplate (const Value & template) =0;

virtual Value & getSecondaryTemplate () const =0;

virtual void setSecondaryTemplate (const Value & template) =0;

virtual Tboolean operator== (const TwoStepMatch &p\_twoStepMatch) const =0;

virtual TwoStepMatch \* clone () const =0;

virtual Tboolean operator< (const TwoStepMatch &p\_content) const =0;

}

**Methods:**

~TwoStepMatch

Destructor

getPrimaryTemplate

Returns the primary template

setPrimaryTemplate

Sets the primary template

getSecondaryTemplate

Returns the secondary template

setSecondaryTemplate

Sets the secondary template

operator==

Returns true if both objects are equal

clone

Return a copy of the matching mechanism

operator<

Operator < overload

**Clause 10.5.3.24 Repetition**

This clause is to be added.

TTCN-3 repetition matching mechanism support. It is mapped to the following pure virtual class:

class Repetition : public virtual MatchingMechanism {

public:

virtual ~Repetition ();

virtual Value & getRepeatedemplate () const =0;

virtual void setRepeatedTemplate (const Value & template) =0;

virtual LengthRestriction & getRepetitionCount () const =0;

virtual void setRepetitionCount (const LengthRestriction & repetitionCount) =0;

virtual Tboolean operator== (const Repetition &p\_repetition) const =0;

virtual Repetition \* clone () const =0;

virtual Tboolean operator< (const Repetition &p\_content) const =0;

}

**Methods:**

~Repetition

Destructor

getRepeatedTemplate

Returns the repeated template

setRepeatedTemplate

Sets the repeated template

getRepetitionCount

Returns repetition count

setRepetitionCount

Sets repetition count

operator==

Returns true if both objects are equal

clone

Return a copy of the matching mechanism

operator<

Operator < overload

## 6.8 Extensions to clause 12 of ETSI ES 201 873-6, C# language mapping

**Clause 12.4.2.16 TciMatchingTypeType**

This clause is to be extended.

public enum TciMatchingType {   
 TemplateList = 0,  
 ComplementedList = 1,  
 AnyValue = 2,  
 AnyValueOrNone = 3,  
 ValueRange = 4,  
 Subset = 5,  
 Superset = 6,  
 AnyElement = 7,  
 AnyElementsOrNone = 8,  
 Pattern = 9,  
 MatchDecodedContent = 10,  
 OmitTemplate = 11,  
 DynamicMatch = 12,   
 Conjunction = 13,   
 Implication = 14,   
 Exclusion = 15,   
 Disjunction = 16,  
 Repetition = 17  
}

**Clause 12.4.2.20 Mutation**

This clause is to be added.

**Mutation** is mapped to the following interface:

public interface ITciMutation

{

bool IsMessageNeeded { get; }

ITriMessage Mutate (ITriMessage subMessage);

}

**Methods:**

* IsMessageNeeded Returns true if encoded sub-message is required for mutation, false otherwise.
* Mutate Returns mutated version of the sub-message.

**Clause 12.4.4.1 Mutation**

This clause is to be extended.

The IDL type **Value** is mapped to the following interface:

public interface ITciValue {  
 ITciType Type { get; }  
 bool NotPresent { get; }  
 string ValueEncoding { get; }  
 string ValueEncodingVariant { get; }  
 string[] EncodeAttributes { get; }  
 string[] GetVariantAttributes(string encoding);  
 bool IsMatchingSymbol { get; }  
 string ValueToString();  
 bool IsLazy { get; }  
 bool IsFuzzy { get; }  
 bool IsEvaluated { get; }

ITciLengthRestriction LengthRestriction { get; set; }

ITciLengthRestriction NewLengthRestriction ();

bool IsIfPresentEnabled { get; set; }

ITciRangeBoundary LowerTypeBoundary { get; }

ITciRangeBoundary UpperTypeBoundary { get; }

ITciLengthRestriction TypeLengthRestriction { get; }

ITciMatchingMechanism TypeMatchingMechanism { get; }  
 bool IsOptional { get; }

Mutation { get; }

}

**Members:**

* Mutation  
  Returns a mutation annotation if defined for the value.

**Clause 12.4.5.6 DynamicMatch**

This clause is to be added.

The IDL type **DynamicMatch** is mapped to the following interface:

public interface ITciDynamicMatch : IMatchingMechanism

{

bool IsFunctionBased { get; }

ITciBehaviourId MatchingFunction { get; set; }

}

**Methods:**

* IsFunctionBased Returns true if the mechanism uses short-hand notation **@dynamic** *FunctionRef* and false otherwise.
* MatchingFunction Gets or sets the function associated with the matching mechanism.

**Clause 12.4.5.7 TwoStepMatch**

This clause is to be added.

The IDL type **TwoStepMatch** is mapped to the following interface:

public interface ITciTwoStepMatch : IMatchingMechanism

{

ITciValue PrimaryTemplate { get; set; }

ITciValue SecondaryTemplate { get; set; }

}

**Methods:**

* PrimaryTemplate Gets or sets the primary template.
* SecondaryTemplate Gets or sets the secondary template.

**Clause 12.4.5.8 Repetition**

This clause is to be added.

The IDL type **Repetition** is mapped to the following interface:

public interface ITciRepetition : IMatchingMechanism

{

ITciValue RepeatedTemplate { get; set; }

ITciLengthRestriction RepetitionCount { get; set; }

}

**Methods:**

* RepeatedTemplate Gets or sets the repeated template.
* RepetitionCount Gets or sets the repetition count

## 6.9 Extensions to clause 7.2.2.2.1 of ETSI ES 201 873-6, The abstract data type Value

The definition of the abstract data type Value is to be extended by adding the following operation:

Mutation getMutation() If a mutation annotation is attached to the value, the operation returns properties of the mutation. Otherwise, the distinct value null is returned.

## 6.10 Extensions to clause 7.2.2.4 of ETSI ES 201 873-6, Data types for complex TTCN-3 properties

**Clause 7.2.2.4.4 Mutation**

This clause is to be added.

The abstract data type Mutation is used to describe properties of a mutation annotation.

The following operations are defined on the base abstract data type Mutation:

TBoolean isMessageNeeded () Returns true if an encoded sub-message is required for evaluation of the mutation. Otherwise, false is returned.

TriMessage mutate (TriMessage subMessage)  
Returns the mutated version of the value. In case an encoded sub-message is required for evaluation of the mutation, the encoded sub-message shall be passed in the parameter. If the encoded sub-message is not required for evaluation, it is allowed to set the parameter to the distinct value null. The operation is used by the encoder.