### 5.4.1 Formal parameters

#### 5.4.1.0 General

TTCN-3 modules, structured types, templates, functions, altsteps, and testcases may be defined incompletely, i.e. some entities (variables, templates, ports, timers, etc.) used by the above objects may not be resolved in the definition of the object. These objects are called parameterized objects. Formal entities replacing the unresolved entities in the parameterized object's definition are called formal parameters.

Formal parameters of parameterized templates, functions, altsteps, and testcases are defined in formal parameter lists. Formal parameters of modules are defined in module parameter definitions (see clause 8.2.1).

Formal parameters shall be **in**, **inout** or **out** parameters (see definitions in clause 3.1). If not stated otherwise, a formal parameter is an **in** parameter. For all these three sorts of parameter passing, the formal parameters can both be read and set (i.e. get new values being assigned) within the parameterized object. Formal parameters can be used directly as actual parameters for other parameterized objects, e.g. as actual parameters in function invocations or as actual parameters in template instances.

If parameters are passed by value (i.e. in case of **in** and **out** parameters), type compatibility rules specified in clause 6.3 apply. When parameters are passed by reference, strong typing is required. Both the actual and formal parameter shall be of the same type.

Formal **in** parameters may have default values. This default value is used when no actual parameter is provided.

NOTE 1: Although **out** parameters can be read within the parameterized object, they do not inherit the value of their actual parameter; i.e. they should be set before they are read.

Formal value or template parameters may be declared lazy using the **@lazy** modifier. The behaviour of lazy parameters is defined in clause 3.1, definition of lazy values or templates. See examples in clause 5.4.1.1.

Formal value or template parameters may be declared fuzzy using the **@fuzzy** modifier. The behaviour of fuzzy parameters is defined in clause 3.1, definition of fuzzy values or templates. See examples in clause 5.4.1.1.

NOTE 2: The actual values of component variables used in the delayed evaluation of a lazy or fuzzy parameter may differ from their values at the time, when the parameterized function or alstep was called.

Assigning default values for lazy and fuzzy formal parameters does not change the parameters' semantics: when the default values are used as actual values for the parameters, they shall be evaluated the same way (i.e. delayed) as if an actual parameter was provided.

Lazy and fuzzy properties are valid only in the scope, where the parameters' names are visible. For example, if a fuzzy parameter is passed to a formal parameter declared without a modifier, it loses its fuzzy feature inside the called function. Similarly, if it is passed to a lazy formal parameter, it becomes lazy within the called function.