Type System Background and Discussion

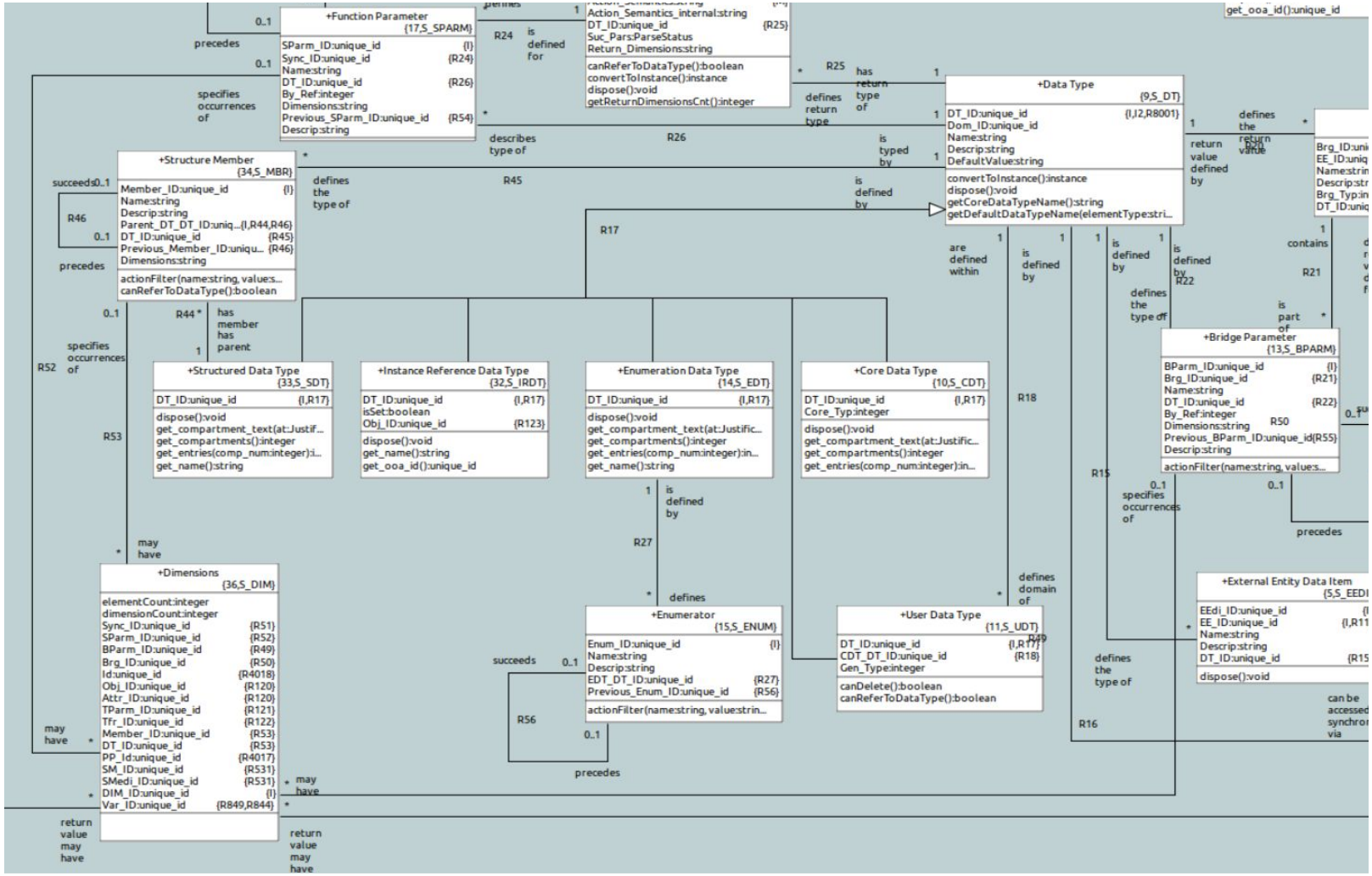


October 2017

Outline

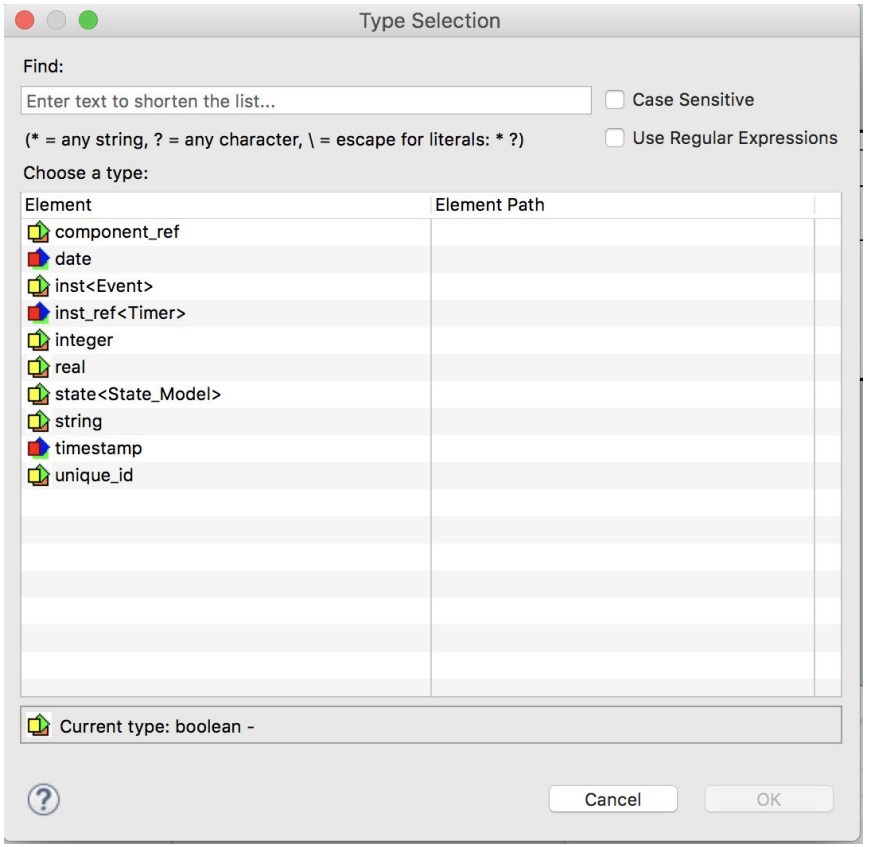
- Overview of the xtUML type system
- Brief word about the MASL type system
- MASL shared type problem
- Possible steps forward
- Open discussion

xtUML Type Model



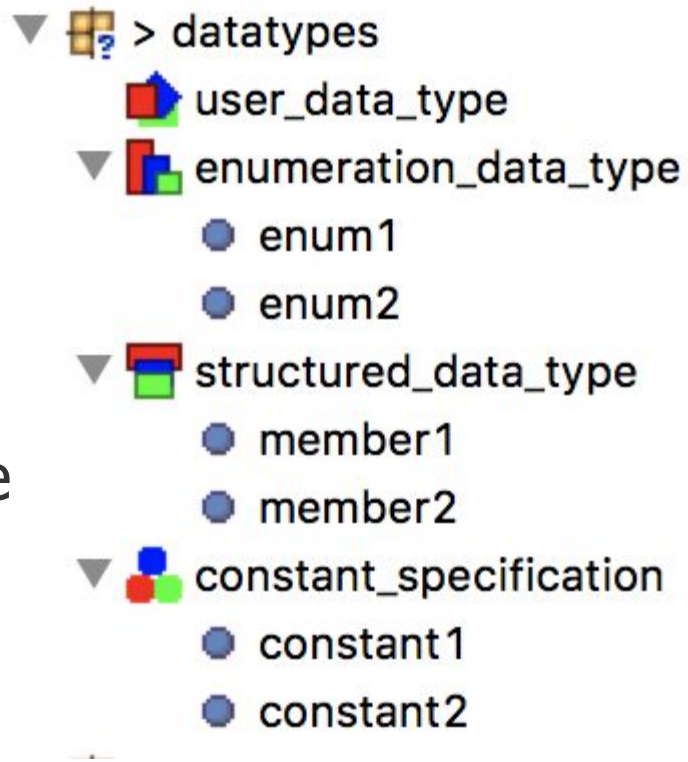
xtUML Type System: Built-in Types

- Include primitives
  - boolean
  - real
  - string
  - integer
- Specialized types
  - component_ref
  - inst<Event>
  - state<State_Model>
  - unique_id
- Timer types (UDT)
  - date
  - inst_ref<Timer>
  - timestamp



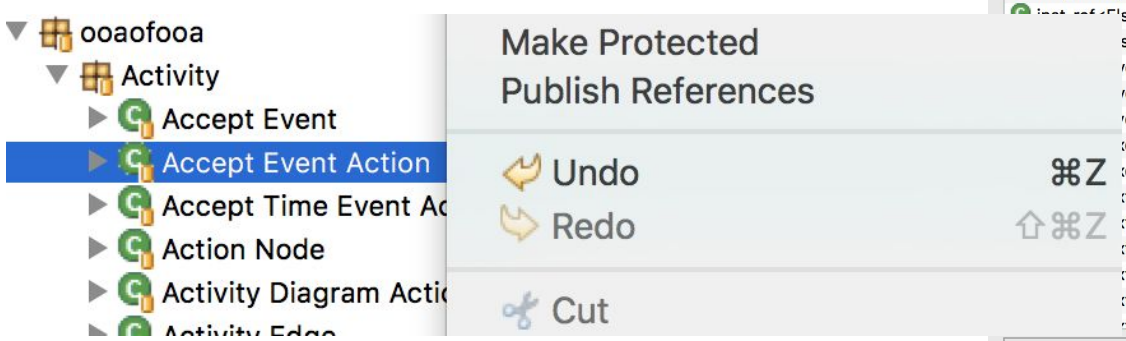
xtUML Type System: User Types

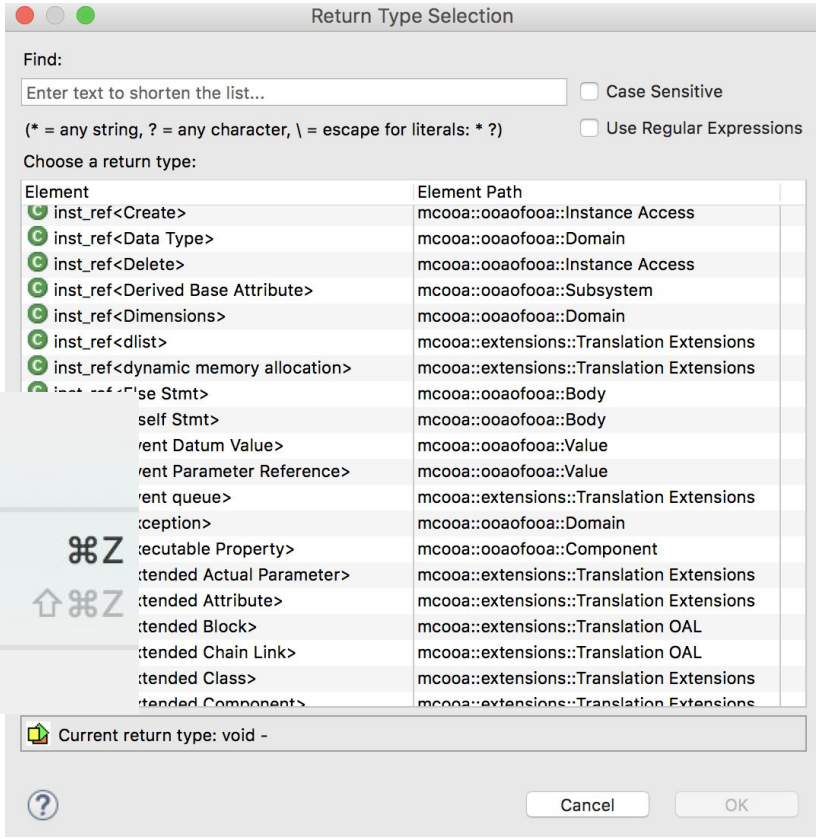
- Enumeration types
- Structured types
  - Each member is typed
- User data types
  - Has core type
  - Has body (new)
- Constants (not a type)
  - Each constant is typed
  - Each constant has a value



xtUML Type System: Instance reference

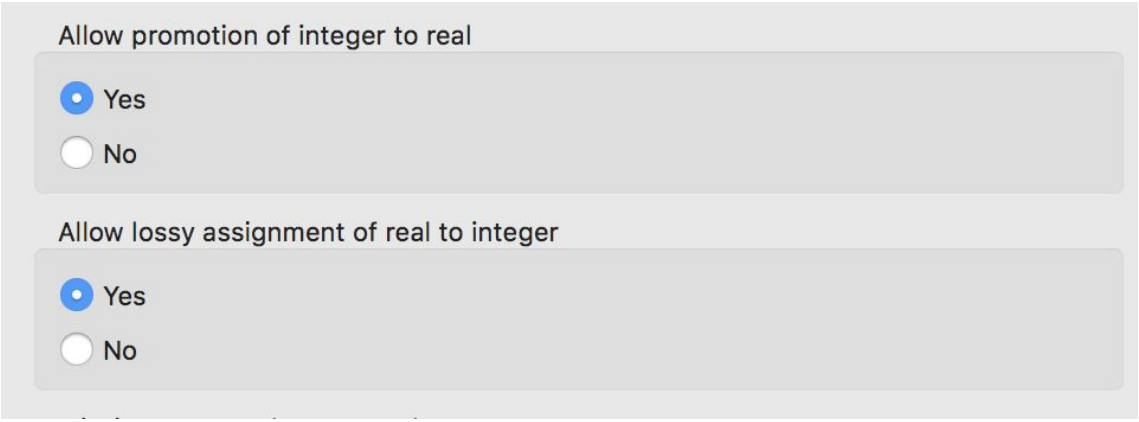
- Instance reference types made available through the "publish" feature
  - inst_ref<class name>
  - inst_ref_set<class name>





xtUML Type System: Type Compatibility

- Dependent on declared type and operator
- Implicit declaration
  - A transient keeps its type once it is declared
- "Strong" typing
- Special rules (based on preference)
  - Real to integer coercion
  - Integer to real promotion
  - User data types



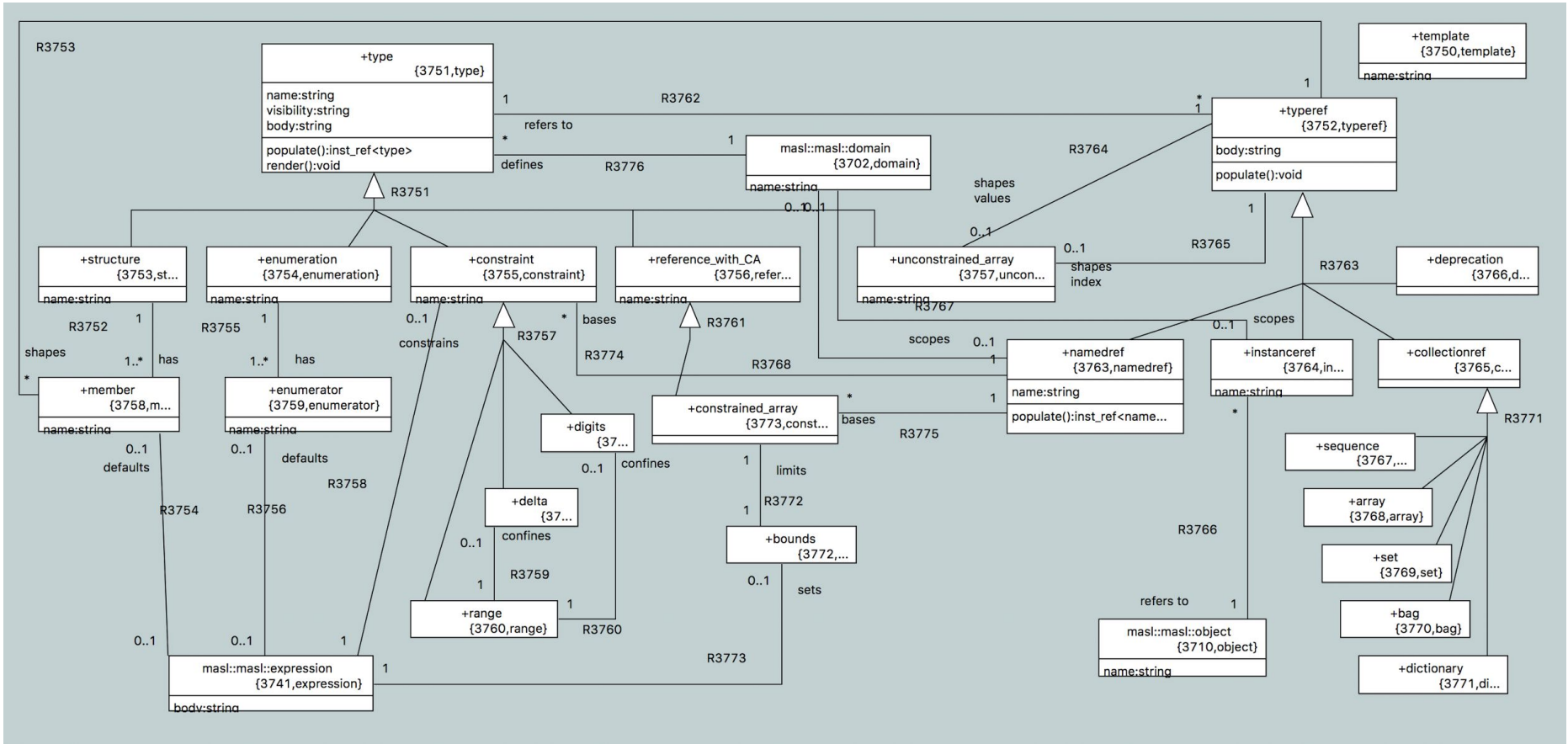
xtUML Type System: Arrays

- Fixed and dynamic arrays supported by OAL
- Dynamic arrays automatically resized for accesses
- Support not complete for model compilers
  - MC-Java has no support
  - MC3020 has support but lacks dynamic resizing of arrays and does not allow array types in certain situations

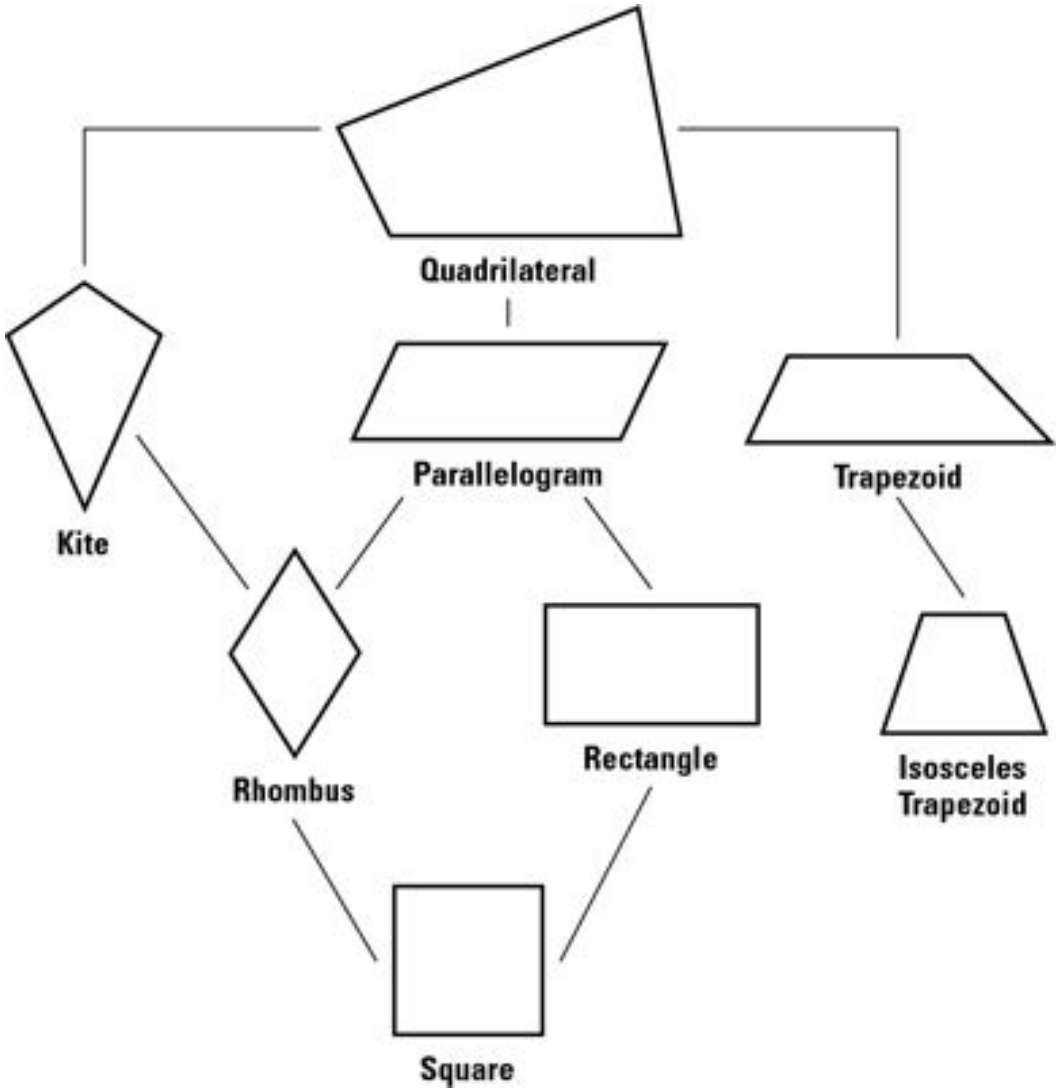
xtUML Type System: Weaknesses

- No ability to cast or convert types
  - Except real to integer and integer to real/UDTs
- Minimal flexibility in user defined types
  - No constraints
- Collection types are not supported
  - Except instance reference sets and arrays
- Set arithmetic is not supported

MASL Type Model



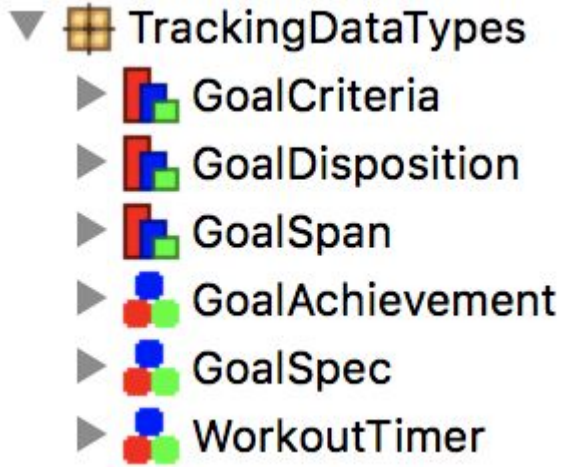
MASL Type System

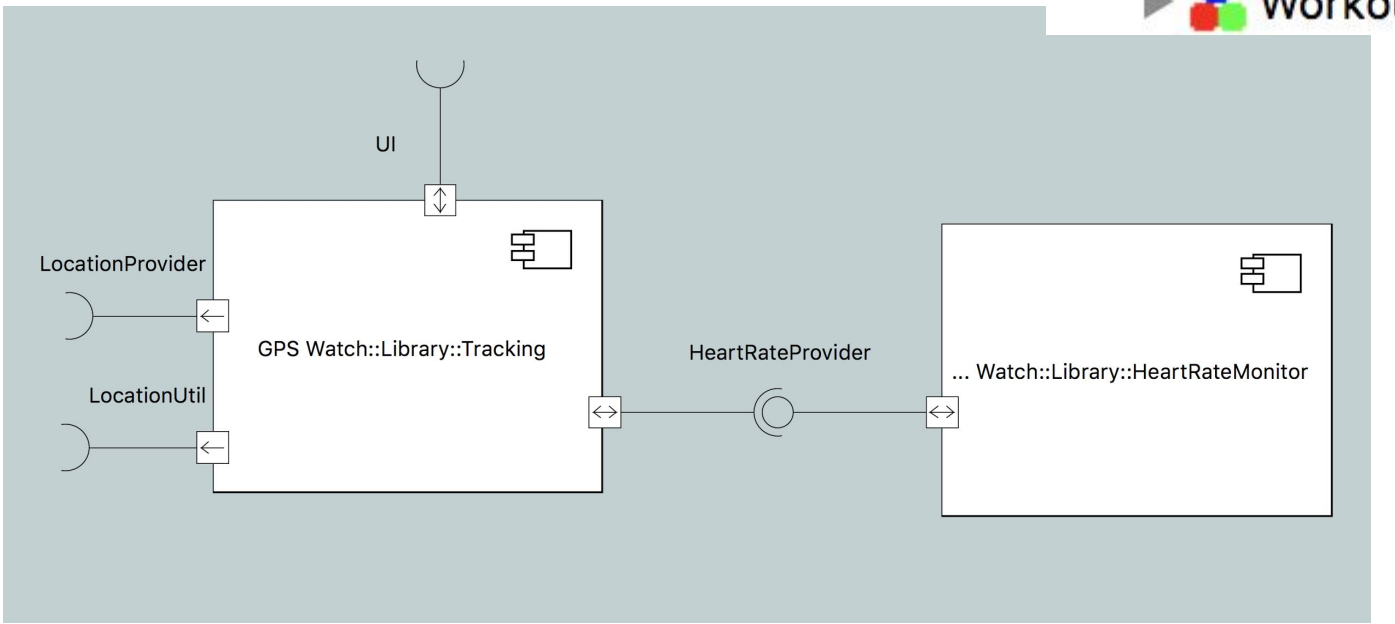


- MASL type compatibility is determined by a type hierarchy
- Each type can have many subtypes
- MASL types can be defined with constraints
  - Range constraint
  - Delta constraint
  - etc.

Inter-domain MASL Types in BridgePoint

- The problem
  - ".int" files
  - type scoping
- Example Solution: Type reference
- Other solutions?





Possible Improvements to xtUML Types

- Constraints
- Improve array support
- Richer collections
- Set arithmetic
- Hierarchical design for type conversion (Darwen & Date)
- Support multiple logical representations of types (Nils)
- others?



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