ALMA Common Software

Basic Track

Characteristic components
BACI properties and DevIO classes

I. Oya, CTAO gGmbH

Component Model

- An ACS component is a piece of software that is executed within a container running on a given machine
  - Container spawn threads for component execution
- ACS implements a distributed object model
- Components are CORBA objects that are remotely accessible from other computers through the client-server paradigm
- A Component is the natural base class for physical and logical "devices"
- ACS components follow a standard component lifecycle

Components and characteristics components

- Abstraction of hardware devices
  - Actions
  - Control/monitor points
  - Characteristics
- A characteristic component aggregates Characteristics and BACI properties of different data types:
  - BACI: Basic Access Control Interface. based on the Component - Property – Characteristic, standard in control systems
  - Characteristics: static data store in the CDB
    - units, default values, monitor*, alarm*, archive*
- All telescope components such as mount, control units, power supplies are characteristic components
- Same structure of components/devices

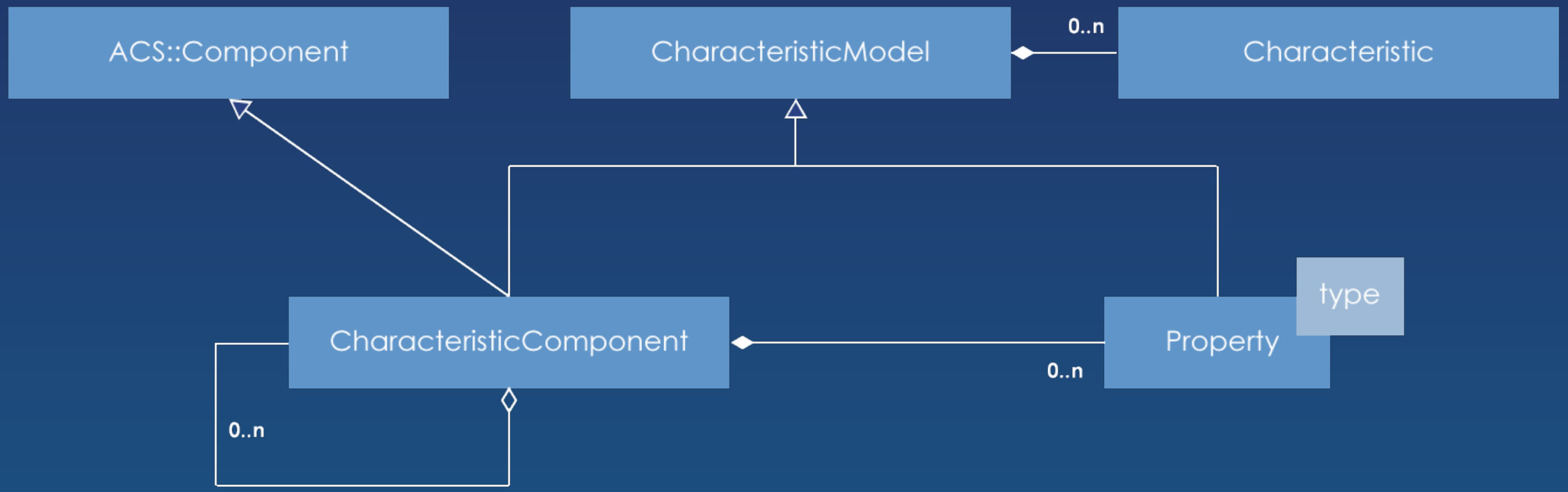
BACI property

- ✧ High-level representation of a monitoring or control point/entity
- ✧ It is a statically defined item
- ✧ It has a value and attributes
- ✧ The value is strongly typed
- ✧ Only basic types are available
  - ✧ double, long, string, pattern, enum, longSeq
  - ✧ limited unsigned support
- ✧ Read-only (RO) and read-write (RW) access
- ✧ Defines an interface, which is extended by developer
  - ✧ Developer implements functions read() and write() functions
- ✧ Combines value(s) with “attributes”
  - ✧ Description
  - ✧ Unit
  - ✧ Monitoring parameters
  - ✧ Alarms thresholds

BACI property (continued)

- ✧ All properties have the same attributes!
  - ✧ This cannot be modified
- ✧ Clients can get / set methods
  - ✧ Synchronous and asynchronous
- ✧ Clients can monitor property values (callback mechanism)
  - ✧ Interval
  - ✧ On change
  - ✧ Keeps history (last 10 values)
- ✧ Value archiving
  - ✧ Same as for monitoring
- ✧ Alarms build-in

Components and characteristics components



- **Component:** software representing a physical/logical device (e.g. temperature sensor, motor)
- Each Component can have **Properties** (e.g. status value, position - control/monitor points).
- **Characteristics** of Components and Properties (static configuration data, e.g. serial number, CAN-Bus-ID, default value)

Example of Characteristic component

```
interface PowerSupply : ACS::CharacteristicComponent
    {
    void on(…);
    void off(…);
    void reset(…);

    readonly attribute ACS::RWdouble current;
    readonly attribute ACS::ROdouble readback;
    readonly attribute ACS::ROpattern status;
    };
```

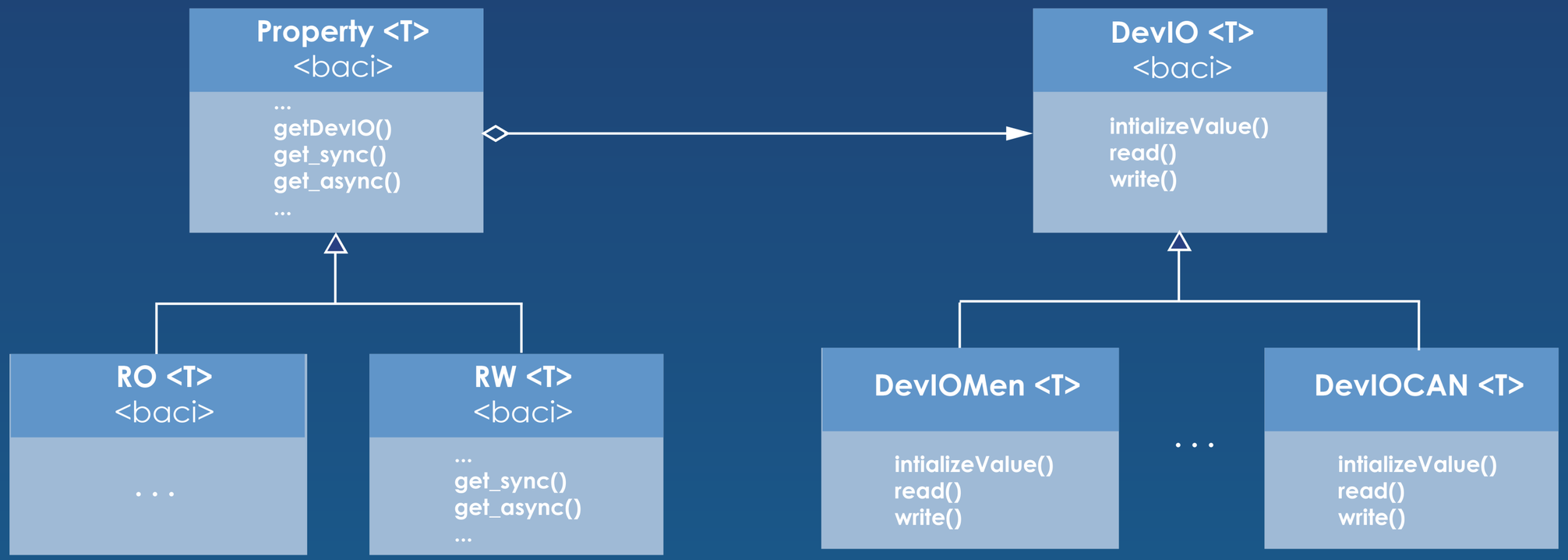
DevIO classes

- ✧ Provides the “value” part in BACI properties
- ✧ Bridge design pattern – access actual hardware
- ✧ Can be extended for real hardware
- ✧ Can be extended for simulation purposes (f.i. DevIOMem)
- ✧ Does not prevent race conditions
- ✧ Does not take care of device init, etc.
- ✧ Does not do error handling when hardware fails
- ✧ Decouple software and hardware implementing a bridge pattern
  - ✧ read() / write() / initializeValue() methods can be overloaded

- ✧ Examples existing:
  - ✧ Memory location (ACS default implementation)
  - ✧ CAN bus access (ALMA)
  - ✧ Socket generic interface (APEX)
  - ✧ …
  - ✧ Generic DevIO for OPU UA communication (D. Melkumyan, CTA)

DevIO example class: DevIOMem

- ✧ Inherits from DevIO
- ✧ Useful for simulation and testing
- ✧ Implements read(), write(), initializeValue() methods
- ✧ Very flexible



DevIO and device drivers

- Usual use case that several BACI properties of a component need to share state across DevIOs instances.
- For example, if the device uses a serial line, we do not want to open a connection per property.
- In that case the usual pattern is to create a device driver class that is a singleton and handles the access to the device information.
- It can manage data caching there as well.
- Many examples in Alma source code.

Questions?

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