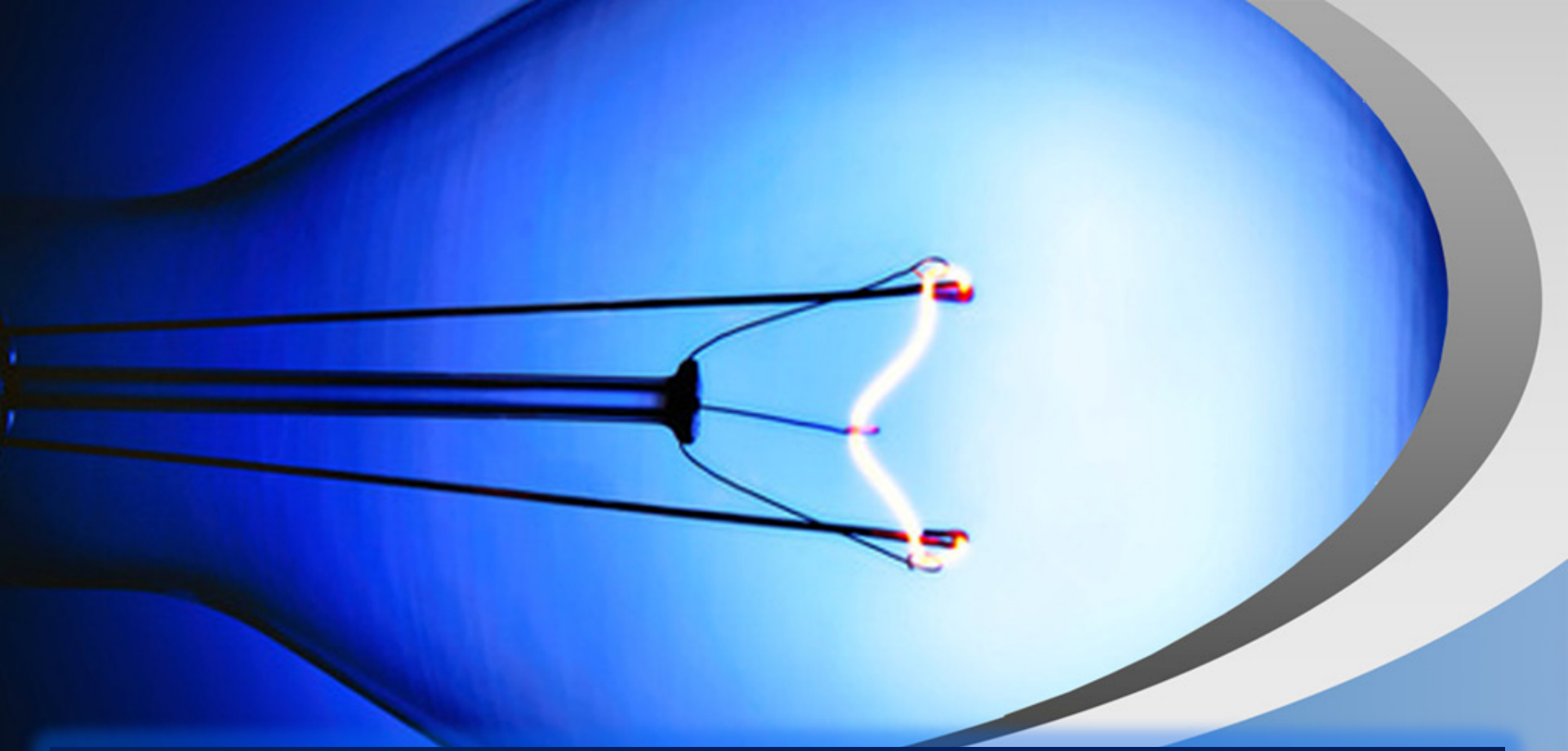

Deploying SystemC® for Complex System Prototyping and Validation

DVCon 2013
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SYSTEMC™

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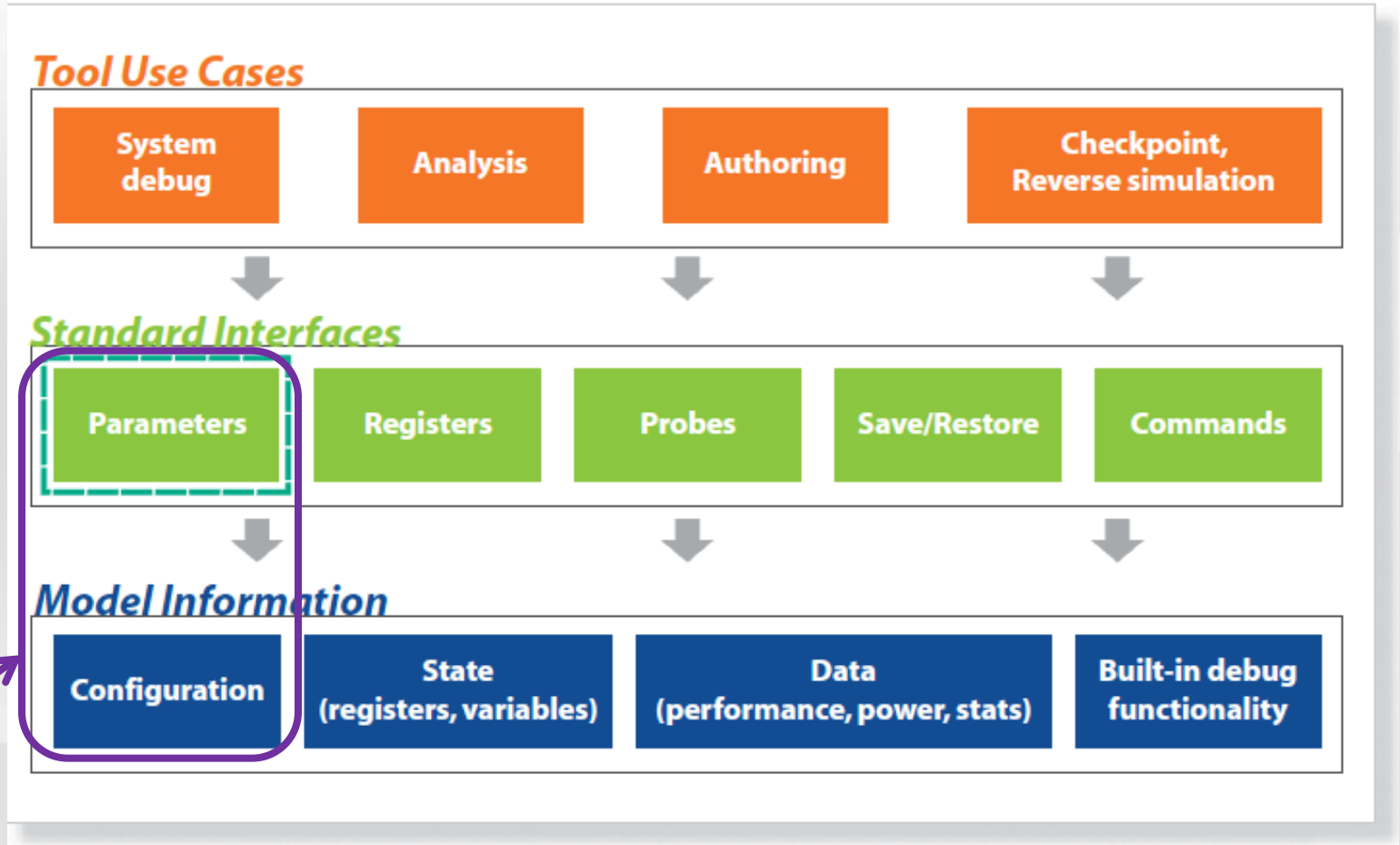
CCI WG Update

Trevor Wieman, WG chair
Sr. Member Technical Staff
Intel Corp.

Materials prepared in collaboration with Doulos

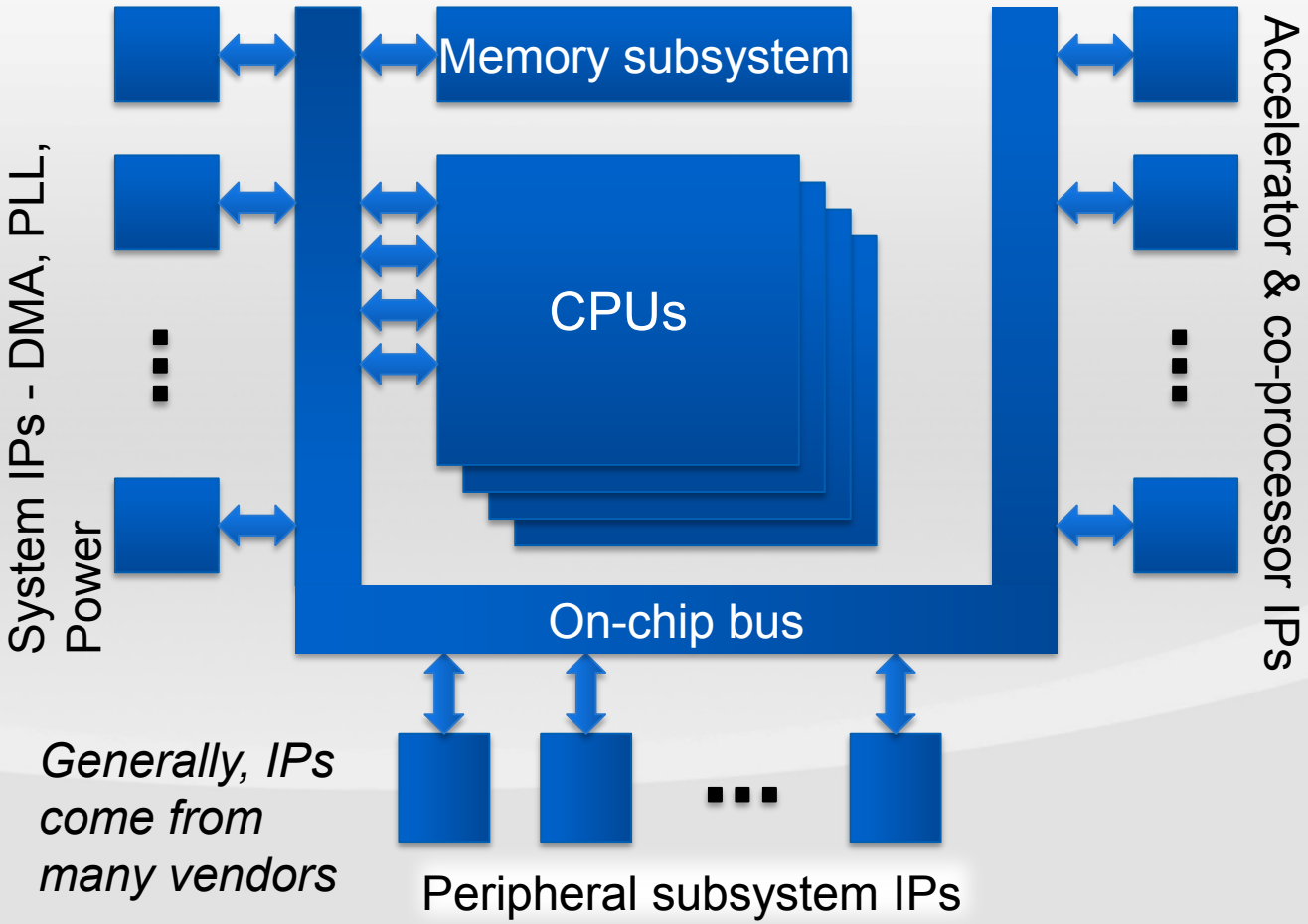
** Details of this draft SystemC Configuration standard preview are subject change.

Configuration, Control & Inspection



Goal: Standardizing interfaces between models and tools

Parameterizing a Typical System



Generally, IPs come from many vendors

Parameter Examples

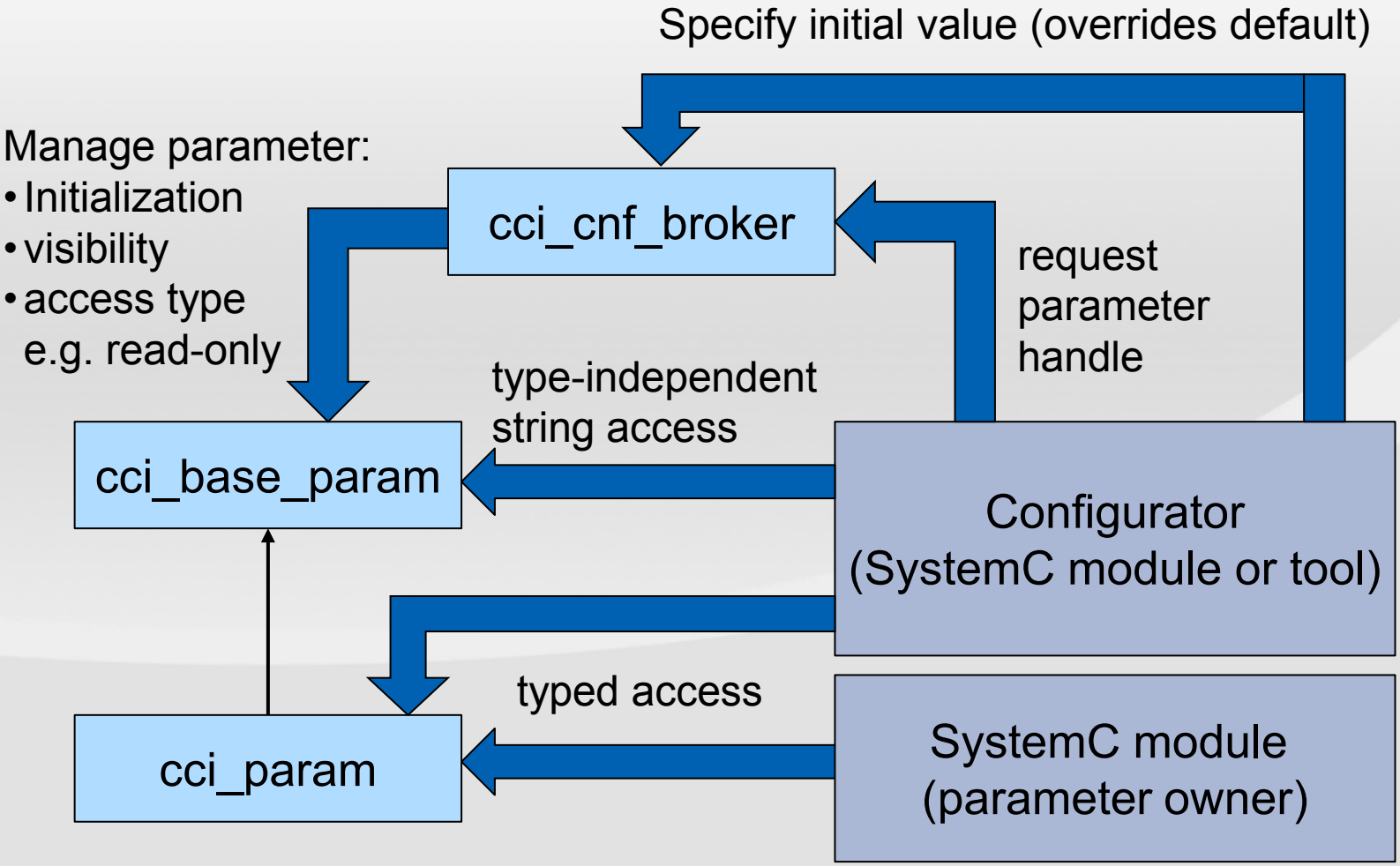
- system clock speed
- # processor cores
- memory size
- address, data widths
- disabled IP(s)
- address maps
- SW image filename
- IP granularity debug control:
  - logging
  - tracing

Need uniform way to configure simulation w/o recompilation

Key Configuration Components

- **Parameter**
  - Has a name (a string) plus a value
  - Is an instance of cci_param<T> class template (T is a type)
  - Is registered with a broker at construction
  - Provides string-based API for type-independent set/get of value
- **Broker**
  - Provides controlled access to parameters registered with it
  - There is one global (public) broker; many private brokers may also exist

Configuration Classes and Use Models



A Parameter Owner Module

```
SC_MODULE(simple_ip) {

private:
 cci::cnf::cci_param<int> int_param;

public:
 SC_CTOR(simple_ip)
 : int_param("int_param", 0)
 {
   int_param.set_documentation("...");
   SC_THREAD(do_proc);
 }
 void do_proc() {
   for(int i = 0; i < int_param; i++) {
     ...
   }
 }
};
```

Parameters are usually private members forcing brokered access

Default values are optionally supplied using a constructor argument

Owner may read parameter value

Parameter Access via Broker (1)

```
SC_MODULE(configurator) {

  cci::cnf::cci_cnf_broker_if *m_brkr;

  SC_CTOR(configurator)
  {
    m_brkr = &cci::cnf::cci_broker_manager::get_current_broker(
             cci::cnf::cci_originator(*this));

    sc_assert(m_cci != NULL);

    SC_THREAD(do_proc);
  }

...
```

Handle to broker

Get handle to broker associated with this module (otherwise global broker)

Parameter Access via Broker (2)

```
void do_proc() {
 const std::string int_param_name = "top.sim_ip::int_param";

 if( m_brkr->exists_param(int_param_name)){

   cci::cnf::cci_base_param *int_param_ptr =
     m_brkr->get_param(int_param_name);

   std::string p_value = int_param_ptr->json_serialize();

   ...

   int_param_ptr->json_deserialize("2");

   ...
```

Check broker has named parameter

Get handle to named parameter from broker

Get current parameter value

Set new parameter value

Accessing Parameter Value

- **When value type is known, call parameter's set or get function**
  - Common C++ types
  - SystemC Data types
- **When parameter type is unknown or unsupported:**
  - Use JavaScript Object Notation (JSON) format strings
  - json_serialize() == get(), json_deserialize() == set()

Parameter Mutability

- Parameters are mutable by default
- Mutability set by template parameter

```
cci::cnf::cci_param<int,cci::cnf::mutable_parameter> p1;
```

- Parameters may also be immutable or locked after elaboration

```
cci::cnf::cci_param<int,cci::cnf::immutable_parameter> p2;

cci::cnf::cci_param<int,
                    cci::cnf::elaboration_time_parameter> p3;
```

Private Brokers

- **Broker association happens during module construction**
- **A standard private broker class is provided**
  - Grants access only to associated module hierarchy
    - No tool access is allowed!
  - Guidelines for creating custom private brokers are also supplied
- **Encapsulate "black-box" (pre-compiled) IP configuration using:**
  - A private broker, to prohibit unauthorized access
  - A configurator, to apply pre-compiled configuration

Parameter Callbacks

- Callback functions may be registered with a parameter
- Callback reason reflects nature of parameter access

```
enum callback_type { pre_read, reject_write, pre_write,
  post_write, create_param, destroy_param };
```

- Callbacks usually members of module owning parameter
- Callback functions return a status

```
enum callback_return_type { return_nothing,
  return_value_change_rejected, return_other_error };
```

Parameter Owner with Callback

```
SC_MODULE(simple_ip) {

private:
 cci::cnf::cci_param<int> P1;
 cci::shared_ptr<cci::cnf::callb_adapt> P1_cb;

public:
 SC_CTOR(simple_ip): P1("P1", 0) {
  P1_cb = P1.register_callback(cci::cnf::post_write,
     this, cci::bind(&simple_ip::cb, this, _1, _2));
  ...
  }

callback_return_type cb( cci_base_param& changed_param,
                         const callback_type& cb_reason);
...
```

Callbacks accessed via shared pointer

Callback registered in constructor

Callback function must have this signature

Callback Function Definition

```
callback_return_type simple_ip::cb(
                          cci_base_param& changed_param,
                          const callback_type& cb_reason)
{

    switch(cb_reason)
      {
      case cci::cnf::pre_write:   ...
                                  break;
      case cci::cnf::post_write:  ...
                                  break;
      default:
        sc_report_warning("CB", "Unrecognized reason");
      }
    return cci::cnf::return_nothing;
}
```

Detect callback reason – function could be registered with multiple callbacks!

CCI WG Summary

- **Initial focus is on the Configuration standard**
  - Aligned to requirements that were publicly reviewed
  - Anticipating public review of a draft standard this year
    - Will include LRM and examples
- **Remaining charter will then be prioritized for subsequent work**
  - “Control” and “Inspection”