OVERWRITING, NON-DETERMINISTIC AND SAFE DATA-PUTS IN (INTEL®) CNC

The Eighth Annual Concurrent Collections Workshop

2016/09/27

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Dynamic Single Assignment

Makes CnC

- Deterministic
- Safe
- Analyzable

Not always intuitive/suitable

- Sensors
- Multi-headed DBs
- Branch& Bound
- Re-using memory
- "GetAnyOne"

Current solution

Define a graph

- Internally allowed to be non-deterministic
- Graph can produce data and control
- Call-back interface intercepts unknown data tags

Not always trivial

Non-DSA items in CnC

Allow overwriting puts

- Non-default, explicit
- Per item(-collection)
- Non-deterministic
- Safe

Non-DSA items in CnC

Put(tag, value) Semantics

- Sets or updates "tag" to "value"
- Updates are atomic

Get(tag) Semantics

- Returns "value" for "tag" for some matching put(tag, value)
- Will not succeed without a put
- No other guarantees

Non-DSA items in Intel® CnC

Put(tag, value):

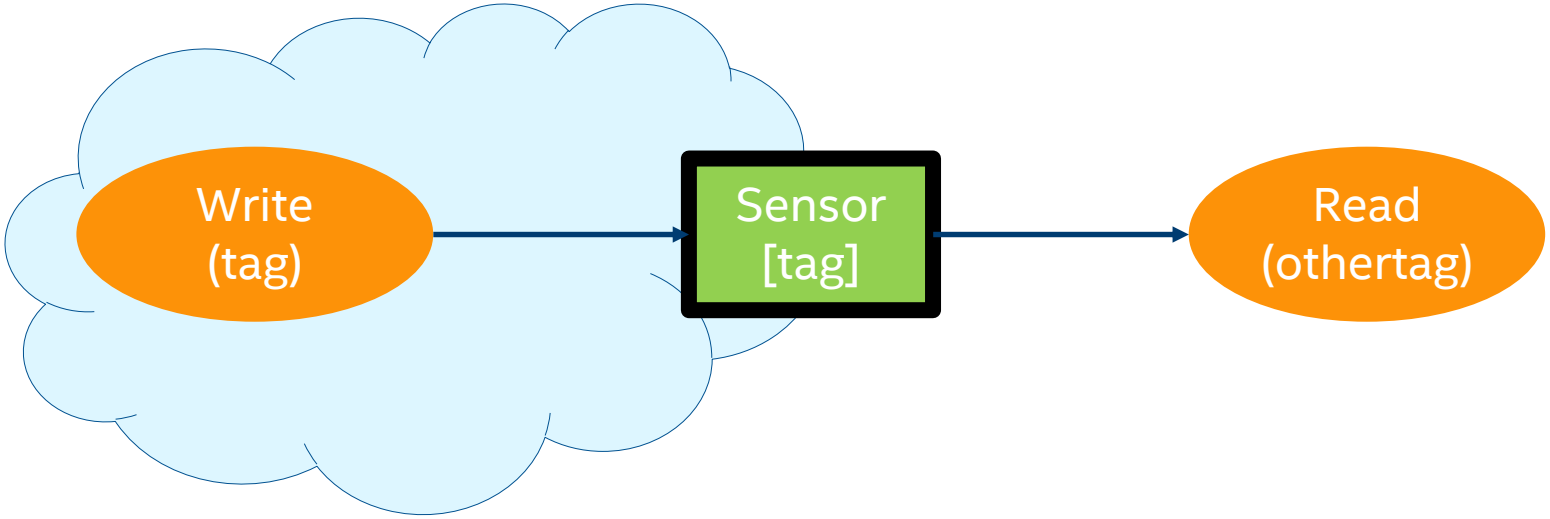
- Like a normal put
- Sets or updates "tag" to "value"
- Updates are atomic
- Updates "interested" remote copies
- On_put only executed at "first" put

Get(tag) Semantics

- Returns "value" for "tag" for some matching put(tag, value)
- Will not succeed without a put
- No other guarantees
- Gets the latest available value but does not check for updates

Example - sensor

Example - sensor



Example - sensor

```
/// producing sensor data
/// we get all latest input data and produce one combined data object
template< typename t1, typename t2, typename t3 >
int produce<t1, t2, t3 >::execute( const time_t, cv_context & ctxt ) const
{
    sensor1.get(0, v1);
    sensor2.get(0, v2);
    sonesor3.get(0, v3);
    ctxt.vals.put( 0, triple<t1, t2, t3 >( v1, v2, v3 ) );
    return 0;
}

/// dummy: just get the value tuples for given time (tag)
int consume::execute( const time_t, cv_context & ctxt ) const
{
    mytriple _vals;
    ctxt.vals.get( 0, _vals );
    CnC::Internal::Speaker oss;
    oss << _vals.val1 << " " << _vals.val2 << " " << _vals.val3 << " " ;
    return 0;
}
```

Example - sensor

```
// let our collections be non-DSA
struct ndsa_tuner : public CnC::hashmap_tuner
{
    template< typename Tag >
    bool is_dsa( const Tag & tag) const
    {
        return false;
    };
};
```

Per item!

Tuner is a template arg.
Constants get optimized out!

Overwriting (simplified)

```
acc = get_accessor(tag)
if not acc.insert_first (value) {
    if not tuner.isdsa(tag) {
        acc.update(value)
    } else ERROR
}
send_value_to_interested(tag, value)
```

Tuner is a template arg.
Constants get optimized out!

Advanced

Other cases require more than unconditional update

- Branch&bound

Extend overwrite-check with condition

In the works: conditional overwriting

We always have an old value!

```
// let our collections be DSA
struct ndsa_tuner : public CnC::hashmap_tuner
{
    template< typename Tag, typename Value >
    bool overwrite( const Tag & tag, const Value & old, const Value & new) const
    {
        return false;
    };
};
```

```
// overwrite only if new value is greater then the old one
struct ndsa_tuner : public CnC::hashmap_tuner
{
    template< typename Tag, typename Value >
    bool is_dsa( const Tag & tag, const Value & oldV, const Value & newV) const
    {
        return newV > oldV;
    };
};
```

Open questions

Should on_put be called for every put?

How to handle multiple puts on different processes?

- Currently ignored
- Re-evaluate the condition or not?

More examples!

More use cases!

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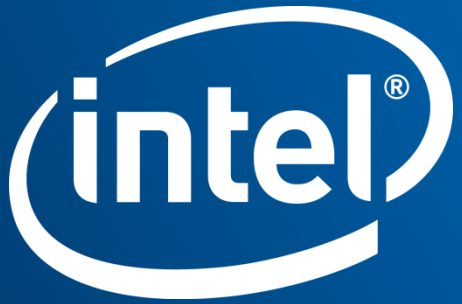
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