NO CONCURRENT COLLECTIONS TUTORIAL

The Eighth Annual Concurrent Collections Workshop

2016/09/27

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Agenda

Isolation

Intel® CnC…

Graphs

Separation and Isolation in CnC

Semantics/ Dependences From **Tuning and Platform**

What and How From **Where and When**

Control From **Data**

Consumer From **Producer**

Controller/Caller From **Controlee/Calee**

Semantics/Tuning

Abstract CnC

Domain-spec vs tuning spec

Intel® CnC

- Collections vs Tuners
  - Combination decided at compile-time
- Communication selected at runtime

Semantics/Tuning

Abstract CnC

- No code
- Tuning spec
  - Grouping
  - Placement
  - …

Intel® CnC

- Steps define the how
- Collections define what
- C++ API brings them together
- Tuners define
  - Placement
  - influence timing
  - …

What and How / Where and When

Abstract CnC

- No explicit concept of time
- No concept of space
- Collections are arbitrators/proxies
  - Put and get

Intel® CnC

- Steps define the how
- Collections define what
- Tuners define placement and influence timing
- A step use only IO collections for communication (sender/receiver is unknown)

Control/Data

Abstract CnC

- Control is explicit
  - Special edges or
  - Dedicated control collections
- Data is separate
  - "if" something needs to be done can be elsewhere (in time and space) than its input data

Intel® CnC

- Explicit control collections
  - Separates controller/controlee

Consumer/Producer, Controller/Controlee

Abstract CnC

- Collections serve as arbitrator

Intel® CnC

- Steps only communicate with IO collections
- Other side is unknown/not important
- Space and time are also irrelevant
- Runtime coordinates

Agenda

Isolation

Intel® CnC…

Graphs

Intel® CnC

C++ (open source, Linux, Windows, Xeon, Phi™…)

- Good performance through TBB, MPI and C++ template optimization potential

Domain API - Tuner API

- Linked/combined at compile-time

Shared and distributed memory

- With tuning only required data is transferred

Debugging aids

- Tracing: printf and Intel® Trace Analyzer and Collector
- Detailed timing

Intel® CnC - Advanced

Tuning

- Placement
- Scheduling (avoid re-try, priority)
- GC
- Sequentialization
- Cancelation
- Range/set partitioning
- Storage type (vector, hashmap, DB)

Lower-level APIs

- Communicator
- Scheduler
- Distributor (future)

Agenda

Isolation

Intel® CnC…

Graphs

Graphs

Goal: compose components but minimize requirements

⇒ Maximize exposed parallelism

⇒ Maximize flexibility

⇒ Minimize visibility

⇒ Keep it simple

Let their semantic dependences be the only restriction on parallelism.

- no implicit (or even explicit) barriers

Stick with the dependence theme.

Resource utilization will be nicley isolated as a separate concern.

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- Operates on a “continuous” stream of incoming elements

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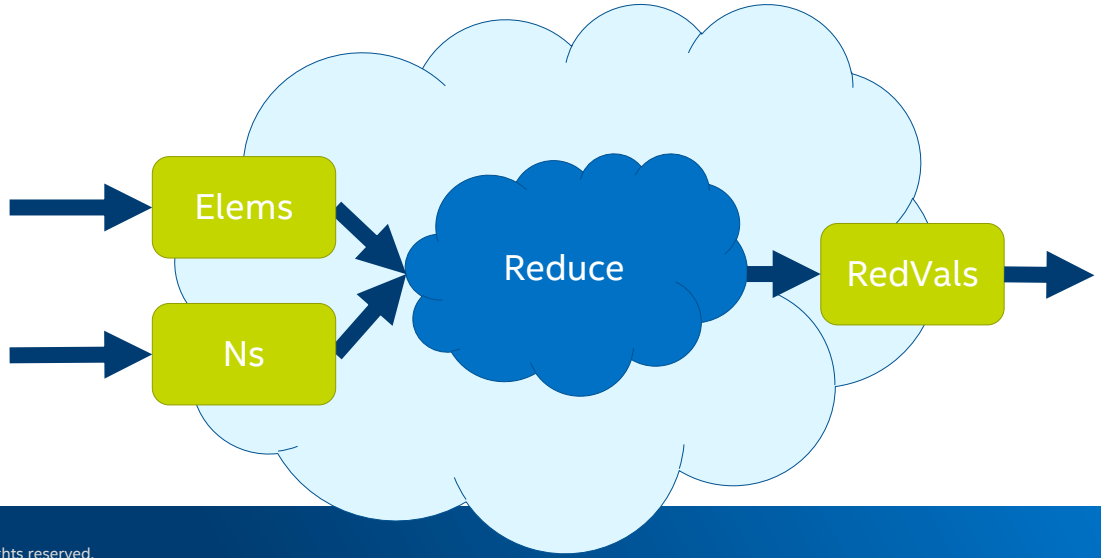
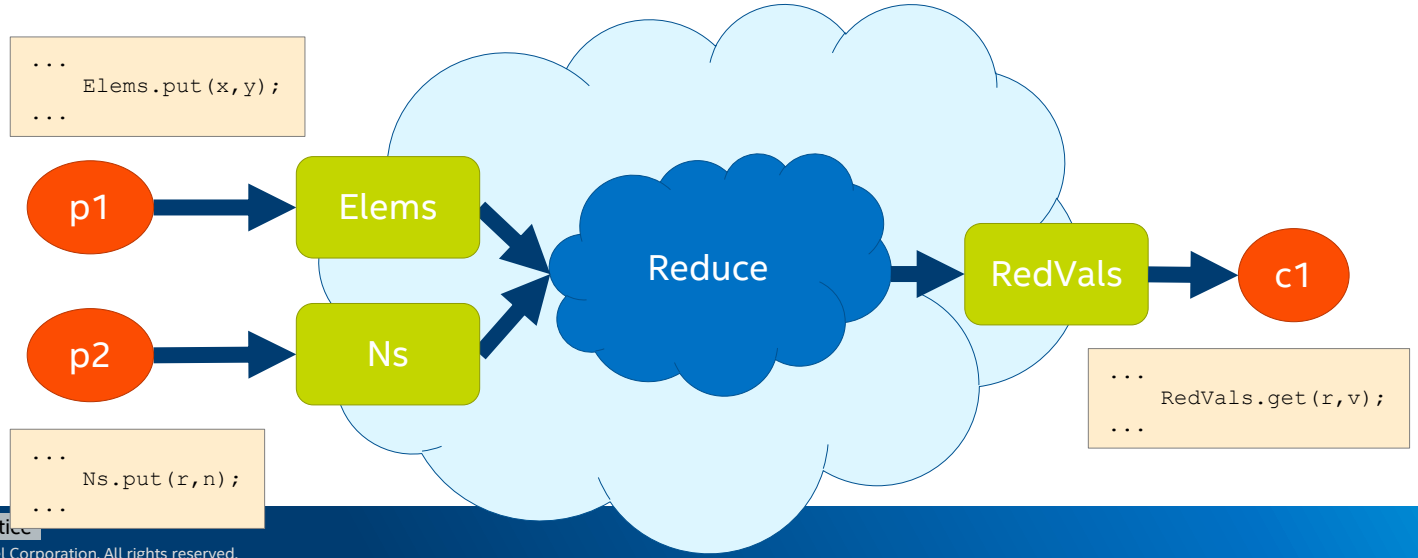
- Input/output to a graph handled through CnC collections



Example: Graph-like Reduction in Intel® CnC

- Operates on a “continuous” stream of incoming elements
- Continuous input accessed via callbacks
- Input/output to a graph handled through CnC collections
- Connected steps operate with usual put/get semantics



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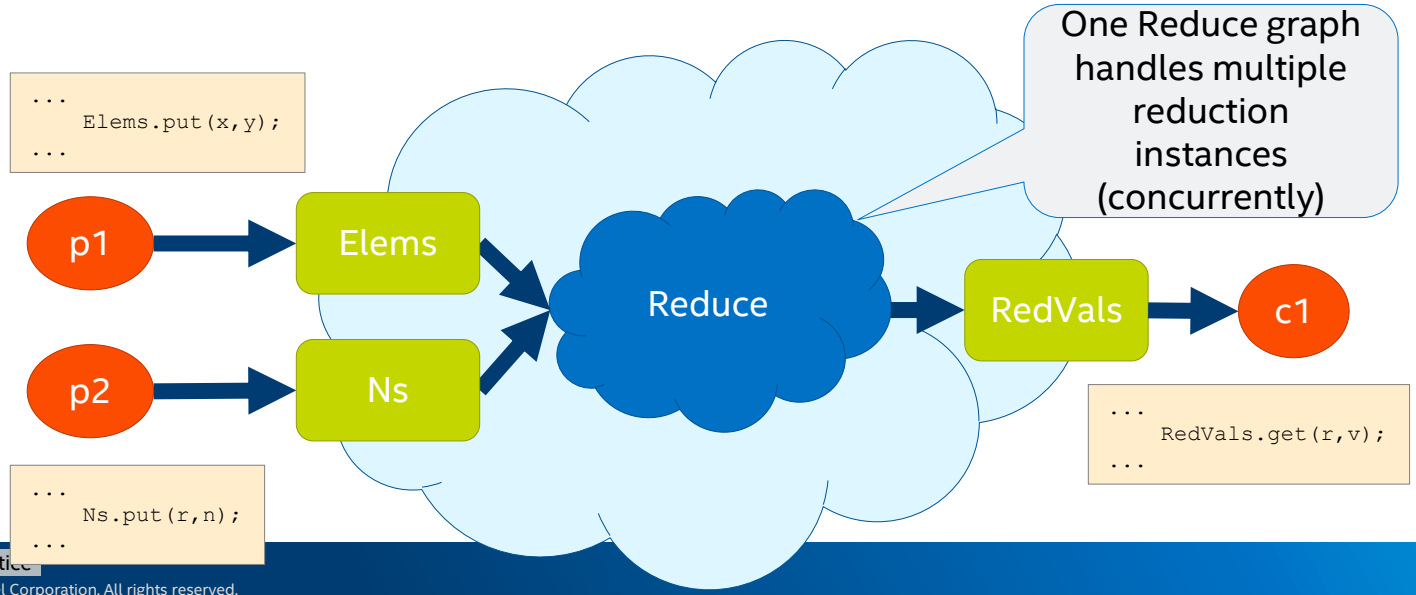

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Ongoing Graph Discussions

Can a graph be prescribed and if so, what does it mean?

What's the "home" of IO collections?

Connecting runtimes through graphs?

Hierarchical data?

Hierarchical tag-spaces?

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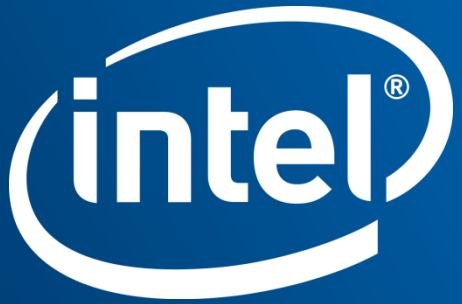
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