

# Naucrates: Dealing with Hardware Failures in Future Multi-Cores



A framework to automatically configure software to deal with partial hardware failures.

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Problem

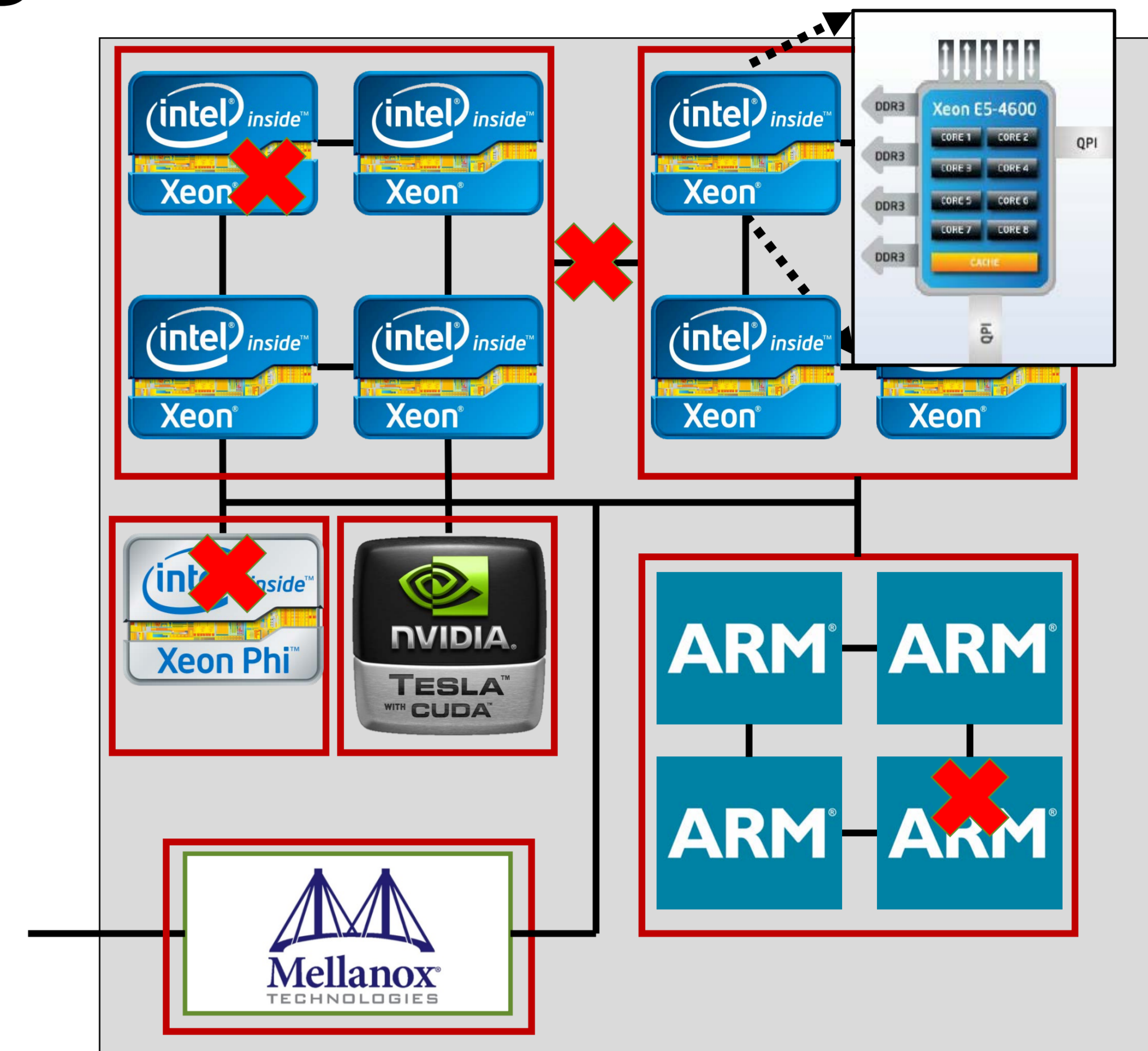
Multi-cores: More components, increasing complexity and heterogeneity

➔ Transient **hardware failures** exposed to software

➔ **Incorrect software**

➔ Failure tolerance with **replication** requires **consistency**

➔ Traditional distributed protocols are **not optimized** for closely coupled multicore systems

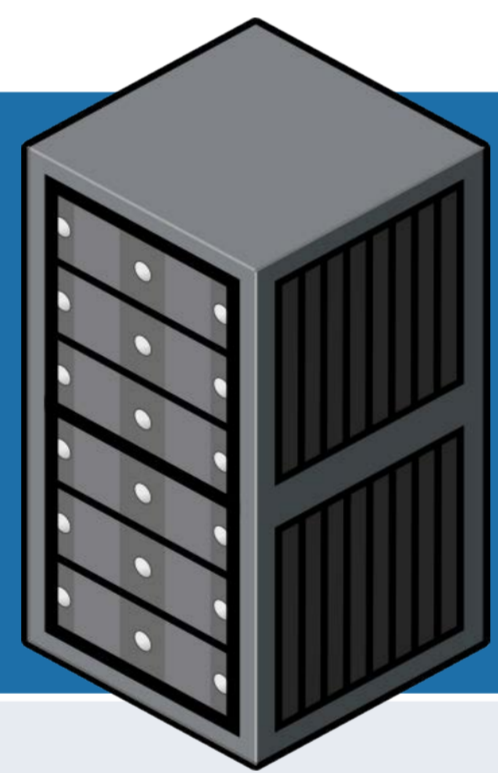


Idea

**Composing** existing protocols and **automatic configuration** based on a machine model

Approach

## Hardware Model



Declaration of HW facts using logic programming:

```
core(1). core(2).
latency(core(1),core(2), 300).
failedomain(core(1), 1).
cache(25M, L3, shared).
```

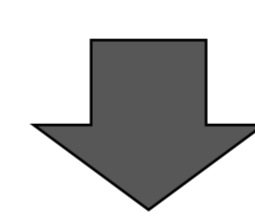


## Software Model

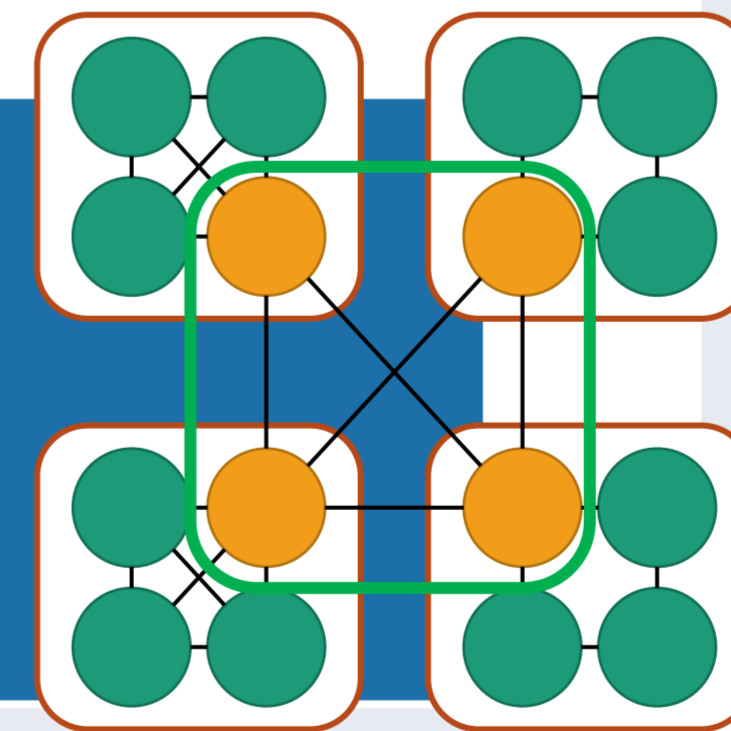


Description of the algorithms

```
paxos = {
  messages = N;
  pattern = ONE_TO_N;
  rounds = 4;
  time = ASYNC;
}
```



## Specific runtime configuration



```
config {
  numlevels = 2;
  levelconfig = {paxos, 2-phase-commit};
  channels = {message passing,
             shared memory};
}
```

Challenges

**Configuration oracle**

**Verification of correctness**

Revisiting existing algorithms

**Failure and machine model**