



Norchip

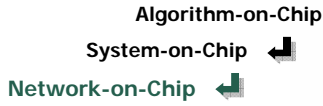
Linköping, Sweden, 2006

Service-Oriented Approaches for the Operation of large on-chip Networks

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System Control for Networks-on-Chip

Emergence:



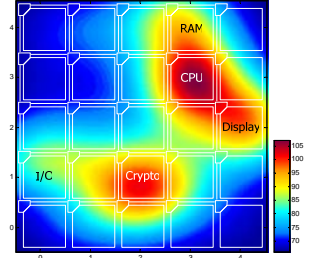
Nowadays operating systems can not simply be adopted.

System monitoring / -control:

Dynamic, online management:

- Task mapping, load balancing
- Communication
- Power consumption:
 - Temperature distribution
 - Supply voltage drop
 - Power-down modes
- Composition of functions/tasks/services
- Reliability, self-healing

Application example for the temperature distribution of a 5x5 mesh network

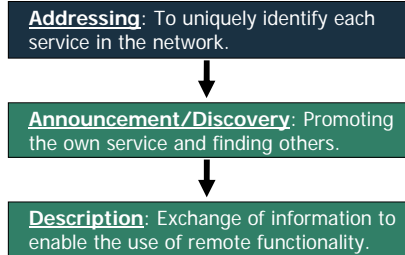


Service-Oriented Architecture (SOA)

Related work:

- Centralized approach:
 - Polling of packet statistics within a separate control network [Nollet, 2004]
 - Distributed object system for hardware reconfiguration [Hecht, 2006]
 - Task mapping for QoS, no control of communication [Kavaljdjev, 2004]
- Distributed approach:
 - Configurable and modular system software [Benini, 2002]

Life-cycle of a service:

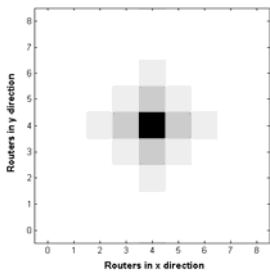


Implementations:

- JINI – Java based with a central repository (Sun Microsystems)
- UPnP – Intended for rather small networks of devices
- DPWS – Subset of Web service protocols for resource constraint devices

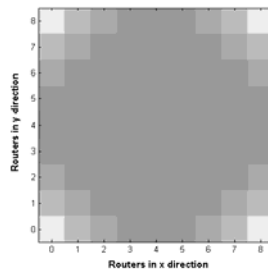
Different Approaches for System Control

Centralized:



- Straight forward implementation
- Global system perspective
- Little hardware requirements
- Message contention
- Latency (hop count & contention)

Distributed:

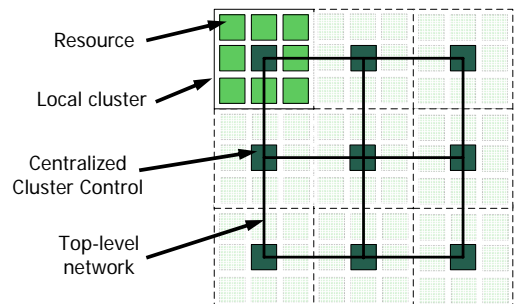


- Hot spot avoided
- Raised number of control messages
- Redundant hardware required
- Global awareness lost
- Real-time requirements
- Multi- or broadcast messages needed

Implementation dependent

Hierarchical:

A hierarchical approach could bring together the advantages of both approaches while masking their drawbacks.



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