

# *one.world* – Programming for Pervasive Computing Environments

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# Pervasive Computing

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- Ubiquitous smart devices
  - Deployed in our working and living spaces
  - Some mobile, some stationary
- Powerful network services
  - Shared within the infrastructure
- Devices and services are context aware and coordinate with each other
  - Provide immediate access to information
  - Support users in completing their tasks

# Problem

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- Giant, ad-hoc distributed system
  - Tens of thousands devices and services come and go
- Applications need to
  - Adapt to a changing environment
  - Work even if
    - Devices are roaming
    - Users switch devices
    - Network provides only limited services, or none at all

# Distributed Computing Today

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- Transparent access to remote resources
  - Distributed file systems
  - Remote procedure calls
- Static composition
  - Simple, location-dependent names
  - Early binding
- Tight coupling between data and functionality
  - Distributed objects

# Our Approach

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- Alter way programmers think about applications
  - Programming for change
    - Remote resources: devices, services, people
    - Local resources: CPU, storage, networking
    - Stored data
- Provide system support
  - Integrated architecture
    - Designed to support pervasive applications
    - Provides powerful primitives to help programmers

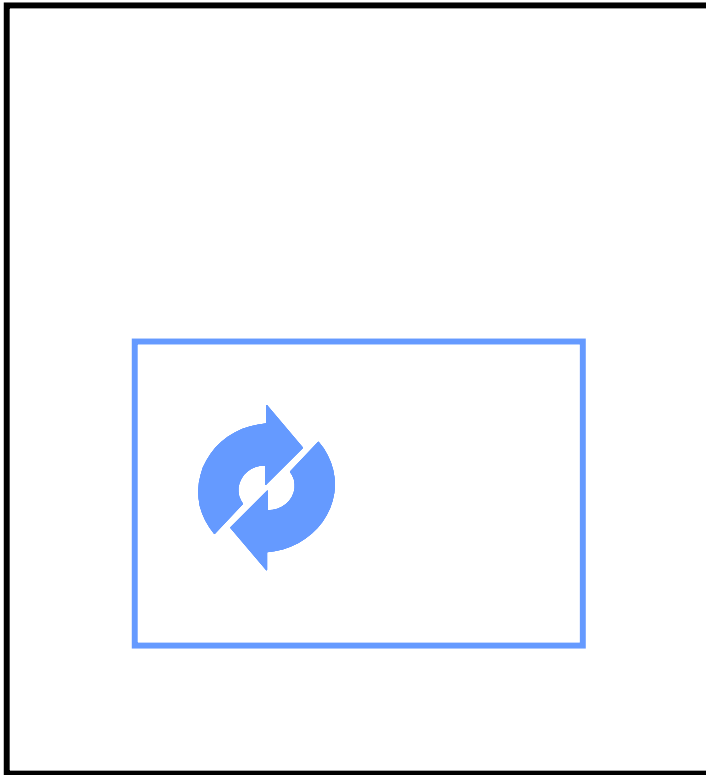
# Research Issues

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- How to structure the architecture?
  - Tuples to represent data
  - Components to provide functionality
    - Exchange asynchronous events
  - Environments to group stored tuples, components, and other environments
- What are the right primitives?
  - Checkpoint, restore
  - Move, copy
  - Send to matching resource

# *one.world* Illustrated

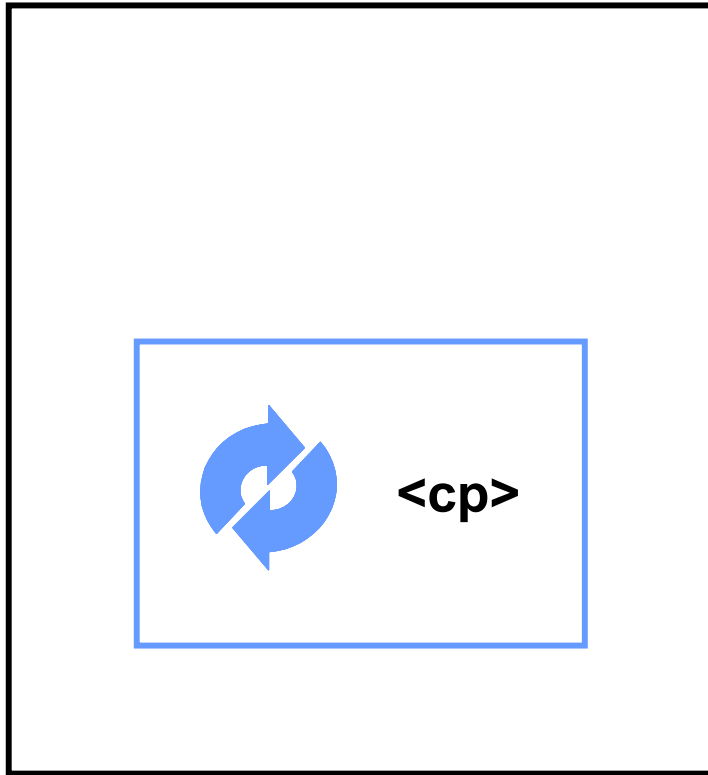
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Node 1

# *one.world* Illustrated

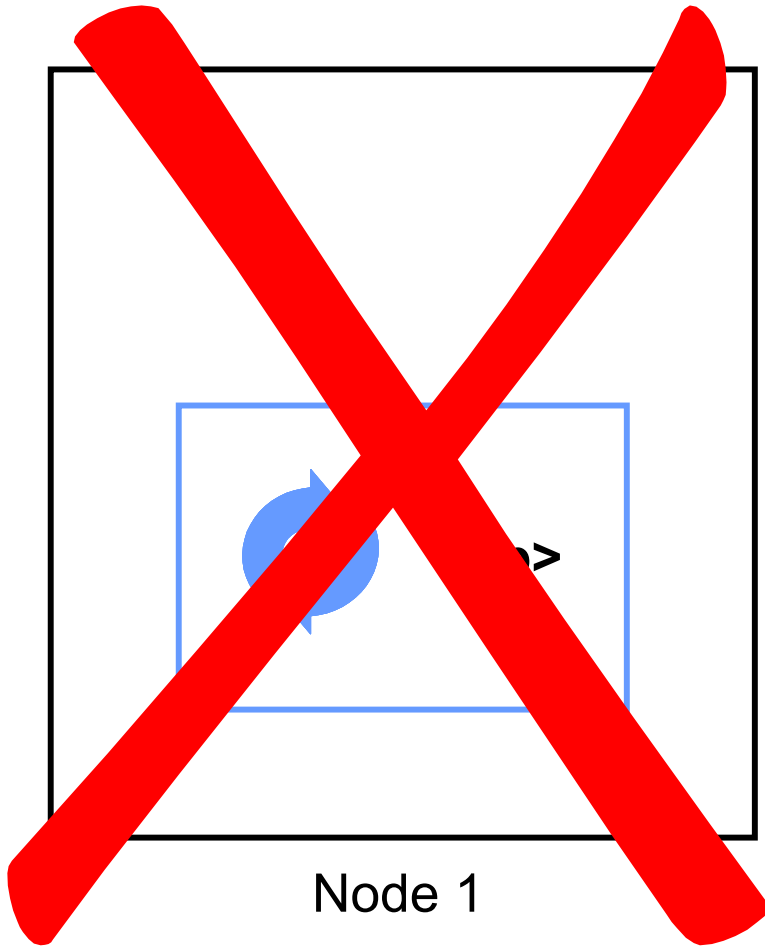
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Node 1

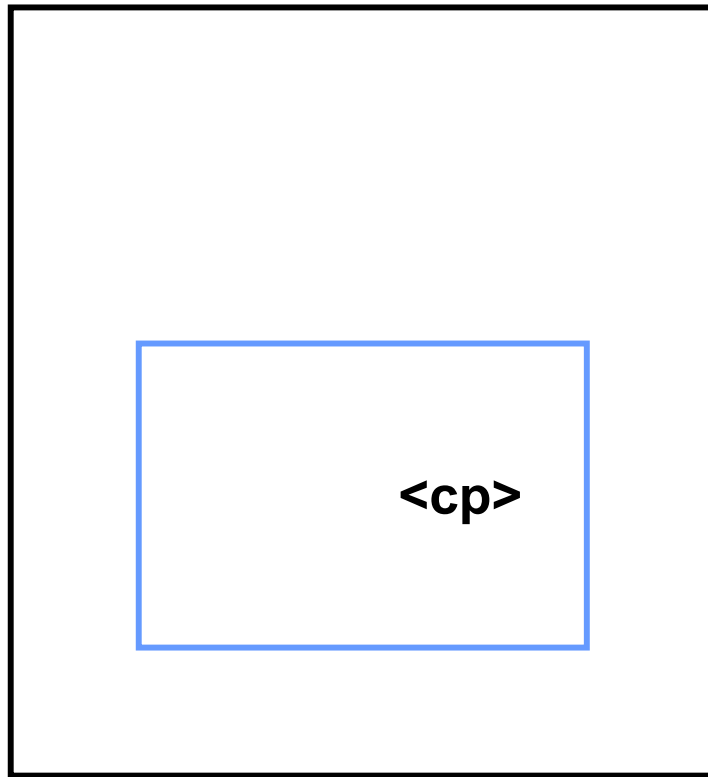
# *one.world* Illustrated

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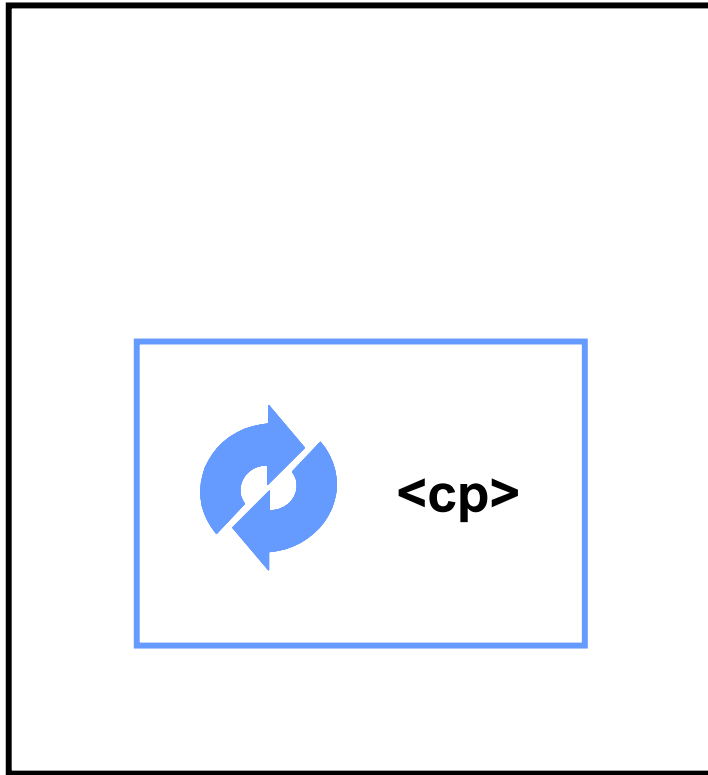
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Node 1

# *one.world* Illustrated

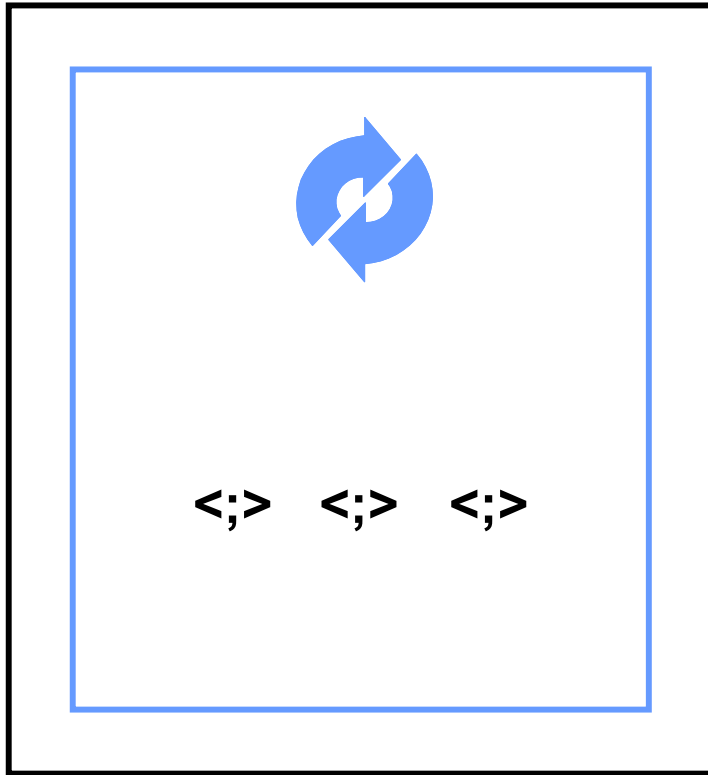
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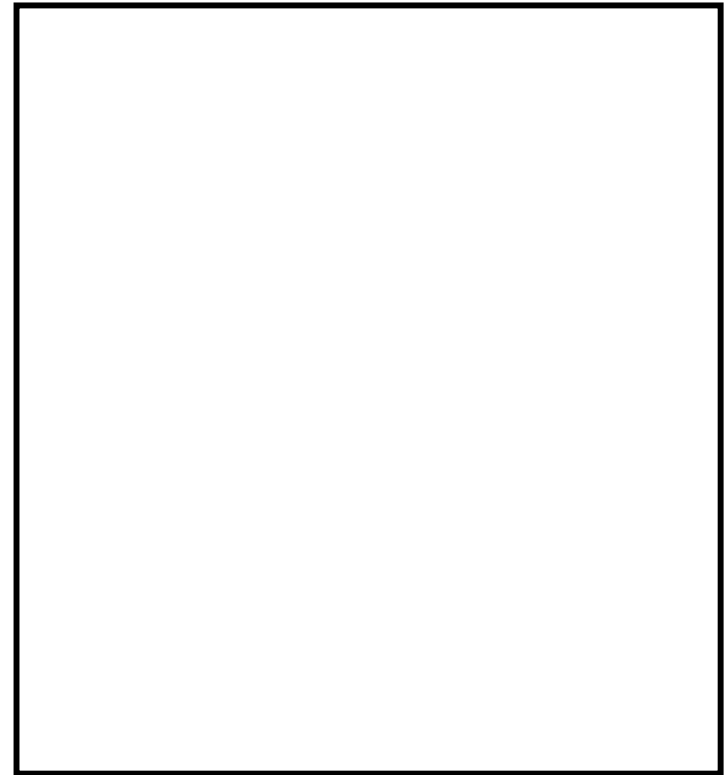
Node 1

# *one.world* Illustrated

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Node 1



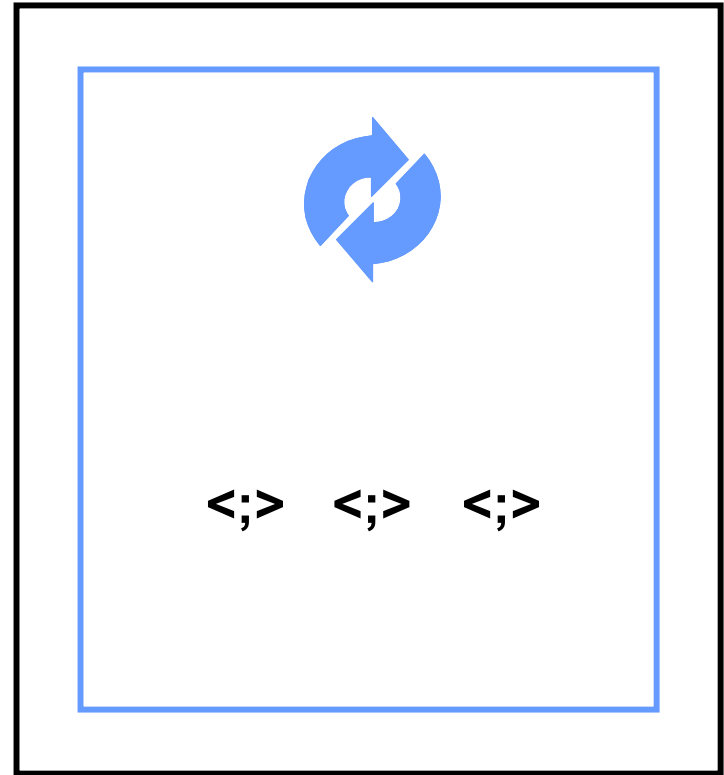
Node 2

# *one.world* Illustrated

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Node 1

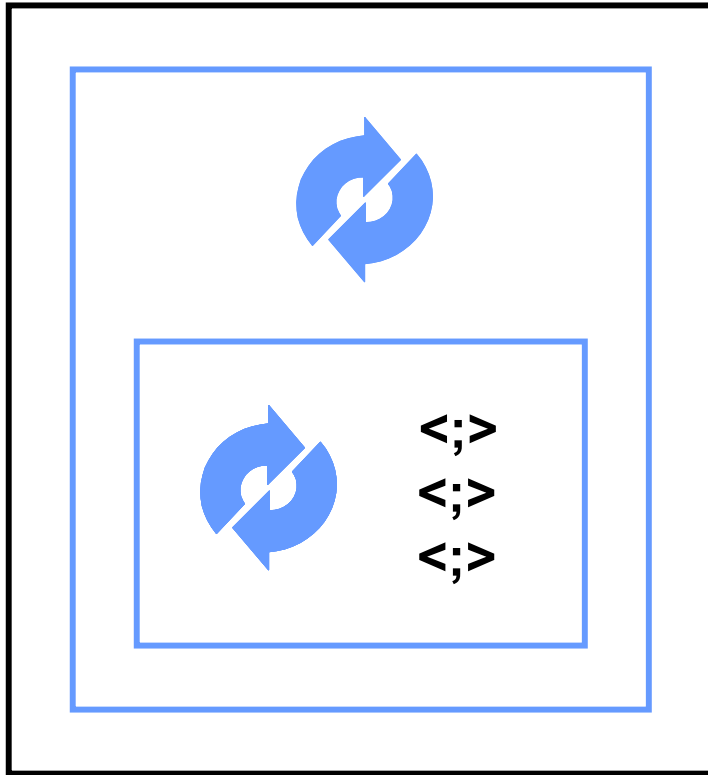


Node 2

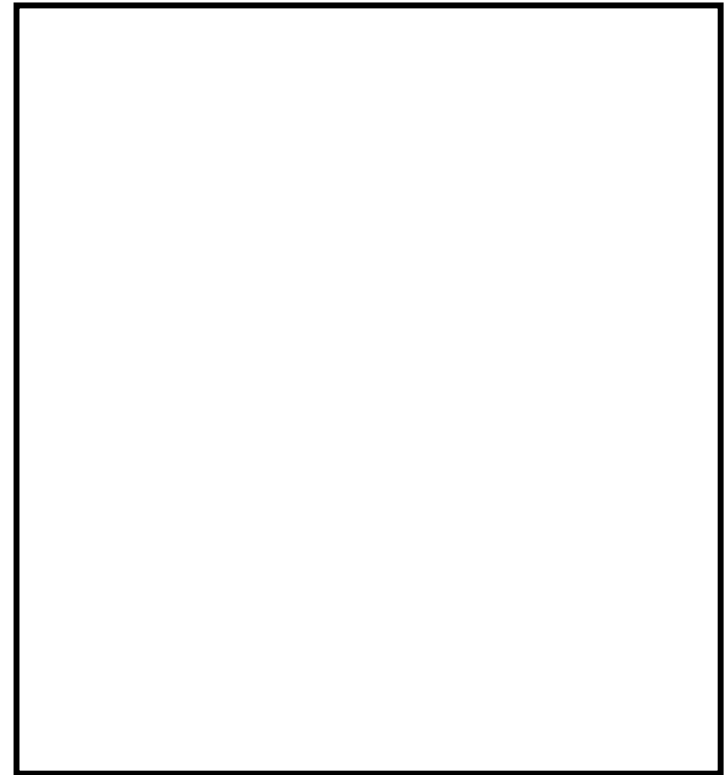
*one.world*

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Node 1



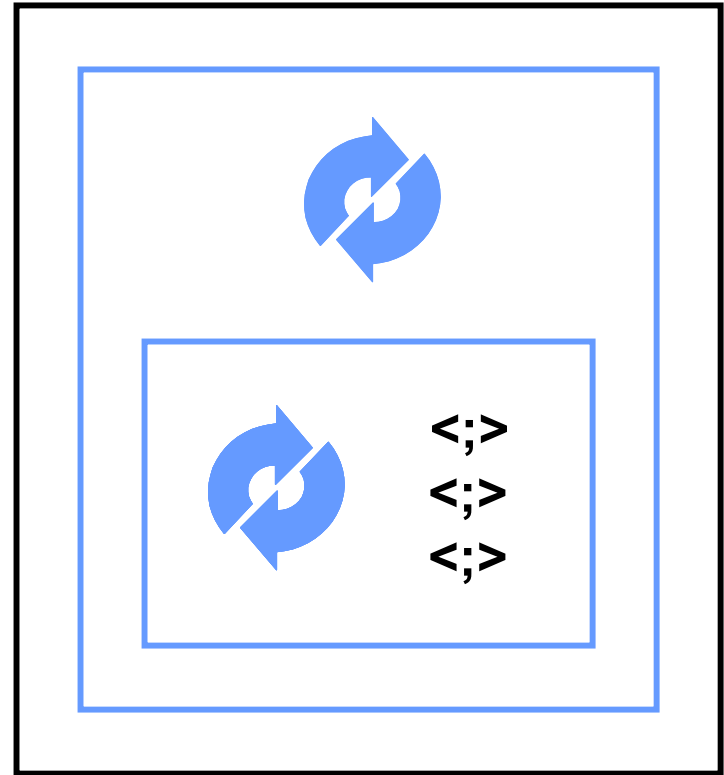
Node 2

# *one.world* Illustrated

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Node 1



Node 2

# Status

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- Implemented core architecture in Java
  - Source release publicly available (v0.4)
- Exploring applications
  - digime: PIM on steroids
- Conducting an experiment with CSE 490dp
  - Projects compare Java vs. *one.world*
    - Music search engine
    - Universal inbox

Demo

Poster

<http://one.cs.washington.edu>