

The 5th Dimension

Building Blocks for
Smart Infrastructures

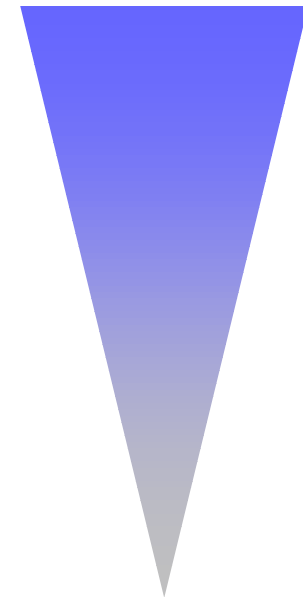
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Motivation

HUC2k Workshop

- Ubiquitous Computing
 - Smart Environments
 - Information Appliances
 - Low Power Devices
 - Unpowered Artifacts (tagged)

Computing
Power



Motivation

HUC2k Workshop

- Ubiquitous Computing
 - Smart Environments
 - Information Appliances
 - Low Power Devices
 - Unpowered Artifacts (tagged)
- Making Smart Devices First Class Citizens

Computing Power

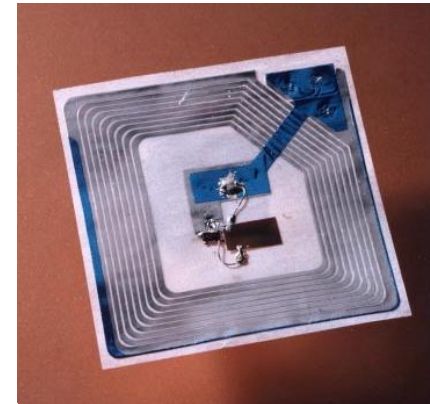


Leveling the Playing Field

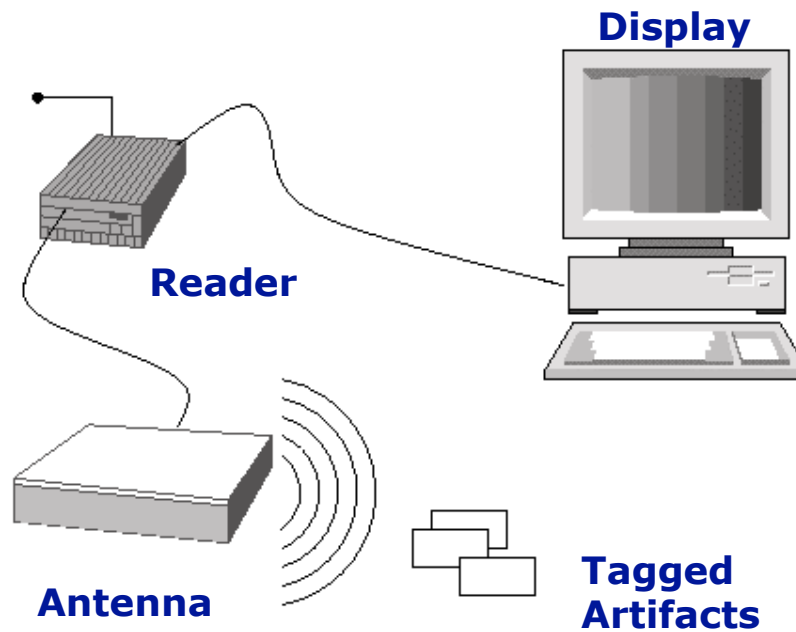
Linking

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- Connecting
 - Real-World Artifact
 - Virtual Representation



RFID Tag



- Active or Passive IDs
- Readers Identify Tags
- Network stores Artifact Data
- Displays Provide Access

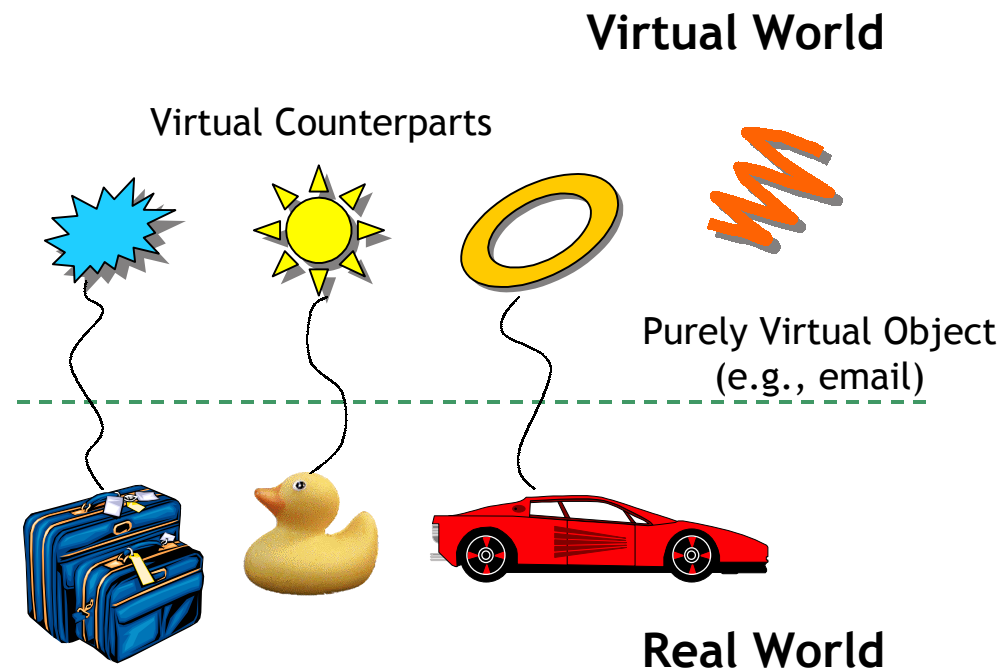
Virtual Counterparts (VCs)

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- Network Representation of Artifact
 - Data + Code + Execution (Autonomous Agents)
 - Represents & Extends Artifacts

- VCs are:

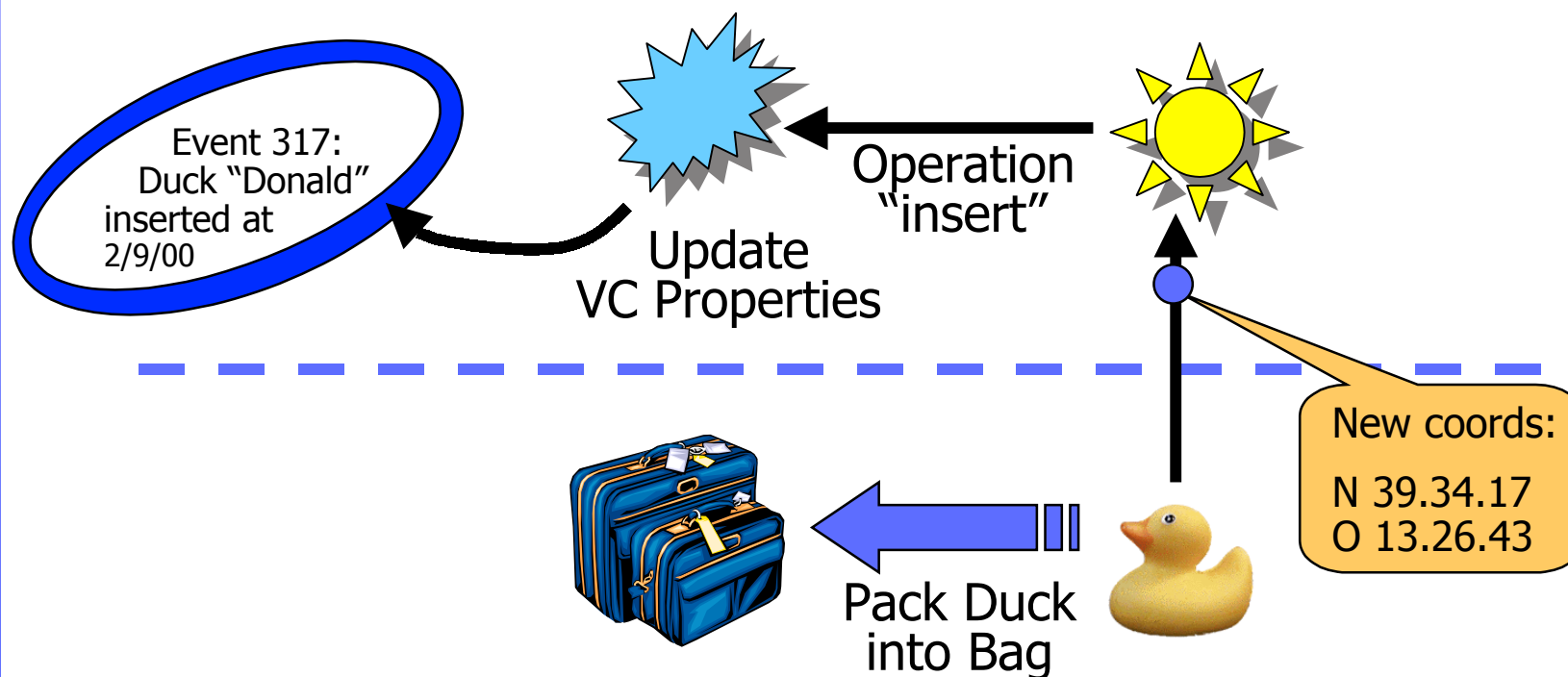
- Autonomous
- Coupled to Artifact
- Mobile



Data + Code

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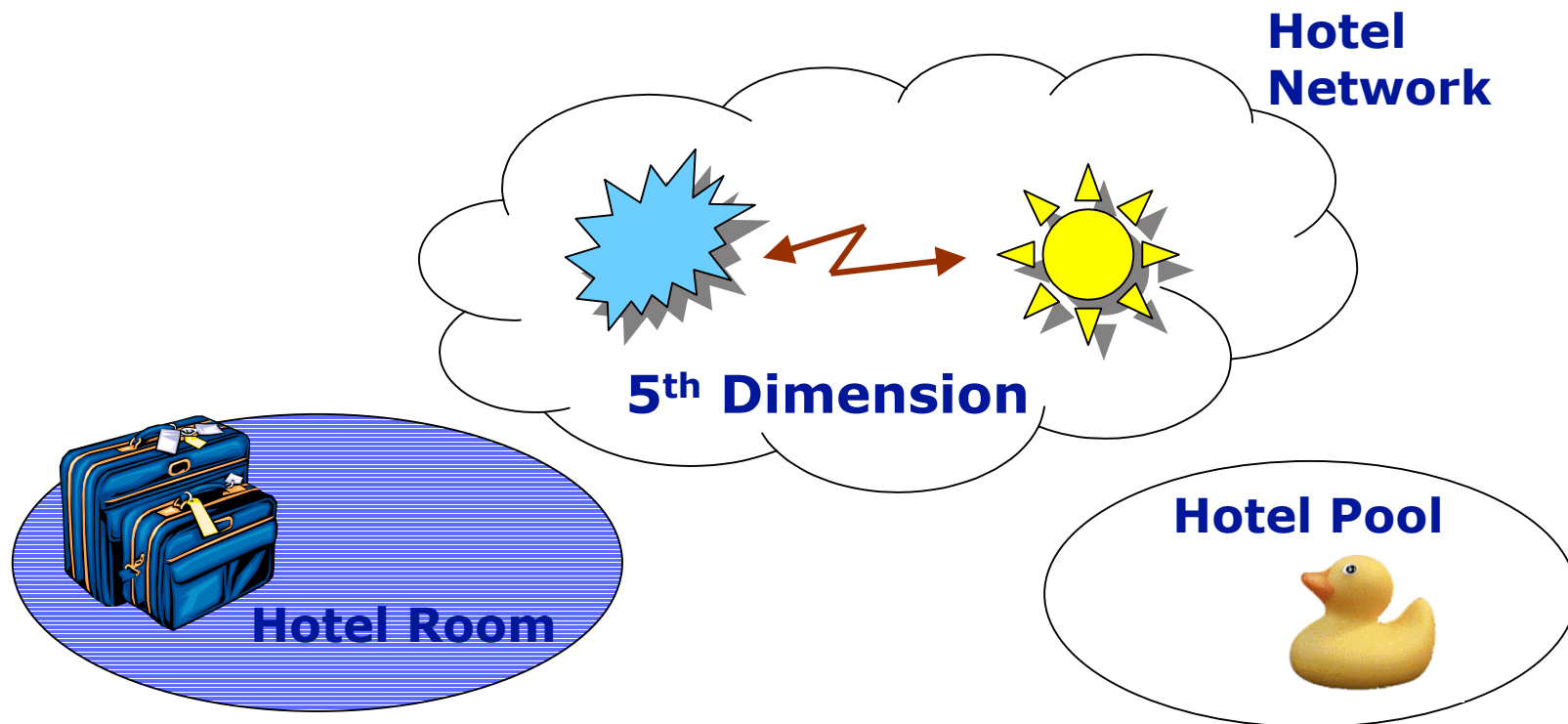
- Extends 4D Interaction Patterns
- Arbitrary Functionalities per Artifact



Autonomous Execution

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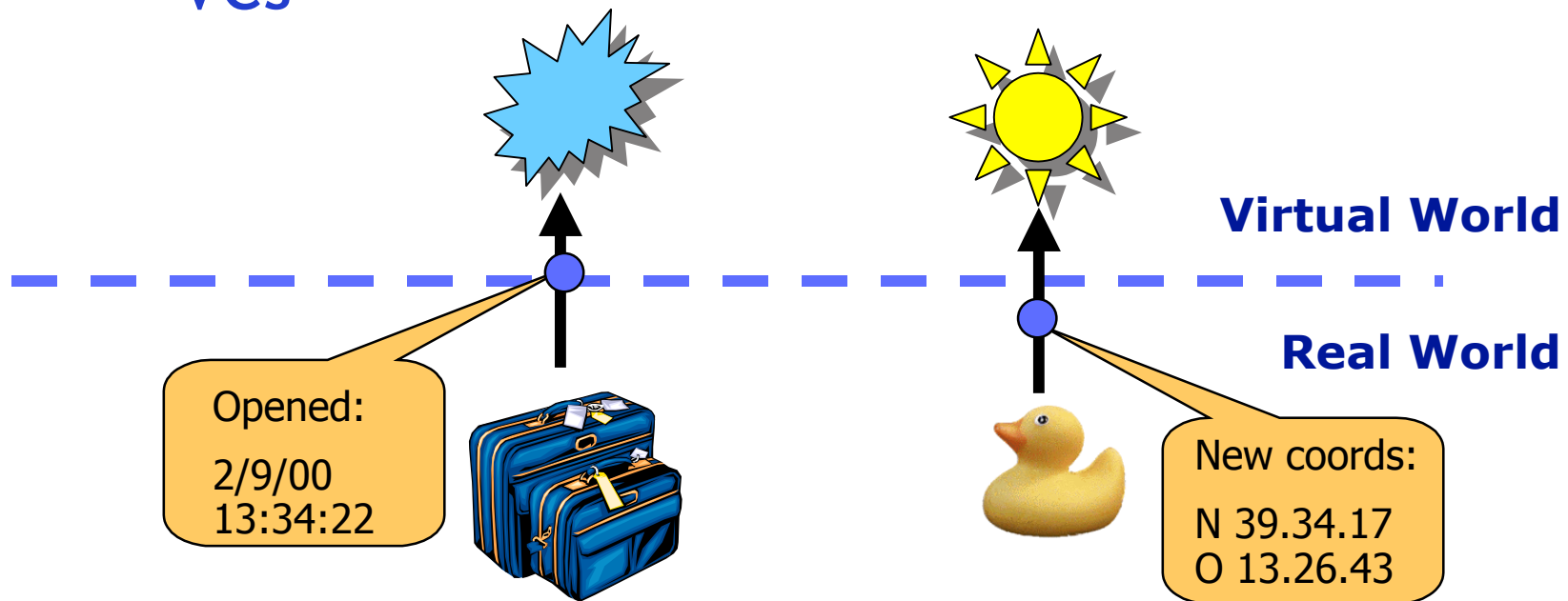
- Decoupled Interactions
- Self-activation



VC Runtime Environment

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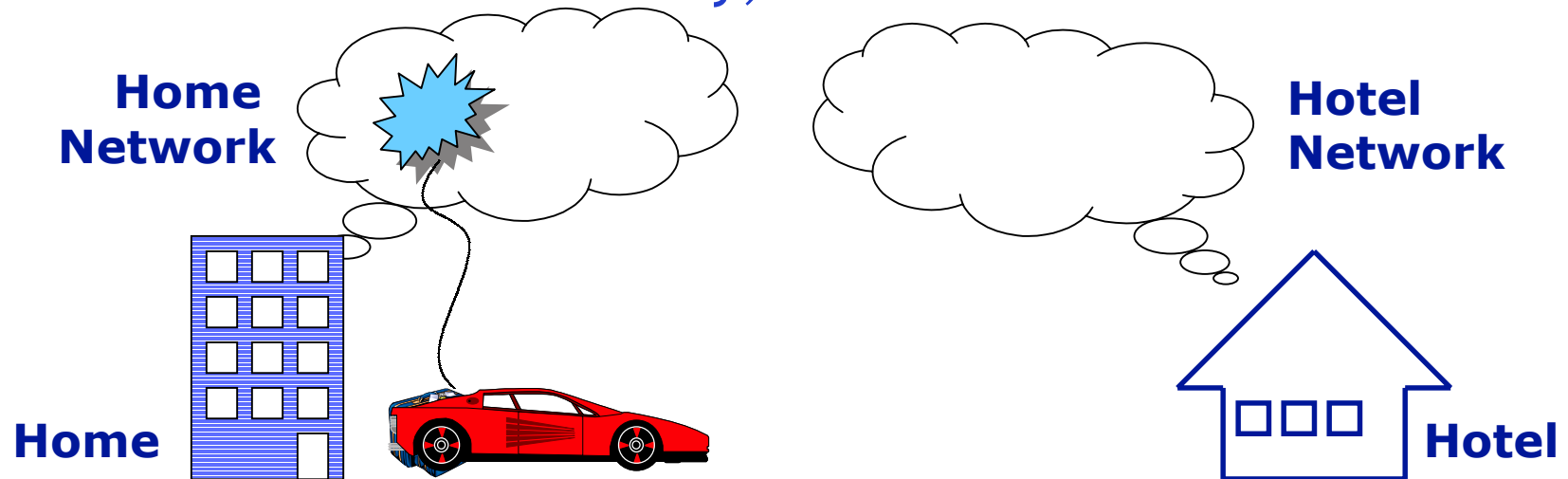
- Event-Driven Infrastructure
 - VCs Register Interest in Events
 - Infrastructure Relays Events to Interested VCs



Disconnected Operation

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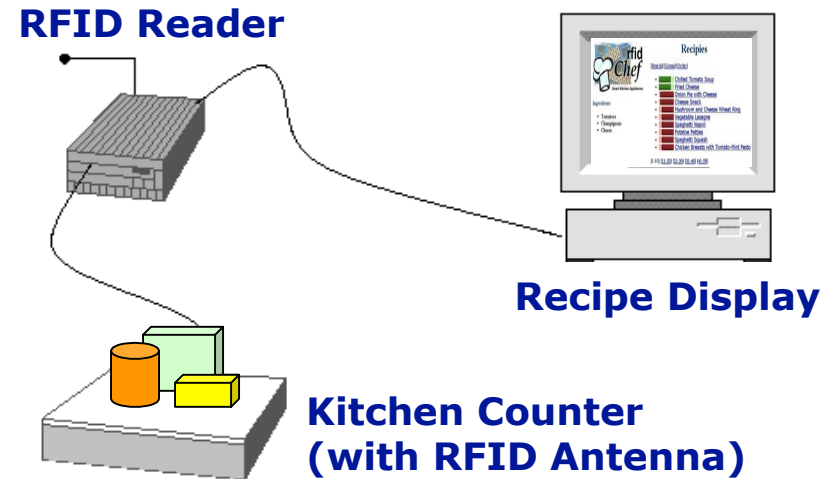
- Virtual Worlds Non-Continuous
 - Different Localities, Operators, Vendors, Trust Levels
- VC Mobility
 - VCs follow across World Boundaries
 - Ensures Connectivity, Minimizes Traffic



RFID Chef

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- Virtual Cookbook
 - Suggests Recipes based on available Items
 - Reader in Countertop



Issues

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- **Ontology?**
 - Do we need Hierarchies? Object Fusion?
- **Objects or Data (XML)?**
 - Simplicity or Expressiveness?
- **Code Mobility**
 - Aren't all Networks Interconnected?
- **What's in an Infrastructure?**
 - Basic Services?