

The 5th Dimension

Building Blocks for
Smart Infrastructures

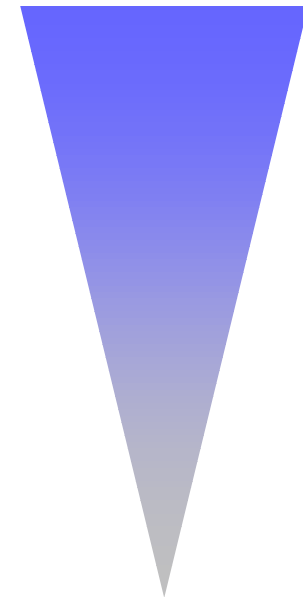
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Motivation

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

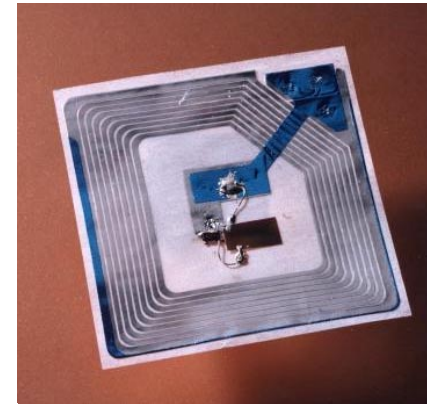


Leveling the Playing Field

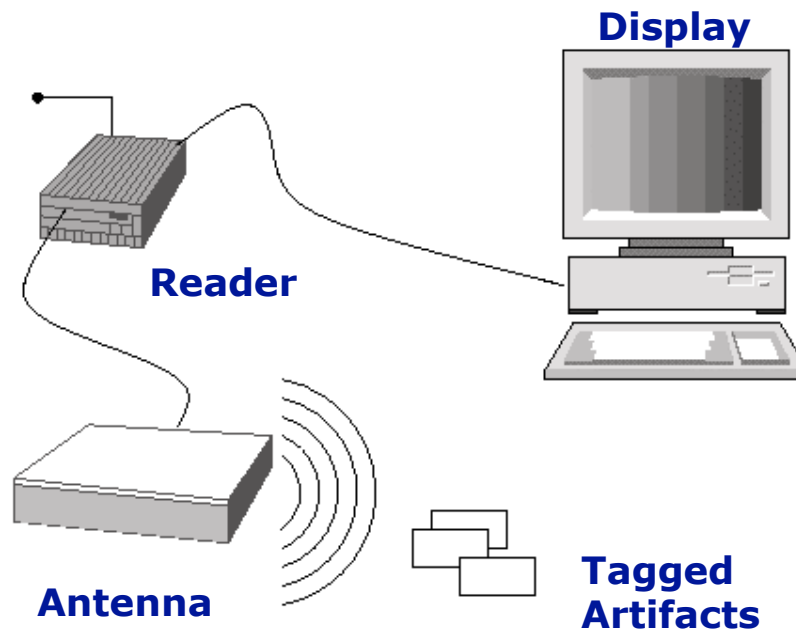
Linking

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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

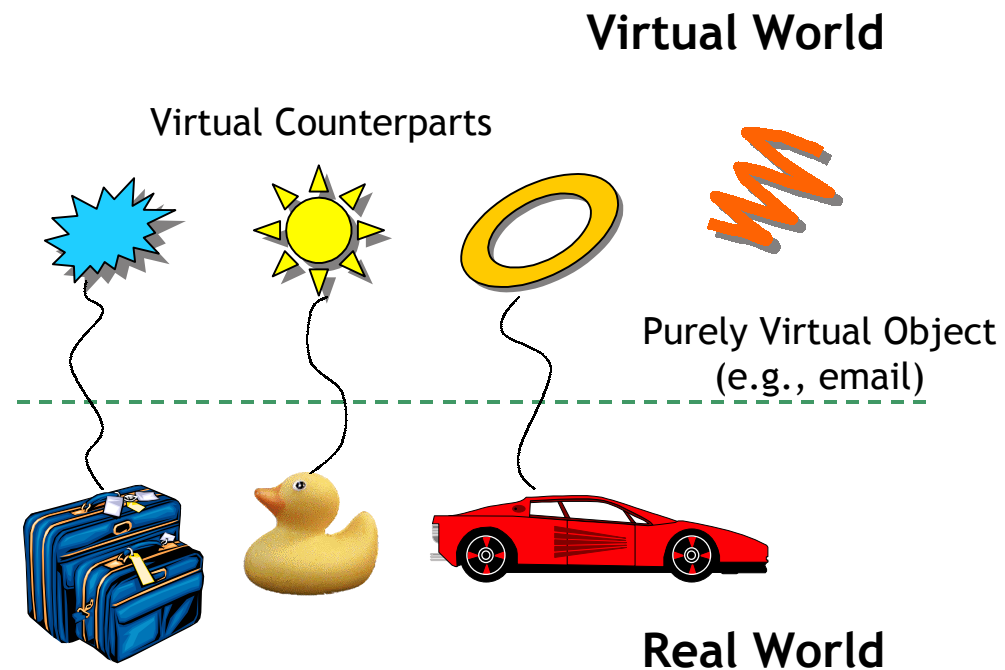
Virtual Counterparts (VCs)

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

- VCs are:

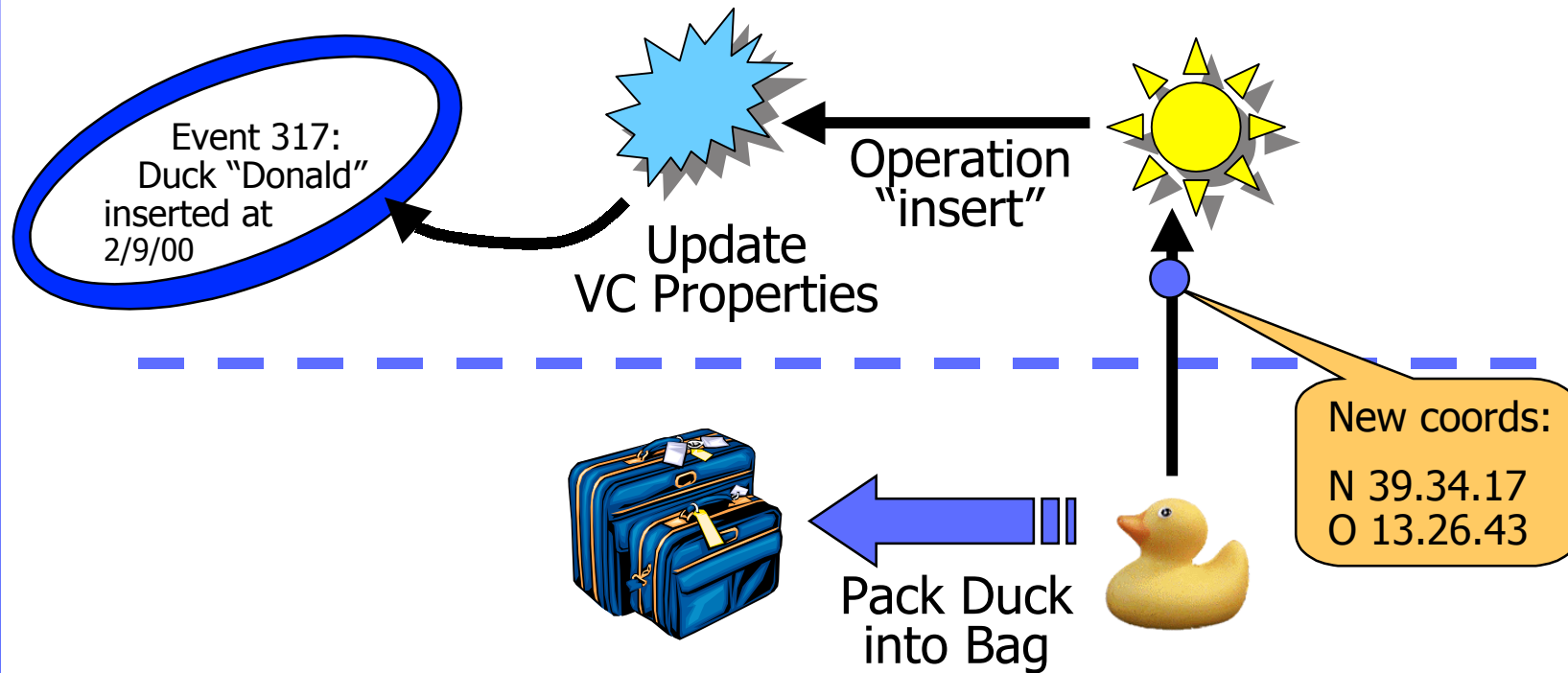
- Autonomous
- Coupled to Artifact
- Mobile



Data + Code

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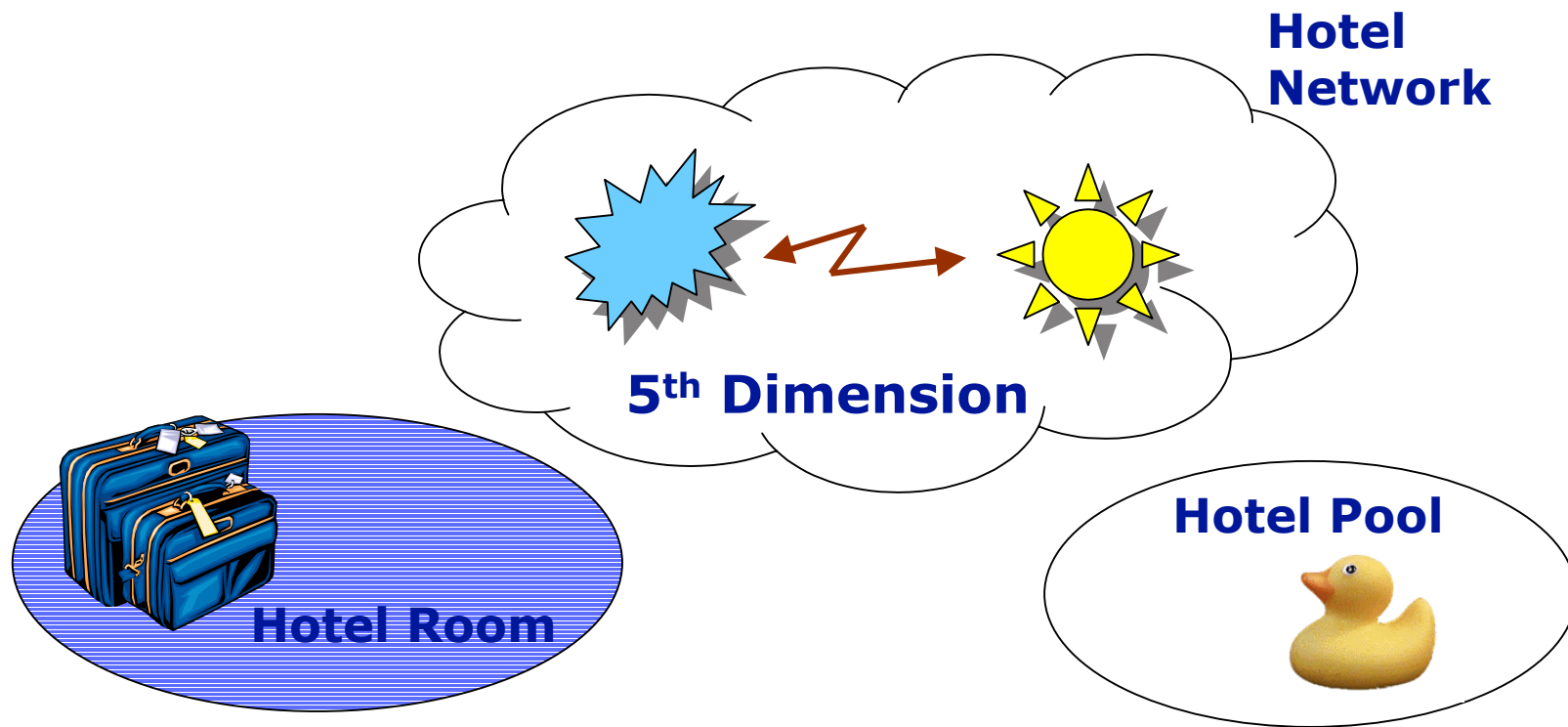
- Extends 4D Interaction Patterns
- Arbitrary Functionalities per Artifact



Autonomous Execution

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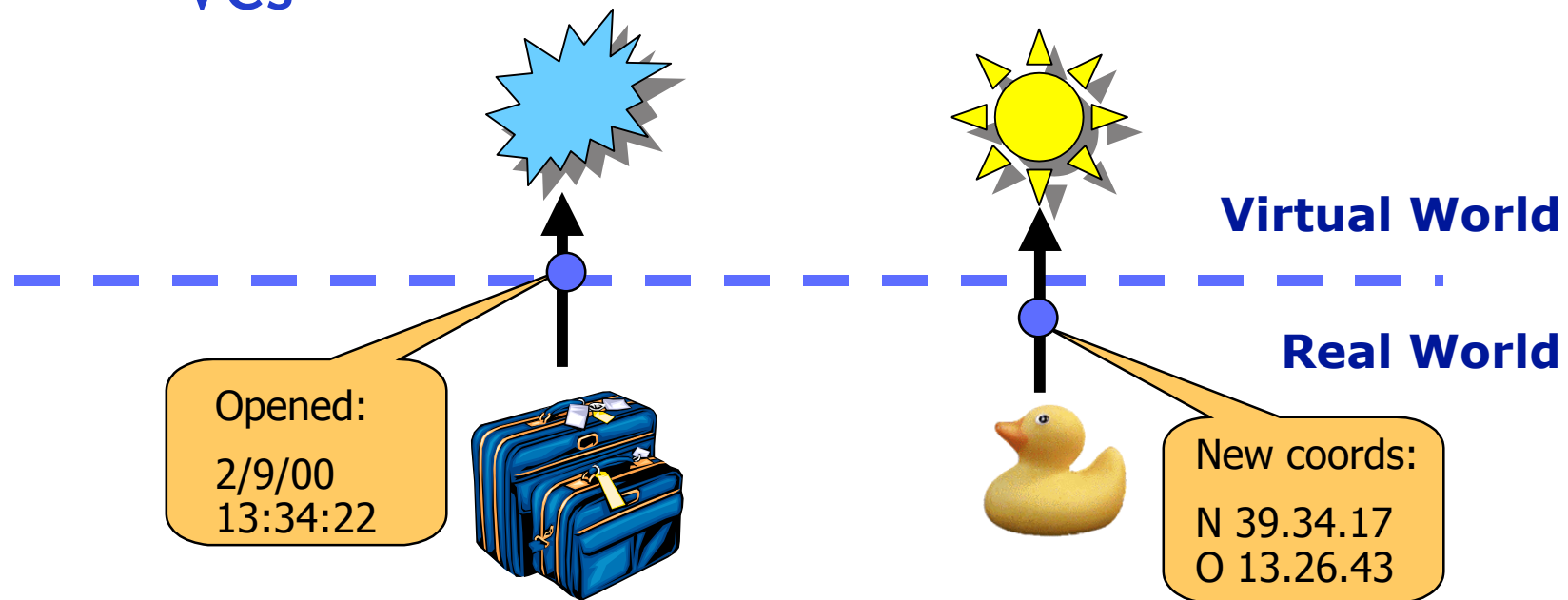
- Decoupled Interactions
- Self-activation



VC Runtime Environment

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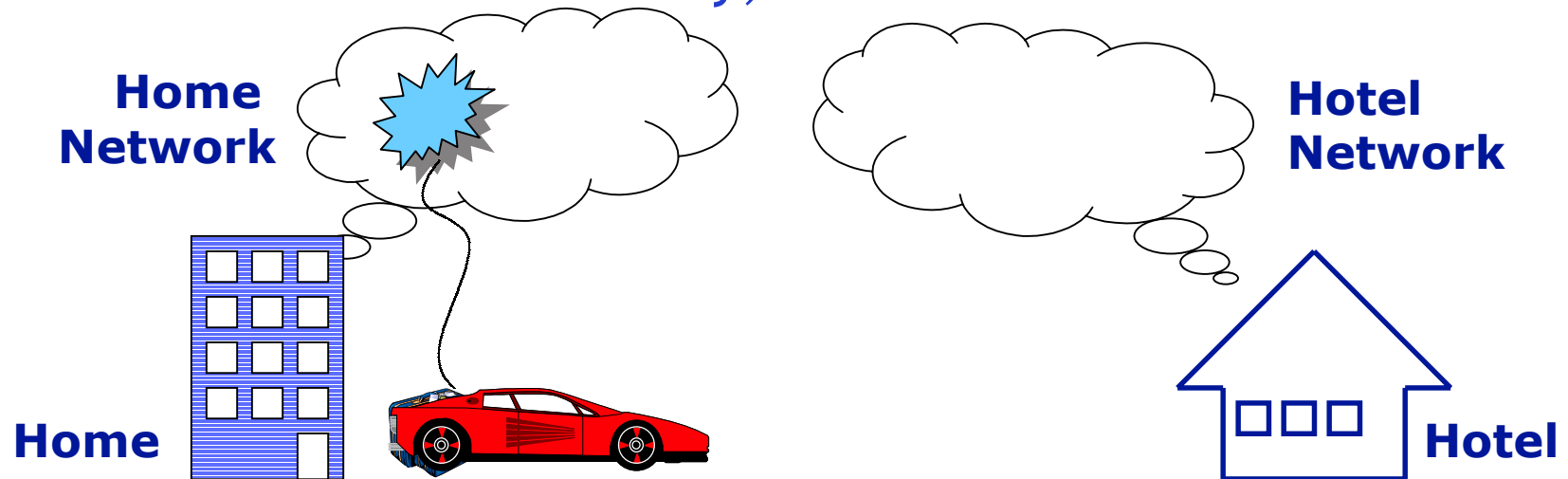
- Event-Driven Infrastructure
 - VCs Register Interest in Events
 - Infrastructure Relays Events to Interested VCs



Disconnected Operation

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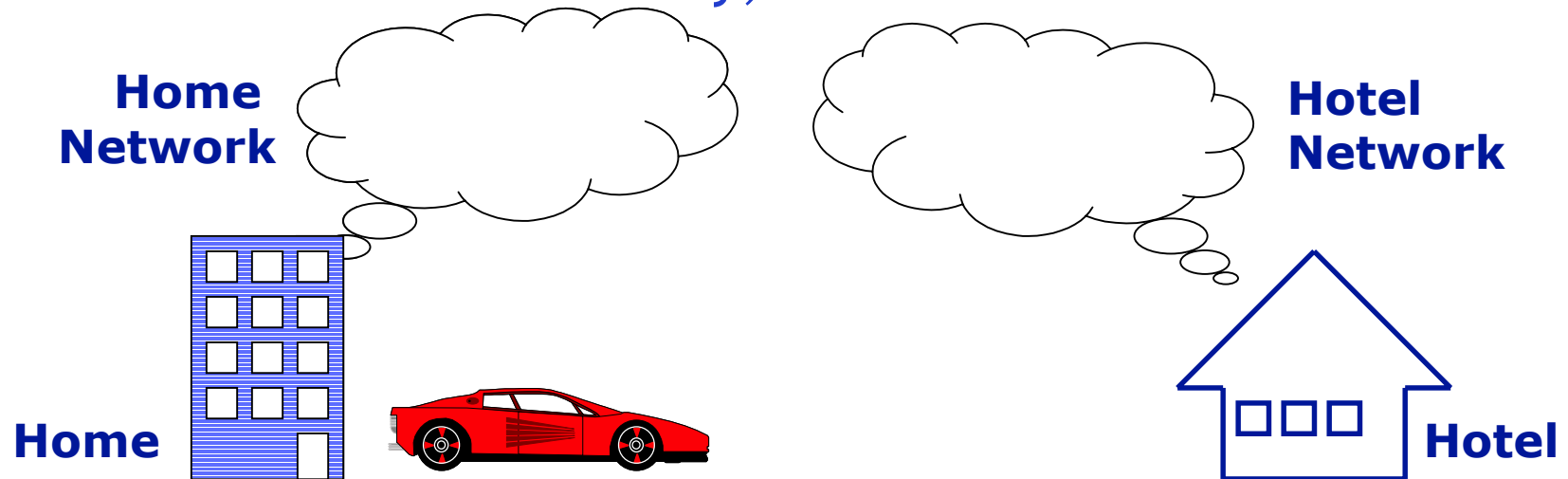
- Virtual Worlds Non-Continuous
 - Different Localities, Operators, Vendors, Trust Levels
- VC Mobility
 - VCs follow across World Boundaries
 - Ensures Connectivity, Minimizes Traffic



Disconnected Operation

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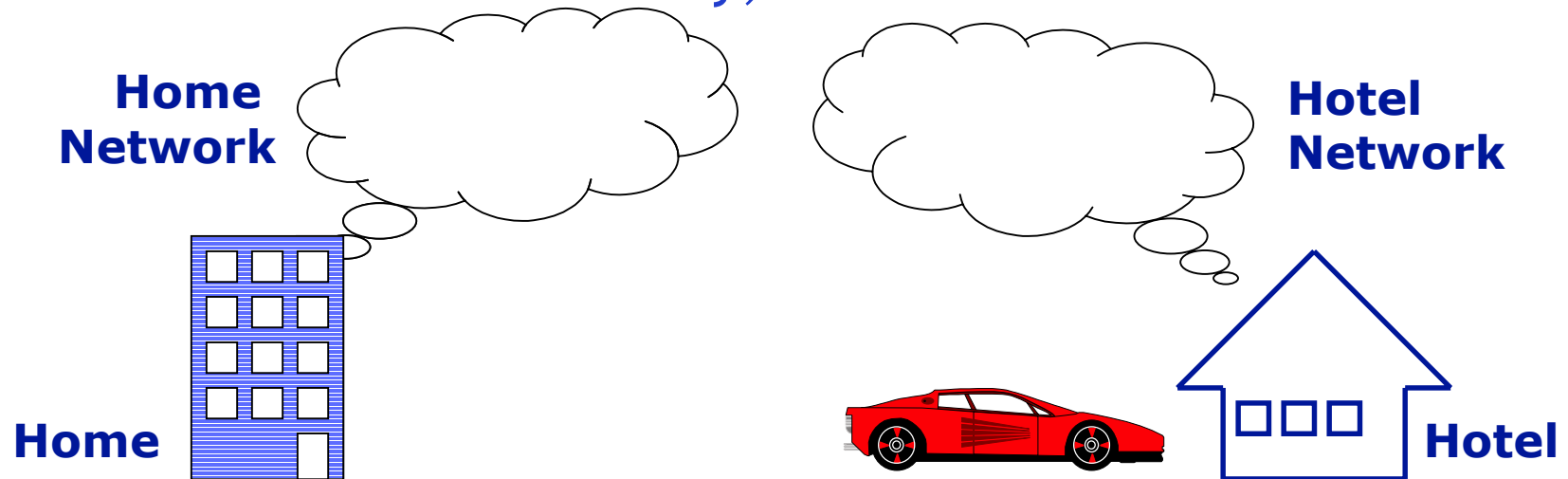
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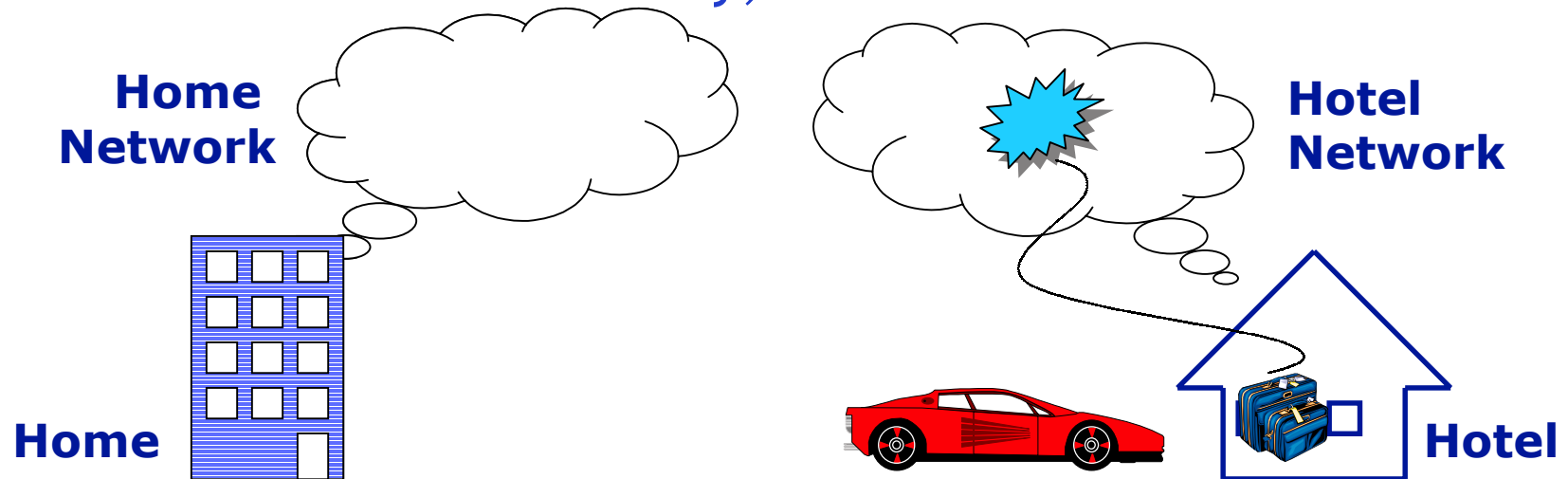
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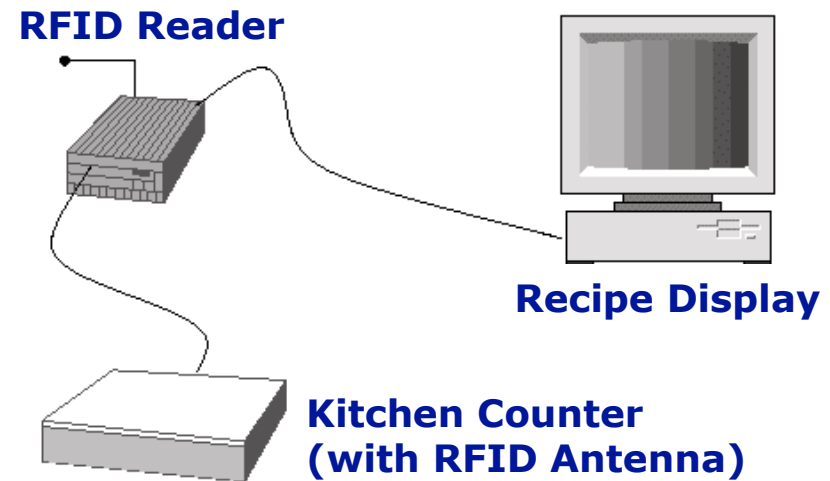
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RFID Chef

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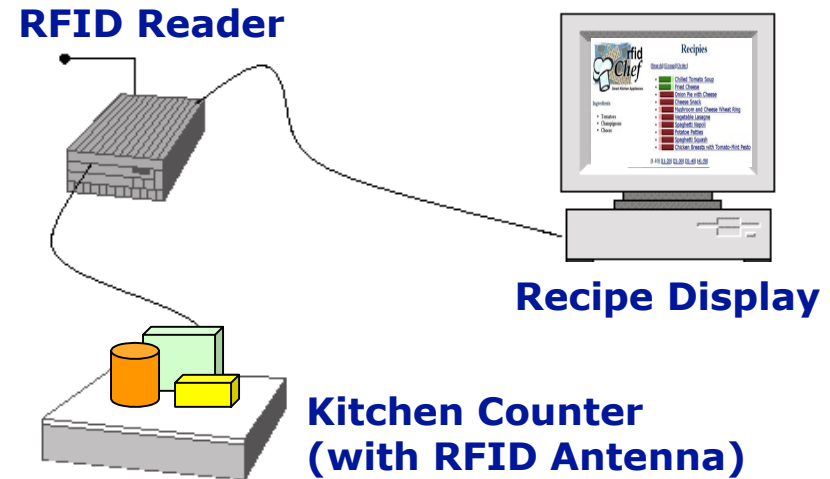
- Virtual Cookbook
 - Suggests Recipes based on available Items
 - Reader in Countertop



RFID Chef

HUC2k Workshop

- Virtual Cookbook
 - Suggests Recipes based on available Items
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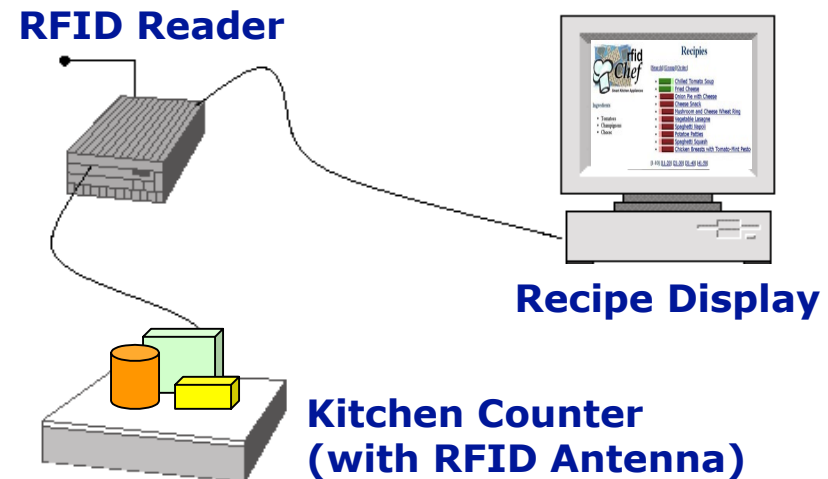


The screenshot shows the RFID Chef software interface. On the left, there is a logo for 'rfid Chef' with a chef's hat and the text 'Smart Kitchen Appliances'. Below the logo, the 'Ingredients' section lists: Tomatoes, Champignons, and Cheese. On the right, the 'Recipes' section is titled 'Recipes' and includes a search bar and navigation links: [Search] [Group] [Order]. A list of recipes follows, each with a colored square icon: Chilled Tomato Soup (green), Fried Cheese (green), Onion Pie with Cheese (red), Cheese Snack (red), Mushroom and Cheese Wheat Ring (red), Vegetable Lasagne (red), Spaghetti Napoli (red), Potatoe Patties (red), Spaghetti Squash (red), and Chicken Breasts with Tomato-Mint Pesto (red). At the bottom, there are pagination links: [1-10] [11-20] [21-30] [31-40] [41-50].

RFID Chef

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- Virtual Cookbook
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- Basic Event Infrastructure
 - *Event* „RFID nnn appears or disappears“
 - *Collisions* make objects become *invisible* for a short time
 - Requires some *corrections* of the sensor information

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?