Context-Aware Systems
Ch. 2 of Ubicomp Fundamentals

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Designing a context-aware system is difficult

Suddenly, your app knows nothing with 100% certainty

What is it going to do now?

: Context Aware Systems

- The world is fractured
- Context-Aware systems try to make sense of the chaos

: Context Aware Systems

- Heterogeneity in hardware
  - Invisible embedded systems in cars, walls, objects
  - Feature phones, smart phones, tablets, ultra-books, netbooks, laptops, desktops
  - e-readers, mp3 players, personal health systems
  - Keyboard, Mouse, touch, gesture, tilt, eye-tracking

: Context Aware Systems

- Heterogeneity in software and standards
  - Windows, iOS, Linux, Symbian, Android
  - Wifi, Bluetooh, Zigbee, WiMax, 4G, Ethernet, IrDA

: Context Aware Systems

- Heterogeneity in sensing
  - Location
    - GPS
    - Cell-tower
    - Wifi
    - IP lookup

: Context Aware Systems

- Heterogeneity in use-cases
  - Home
  - Office
  - Hospital
  - Car
  - Outdoors
  - Indoors
  - Crowds
  - Retail
  - Agriculture
  - Wilderness

: Context Aware Systems

- Heterogeneity in use-cases
  - 1 : 1
    - Device = Owner
    - fallacy
  - 1 : many
    - Family Plan
  - many : many
    - Zipcar model

: Context Aware Systems

- Many of the challenges only occur because of an application focus
- Many devices remain resource-constrained
  - CPU
  - Memory
  - Bandwidth
  - Power (wireless comms)
- Resource-aware computing
- power foraging
- cyber foraging

: Context Aware Systems

- Volatility is the rule not the exception
  - Service discovery
    - Jini, UPnP, Bonjour, Bluetooth
  - The system is distributed
    - “The set of users, devices, hardward, software and operating systems in ubicomp systems is highly dynamic and change frequently”
  - Connections are volatile
  - Network is volatile

: Context Aware Systems

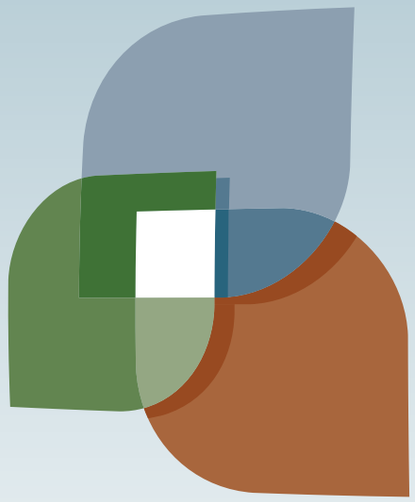
- Volatility of usage environment
  - Location of the users
    - Location-based services
  - Changing context of the computers
    - Context-aware computing
  - Multiple activities of the users
    - Activity-based computing (ABC)

: Context Aware Systems

- Systems don't get the attention of the user for free
  - Sending notifications
    - may never be seen
  - Asking what to do with a failure
    - user won't respond
  - Asking the user to upgrade or install something else
- Autonomic computing
- Multi-agent systems
- Contigency Management
- Graceful degradation

: Context Aware Systems

- Security and Privacy
  - Trust
    - devices are not going to be under administrative control
  - Resource assumptions are wrong
    - no access to security servers
    - no resources to compute crypto
    - device is mobile
- Data is collected without users knowledge
- Short connections don’t lend themselves to passwords
  - refrigerator, HVAC, etc.



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Tuesday, January 31, 12