ConnectivityWeek

eCommerce and Battery Cars: Challenges and Solutions

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Agenda

- Introduction and Background
- Use Case—Battery Car Charging
- The Bigger Picture
- What Have We Done?
- Where's the eCommerce?
- Challenges
- Questions
- References

Introduction

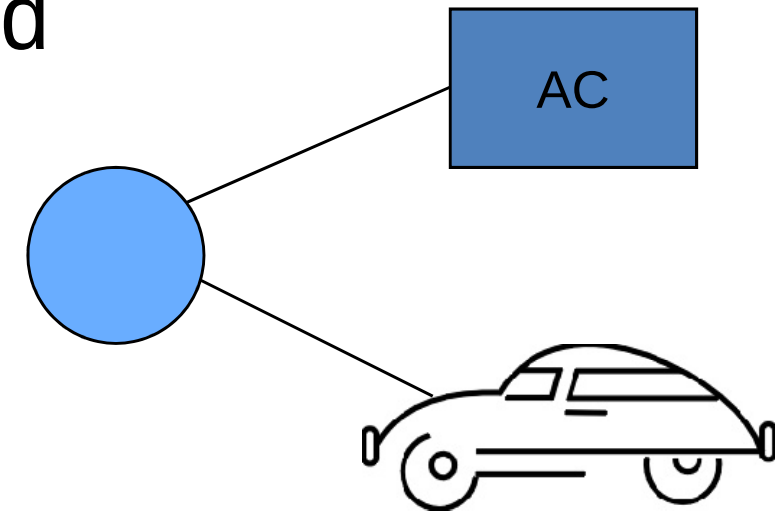
- Who am I?
  - Consulting enterprise software architect
  - Elected to OASIS Technical Advisory Board
    - OASIS is the leading eBusiness, Web services, and XML vocabulary standards venue
  - Skilled at building standards and products from ideas to adoption
  - Business, marketing, and technical background

Background

- Draws on previous session talk on eCommerce applications to building and energy systems
- Service-Oriented Architecture [SOA] and optimization
- Demand *shaping* versus demand *shaving*
- Power costs
  - Peak versus base
  - Emerging markets
  - Olympic Peninsula Project

Use Case—Battery Cars

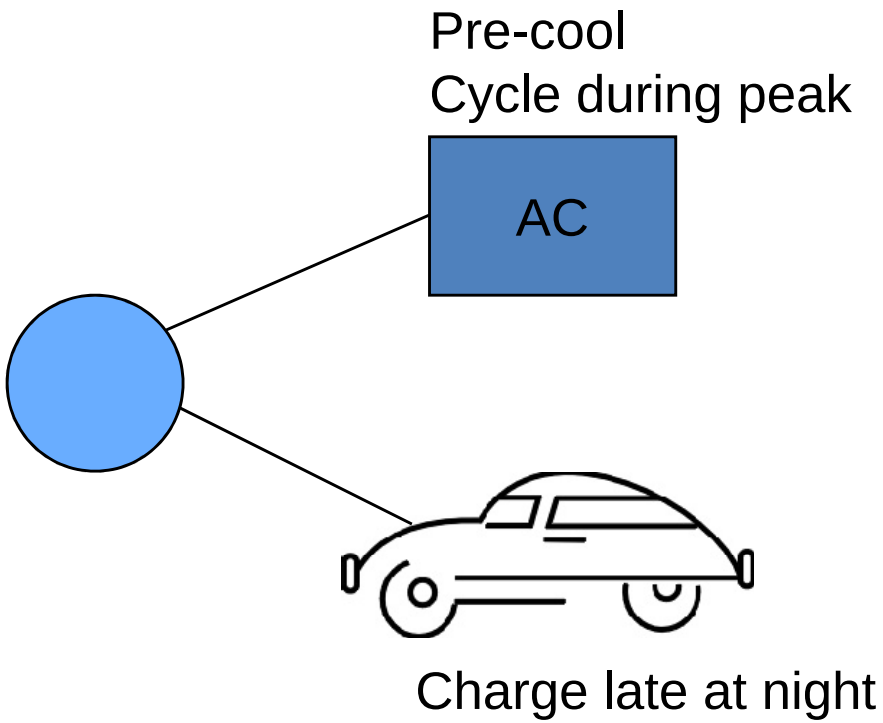
- Series of scenarios
- Significant energy demand



- Wrong Timing:
  - Come home at 6pm
  - Plug in car to charge
  - Flip on air conditioner
  - Peak demand increases (more power)
  - Cost to deliver increases (higher peak)

1: Improve AC Demand

- Better
  - Intelligent house pre-cools
    - Below peak
  - Come home at 6pm
  - AC cycles
    - Limit use
  - Late at night charge car
- BUT
  - No consumer benefit in today's markets



2: Peak Shaving Applied

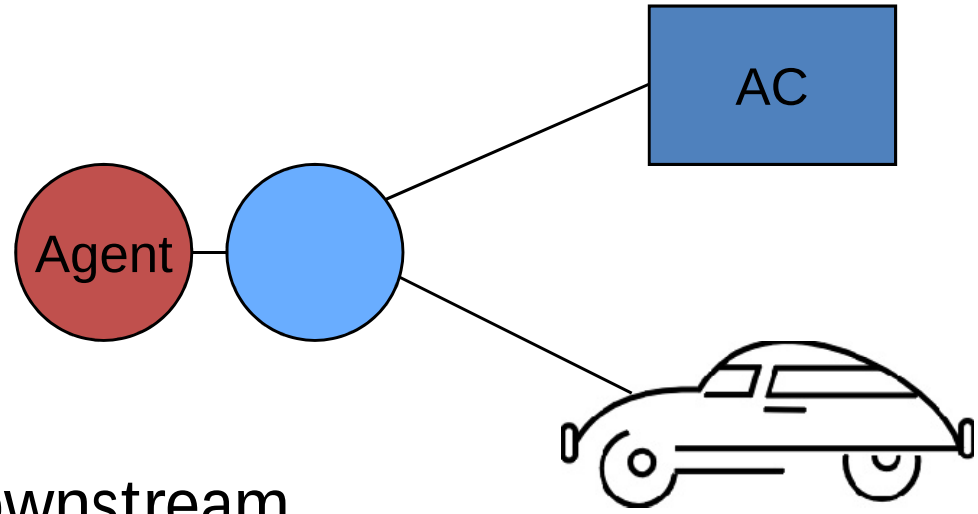
- Peak shaving
  - Limits peak demand, otherwise no effect
  - Like a throttle governor in your car
  - Requires controls and policies
    - How and when do you limit?
    - Whole house or just some devices?
  - In our example, the house receives a signal to reduce demand, controls what it can (the AC)

3: Demand Shaping Applied

- Demand shaping
- Let economic signals (cost) show through
- Economic signals guide and (in the aggregate) control use
- Best case: Usually don’t need peak shaving

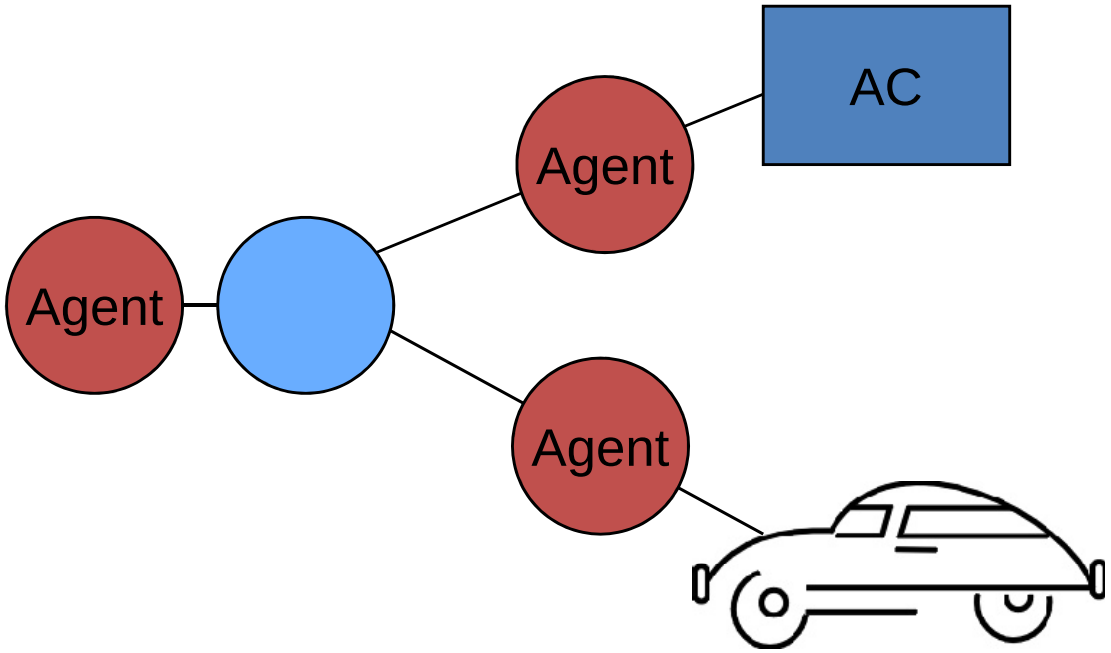
4: Pricing Information

- Simplest scenario
  - Whole house single agent
  - Contracts for power
  - Makes decisions
    - E.g. buy in cheaper forward market
- BUT
  - Still needs to control downstream
  - Individual appliance control missing
  - Control is too coarse
  - Simpler for sysop



5: Add Device Agents

- Add agents for each appliance
- Communciate with household agent
- Agents take pricing info and buy power
- Your agents need to collaborate
- BUT
  - Use of car?
  - Comfort?
  - Occupancy?



6: Situation Information

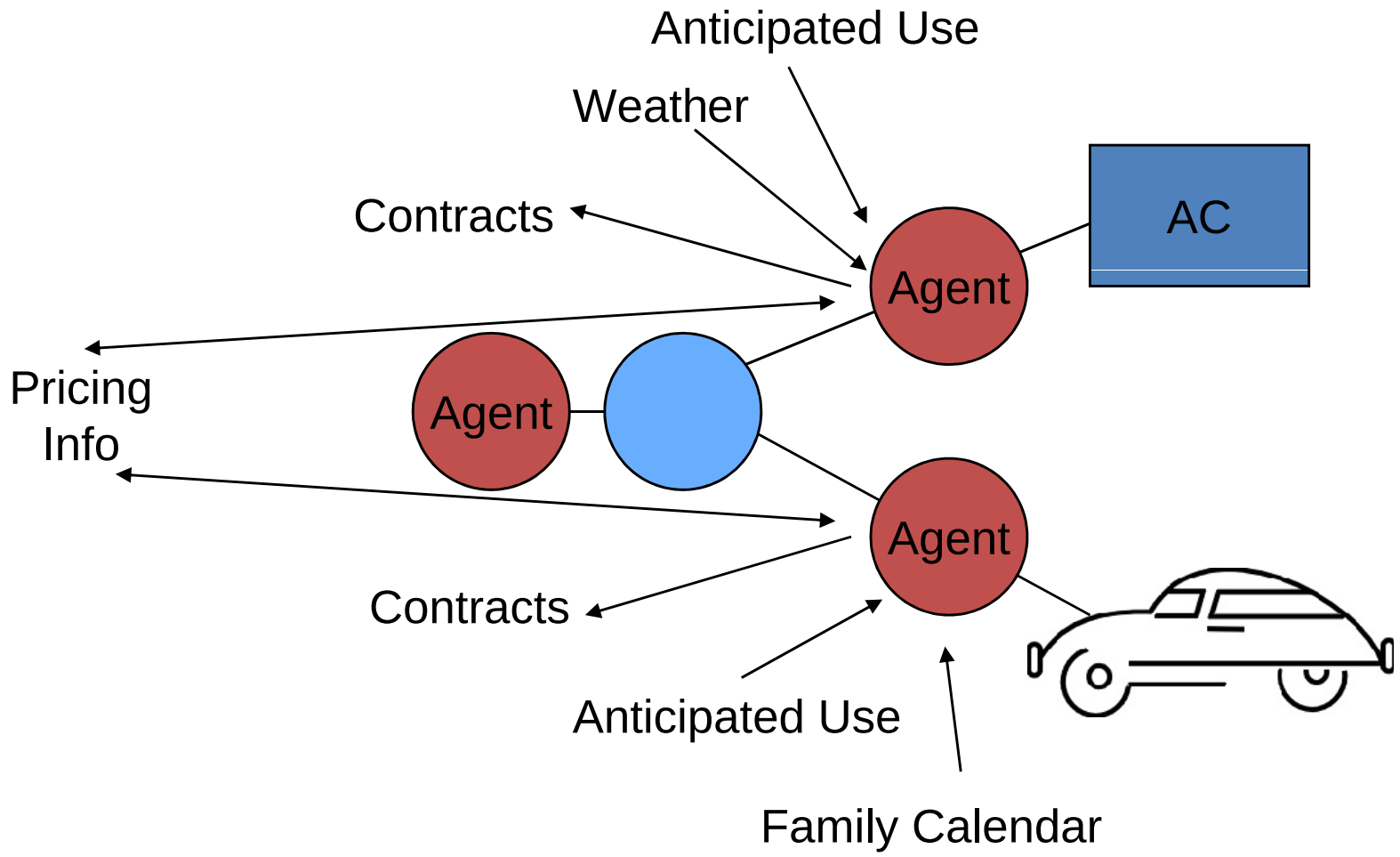
- What is anticipated use of car?
  - Charge time 4 hours
  - Pick up son at 7:30pm
    - Buy more expensive power to charge now
    - Top up battery now so have reserve for trip
  - OR no use until morning
    - Buy less expensive power in forward market
- What is anticipated use of Air Conditioner?
  - Going out at 7:30pm?
    - Precool at cheaper rates
    - Cycle compressor to keep comfortable

6a: Situation Information

- Use agents to gather and apply information
  - Car agent input
    - Intended usage and range
    - Pricing in current forward market
  - AC agent input
    - Weather forecast
    - Intended usage and load
    - Pricing in current and forward market

The Bigger Picture

- Here's a more complete picture



Benefits

- Delivery infrastructure doesn't need expensive expansion
- Above the device level
- Peak power use is limited by market forces
  - Peak power use is reduced by people attracted to alternative times and lower costs
  - Market shapes demand by communicating real costs, not command and control signals
- Markets provide best communication and fastest response

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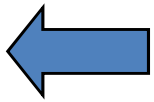
- What Have We Done? 
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What Have We Done?

- Taken advantage of less expensive energy
- Adapted to our use
- Adapted to the weather
  - Current example: Water boiler adjustment to outside temperature
- Shaped demand
  - Limited peaks
  - Shaped demand, moved to valleys
- All in a distributed and efficient way

Where's the eCommerce?

- Who has the authorization to execute contracts?
  - Authentication, authorization, delegation, privacy
- Consistent contracts
- Agency and negotiation
- Web services for weather, pricing, contracts
- Calendaring and event standards for usage
- Easier communication of other considerations
  - Kids home for Thanksgiving?
  - Budget limits and tradeoffs?
- Economic information drives demand decisions

Implications

- Need continued enabling of residential markets that reflect actual costs
- Demand shaping helps reduce costs in regulated markets
- Market energy purchases can take advantage of time-based cost savings
- Demand-Response architectures should support price information and eCommerce

Summary

- eCommerce approaches take advantage of emerging markets in residential energy
- Demand shaping drives savings in regulated infrastructure investment and energy costs
- We've shown a use case where an emerging technology is made more effective
- Markets effectively communicate information

A Challenge

- If this is interesting, try solving problems with these eCommerce approaches
- Some candidates for standardization
  - Across industries, utilities, regions
- Have an idea or problem or question?

  See my web site for free offer

A Further Challenge

- OASIS looking at Energy / Green Buildings / Building Management
  - Member section provides focus on a topic
  - Talk to me, Rik Drummond, or Toby Considine
  - Many opportunities for collaboration
  - Many opportunities for new businesses and models
- New energy and building technologies need to consider eCommerce/enterprise issues
  - Enable economic interaction and solutions
  - Move from Command & Control to markets

Questions

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References

- Email me wtcox@CoxSoftwareArchitects.com
  - Put “ConnectivityWeek” in subject line
- Information, free newsletter signup at www.CoxSoftwareArchitects.com
- Gridwise Architecture Council for background

  www.gridwiseac.org

  www.gridwiseac.org/about/publications.aspx

  especially interop constitution and tenets (page 4)
- Olympic Peninsula Project
  - www.nytimes.com/2008/01/10/technology/10energy.html
  - Search for publication 17167 at www.pnl.gov/publications/