

New Applications of Electronic Commerce Technology To Energy, Buildings, and Capital Management

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Agenda

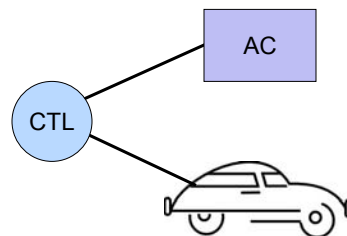
- Introductions
- Markets
- Smart Grids + Smart Buildings
- Use Case
 - More Intelligence, More Information
- Pricing
- Agent Service Definition
- Realism
- eCommerce, Security, SOA
- Benefits
- A Challenge

- Who am I (William Cox)?
 - 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
 - <http://www.CoxSoftwareArchitects.com/energy>
- Toby Considine biography in paper, other talk in this session

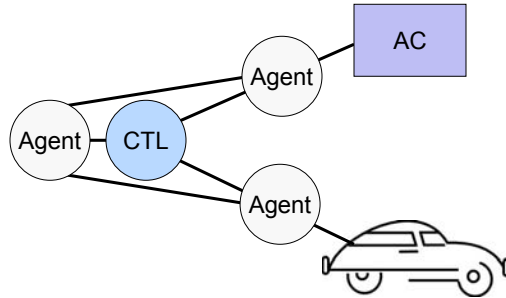
- Markets Provide
 - Effective distributed management of resources
 - Economic rationale for demand management
- Energy Markets Today
 - Wholesale electric
 - Commercial and Industrial consumers (hourly, ...)
 - Starting for residential consumers
- Consumer and Producer
 - Consumer = user of energy
 - Roles change quickly
 - Micro Grids, co-generation, office park solar, ...

- Electronic Commerce Technologies
 - Fine-grained security
 - Collaboration, messaging, publish-subscribe
- Building Technologies
 - Control and monitoring of building systems
 - oBIX, agents, coming semantic services
- Apply standards we already have to solve new problems

- Significant energy demand
- Not generating capabilities (PEHV)
- 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)



- Include Agents
- Services provided
 - Time of day info
 - Occupancy info
 - Communication
- Agents for each consuming appliance
- Pricing

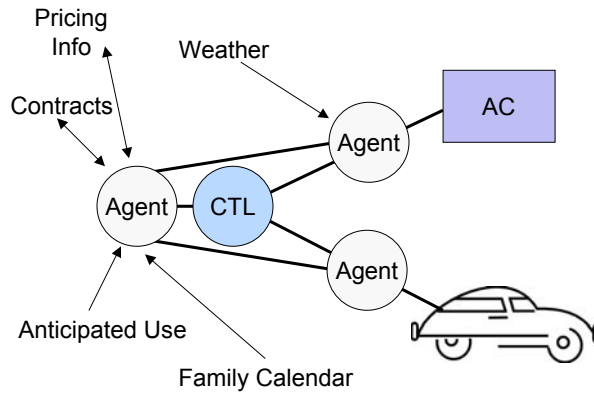


- Static Pricing
 - Pricing varies in manner known in advance
 - Often months in advance
- Varieties of Static Pricing
 - Flat-Rate pricing (FR)
 - Seasonal rates (SR)
 - Time-of-use pricing (TOU)
 - Critical Peak Pricing (CPP)
 - Less notice

- Dynamic Pricing
 - Pricing varies but not definitely known in advance
 - Must query, subscribe, be notified
- Varieties of Dynamic Pricing
 - Real-time Pricing (RTP)
 - Price-ahead (P-A)
- Future Pricing
 - Orthogonal
 - Static and Dynamic can be known in advance
 - Think *Futures Market*

- Manage energy purchases
- Manage energy consumption
- Inputs (so far)
 - Pricing information
- Outputs (so far)
 - Control signals for car charging station
 - Control signals for Air Conditioner

More Information (1)



More Information (2)

- Current information
 - Weather
 - Outdoor reset controls
 - Occupancy
 - IR Sensors
 - Usage
- Anticipated information
 - Weather
 - Forecast of temperature, wind, cloud cover
 - Occupancy
 - Calendars
 - Usage
 - Calendars

- 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?
 - Pre-cool at cheaper rates
 - Cycle compressor to keep comfortable

- Manage energy purchases
- Manage energy consumption
- Inputs (so far)
 - Pricing information (and forward markets)
 - Intended use and range for car
 - Weather, intended use for AC
- Outputs (so far)
 - Control signals for car charging station
 - Control signals for Air Conditioner
 - Purchases and purchasing decisions

- Can be implemented today
 - Controllers off-the-shelf
 - Sensors
 - Information flows need to be defined
 - Agents
 - Single board computer, embedded, or shared
 - Calendar information
- Pricing information and markets not mature
- eCommerce, Security implementations widely deployed
- Communications thru AMI, internet, phone

- 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
- SOA provides simpler scalable view
- Easier communication of other considerations
 - Kids home for Thanksgiving?
 - Budget limits and tradeoffs?
- Economic information drives demand decisions

- Consistent with GridWise Interoperability Principles (details in paper)
- Infrastructure doesn't need expensive expansion
- Home/Business owner in control
 - Pricing limits costs while ensuring desired comfort
- Markets provide best communication and fastest response

- Extend to Industrial and Commercial
- Refine the architectural model
- Elaborate the service definitions
- Validate that the same SOA will work
 - With elaborations in service definitions
 - With composition of needed security, reliability...
- Examine demand elasticity effects

- New energy and building technologies need to consider eCommerce/enterprise issues
 - Enable economic interaction and solutions
 - Move from Command & Control to markets
- OASIS Blue Initiative
 - Energy, buildings, eCommerce technologies
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- Join us in applying these techniques to Smart Grids and Smart Buildings

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