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# Data Types:

**User**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Data type** | **Nullable** |
| email | String | Not Null |
| postcode | integer | Not Null |
| home\_type | string | Not Null |
| square\_footage | integer | Not Null |
| public\_utilities | List<string> | Null |
| them\_setting\_cooling(F) | integer | Not Null |
| them\_setting\_heating(F) | integer | Not Null |

**Postcode**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Data type** | **Nullable** |
| postal\_code | integer | Not Null |
| city | string | Not Null |
| state | string | Not Null |
| latitude | float | Not Null |
| longitude | float | Not Null |

**Appliance**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Data type** | **Nullable** |
| manufacturer | string | Not Null |
| btu\_rating | integer | Not Null |
| model\_name | string | Null |
| Appliance\_type | List<string> | Not Null |

**Power Generation**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Data type** | **Nullable** |
| Power\_types | List<string> | Not Null |
| Monthly\_kwh | integer | Not Null |
| storage\_kwh | integer | Null |

**Air Handler**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Data type** | **Nullable** |
| Heating/cooling method | List<string> | Not Null |

**Water Heater**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Data type** | **Nullable** |
| capacity | float | Not Null |
| current\_temp\_setting(F) | integer | Null |
| energy\_source | List<string> | Not Null |

**Air conditioner**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Data type** | **Nullable** |
| EER | float | Not Null |

**Heater**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Data type** | **Nullable** |
| Heater\_energy\_source | List<string> | Not Null |

**Heat Pump**

|  |  |  |
| --- | --- | --- |
| **Attribute** | **Data type** | **Nullable** |
| SEER | float | Not Null |
| HSPF | float | Not Null |

# 

# Business Logical Constraints:

**Alternakraft Household**

* Users’ email for household information is required; it must be unique and valid.
* A household that does not use any utilities is “off-the-grid”.
* Postal code is required and must be valid.
* Heating/cooling thermostat information is required.

**Alternakraft Appliance**

* Appliances’ information must be added and identified by the household.
* Appliance type should be chosen first and specific information will be prompted.
* Appliance listing is shown after adding an appliance.
* Appliance information is required.
* The appliance number could not be reused if appliance is deleted.
* Decimal number is the tenth decimal point.

**Alternakraft Power Generation**

* The power generation information is required if the household is “off-the-grid”.
* The power generation listing is shown after adding a power generation.
* The power generation number could not be reused if power generation is deleted.
* The power generation information is required.
* Decimal number is the tenth decimal point.

**Alternakraft Finish**

* A thank you message is required after all information is finished.

**Alternakraft Reports**

* A list with links to generate each report is required.
* Appropriate and valid inputs for parameters are required for submitting and executing the reports.
* Tables must have an appropriate header row.
* Appropriate message should be displayed if no return result.
* Ascending order is default.
* “half rounds up” must be used for round number unless specified.
* **Top 25 popular manufacturers**
* Top 25 manufacturers are listed.
* Descending order is required.
* Drilldown report by manufacturer must be provided.
* **Manufacture/model search**
* Case insensitivity
* Partial name search and match
* Display matched manufacturer with all associated models or matched model with its manufacturer; matched string must be highlighted with light green background.
* Ascending order
* **Heating/cooling method details**
* Grouped by household type.
* Average BTU rating is integer, rounded.
* Average EER, SEER, HSPF are float, rounded to tenths.
* **Water heater statistics by state**
* State name must be abbreviated.
* water heater capacity is whole number, rounded.
* Average BTUs and temperature setting are float, rounded to tenths.
* Zero for no data by State
* Ascending order by state abbreviation or energy source
* Drilldown report by state must be provided.
* **Off-the-grid household dashboard**
* Average battery storage capacity is whole number, rounded.
* Percentage is float, rounded to tenths.
* Average water heater gallon capacity is float, rounded to tenths.
* BTUs is whole number, rounded, grouped by appliance type.
* **Household averages by radius**
* Two user input are required: postal code and search radius.
* Radius is whole number; search distance is less than or equal to the distance input.
* postal code must be valid.
* Display 0 for no count of households for each household type.
* Average square footage and monthly power generation are integer, rounded.
* Heating temperature, cooling temperature are float, rounded to tenths.
* Public utilities are displayed in single cell, separated by commas.
* Haversine formula (R=3958.75) is used for distance calculation which must be performed inside of the database.

Main menu  
Task Decomp

Main menu

**Lock Types**: read-only lookup for a RegularUser   
**Number of Locks**: multiple   
**Enabling Conditions**: None   
**Frequency**: Around 200 per day  
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother task is not required to coordinate subtasks. Order is not necessary.

View report/query data

Enter Household info

**Abstract Code**

* Upon:
  + Click ***Enter household info*** link- Jump to the **Household information** form.
  + Click ***View report/query data*** link- Jump to the **View report/query data** form.

Enter household info  
**Task Decomposition**

**Lock Types:** Lookup email and postal code, read only   
**Number of Locks:** Single  
**Enabling Conditions:** Enabled by user’s click on main menu  
**Frequency:** High   
**Consistency (ACID):** not critical, even if reports are being created while user inputs relevant info  
**Subtasks:** No subtasks. Only dealing with one schema.

* Information input of household attributes such as email, postal code, home type, square footage, thermostat settings, and specification of utilities
* Validate that the email address is not already present in DB
* Validate users input for postal code
* Lookups of the home type domain of values: {House, apartment, townhome, condominium, mobile home}
* Thermostat settings allow NULL values if home does not have heating and/or cooling. This can be verified by checking box next to input signifying “No heat” or “No cooling”
* Utility options are provided with check-box; initially all boxes are unchecked.

**Abstract Code**

* Use clicks “Enter Household Information” on Main Menu
* View Household Info form. Populate home type drop down and display checked boxes for thermostat heating and cool as well as the unchecked boxes for public utility options.
* Verify email input is not already in DB. If email is already in DB display appropriate warning message.
* Validate postal code. If postal code is invalid then display appropriate warning message.
* Thermostat setting for heating and cooling in Fahrenheit are required unless the checked boxes indicate otherwise.
* If no public utility check-boxes are checked then indicate the user is “off-the-grid”
* If all information is input appropriately by user and the “Next” button is clicked then the data is saved to the database and the user is taken to the Appliances Form.

If any information is invalid an error message is given and the user remains on the same page.

Add Appliance   
Task Decomp

Add Appliance

**Lock Types**: CanNotDelete  
**Number of Locks**: multiple  
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu   
**Consistency (ACID)**: is not critical   
**Subtasks**: All tasks must be done, but can be done in parallel. Mother task is required to coordinate subtasks. Order is not necessary.

Water Heater

Air Handler

**Abstract Code**

* User clicked on ***Next*** button from **Enter household info** form:
* Run the **Enter Appliance info** task: select *appliance type, manufacturer*, enter *Model* *name*;
  + - if *Air handler* is selected, info about *Energy efficiency ratio*, *heating/cooling method*, *Energy source* are entered.
    - if *water heater* is selected, info about *Energy source, capacity(gallons). BTU rating* and *temperatures* are entered.
  + Enter *manufacturers*, run **search for manufacturer** task, invalid input returns error message.
* upon:
  + - Click ***Add*** button: save data into database and jump to **Application** form.

Appliance   
Task Decomp

**Lock Types**: None  
**Number of Locks**: multiple  
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu   
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is not needed. No decomposition needed.

Appliance

**Abstract Code**

* User clicked on ***Add*** button from **Add appliance** form:
* Run **view/delete appliance list** task.
* display list of added appliances.
* upon:
  + Click ***delete*** button- delete exist appliance info.
  + Click ***+Add another appliance*** link- back to **Add Appliance** form.
  + Click ***Next*** button- Jump to the **Add Power generation** form.

Add power generation   
Task Decomp

Add power generation

**Lock Types**: CanNotDelete   
**Number of Locks**: single   
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu   
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is not needed. No decomposition needed.

**Abstract Code**

* User clicked on ***Next*** button from **Appliances** form:
* Run the **add power generation** task: collect information about *power generation type*, *monthly kwh* and *storage kwh*.
* upon:
* Click ***Skip*** button- finish submitting data and jump to **Wrapping up** form.
* Click ***Add*** button- save data into database and jump to **power generation** form.

Power Generation   
Task Decomp

**Lock Types**: None  
**Number of Locks**: single  
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu   
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is not needed. No decomposition needed.

Power Generation

**Abstract Code**

* User clicked on ***Add*** button from **Add power generation** form:
* display list of added power generation.
* run **view/delete power generation list** task.
* upon:
  + Click ***delete*** button- delete exist power generation info.
  + Click ***+Add more power*** link- back to the **Add power generation** form.
  + Click ***Finish*** button- finish submitting data and jump to **Wrapping Up** form.

Wrapping Up   
Task Decomp

Wrapping Up

**Lock Types**: read-only  
**Number of Locks**: single   
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu   
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is not needed. No decomposition needed.

**Abstract Code**

* display “Submission Complete!” message
* upon:
  + Click ***Return to the main menu*** button- jump to **Main menu** form.

View reports/query data  
Task Decomp

View reports/

query data

**Lock Types**: read-only   
**Number of Locks**: multiple, Top 25 popular manufacturers, Manufacturer/model search, Heating/cooling method details, Water heater statistics by state, off-the-grid household dashboard, household averages by radius.   
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu  
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is needed. No decomposition needed.

**Abstract Code**

* Lists of reports
* Upon:
  + Click ***Top 25 manufacturers*** link- jump to **Top 25 manufacturers** form.
  + Click ***Manufacture/model search*** link- jump to **Manufacture/model search input** form.
  + Click ***Heating/cooling method detail*** link- jump to **Heating/cooling method detail**form.
  + Click ***Water heater statistics by state*** link- jump to **Water heater statistics by state**form.
  + Click ***off-the-grid household dashboard*** link- jump to **off-the-grid household dashboard**form.
  + Click ***Household average by radius*** link- jump to **Household average by radius input**form.

# Top 25 manufacturers

Top 25 manufacturers

View Top 25 manufacturers request

Manufacturer drilldown report request

Task Decomp

**Lock Types**: read-only   
**Number of Locks**: multiple, top 25 manufacturer with most appliances, drilldown table for each manufacturers.  
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu  
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is needed. No decomposition needed.

**Abstract Code**

* User clicked on ***Top 25 manufacturers*** link from **View reports/query data** form:
* Run **view top 25 manufacturers request** task, show list of top 25 manufacturers with the most appliances.
* Upon:
  + Click ***manufacturers name*** link- display table about count of appliance type for this manufacturer name.

# Manufacturer/model search

Manufacturer/model search

Task Decomp

**Lock Types**: CanNotDelete   
**Number of Locks**: single   
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu  
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is not needed.

**Abstract Code**

* User clicked on ***Heating/cooling method detail*** link from **View reports/query data** form:
* User input valid string and search manufacturer/model name from database, invalid input will return error message.
* Upon:
  + User clicked on ***submit*** button-run ***manufacturer/model search request*** task, display table with manufacturers’ name and its models’ name; matched string must highlight with light green background.

# Heating/cooling method detail

Heating/cooling method detail

Task Decomp

**Lock Types**: read-only   
**Number of Locks**: single   
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu  
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is not needed. No decomposition needed.

**Abstract Code**

* User clicked on ***Heating/cooling method detail*** link from **View reports/query data** form:
* Run **report of heating/cooling method detail** task
* Display table of count of air conditioners, with average BTUs and average EER.
* Display table list of count of heater, with average BTUs and most common energy source.
* Display table of count of heat pumps, with average BTUs and average SEER and average HSPF.

# Water heater statistics by states

Task Decomp

Water heater statistics by states

Water heater stats request

State drilldown report request

**Lock Types**: read-only   
**Number of Locks**: multiple,   
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu  
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is needed. No decomposition needed.

**Abstract Code**

* User clicked on **Water heater statistics by states** link from **View reports/query data** form:
* Run **water heater stats request** task.
* display table with water heart statistics for each state, including average water heat capacity, average BTUs, count of water heater w/o temperature setting.
* Upon:
  + Click ***state name*** link- run **state drilldown report request** task, display table about minimum, average, and maximum of water heater capacity and temperature setting for each energy source in this state which will be table title.

# Off-the-grid household dashboard

Task Decomp

Off-the-grid household

dashboard

**Lock Types**: read-only   
**Number of Locks**: multiple   
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu  
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is not needed. No decomposition needed.

**Abstract Code**

* User clicked on ***Off-the-grid household dashboard*** link from **View reports/query data** form:
* Run **off-the-grid household info** task
* Display state with most off-the-grid household and count of its household.
* Display table of average battery storage capacity, the percentage for each power generation types.
* Display table of average water heater gallon capacity of all off-the-grid household and all on-the-grid household.
* Display table of Minimal, average and maximum BTUs for all off-the-grid households’ appliances, grouped by appliance type.

# Household averages by radius

Household average

by radius

Task Decomp

**Lock Types**: CanNotDelete   
**Number of Locks**: single   
**Enabling Conditions**: None   
**Frequency**: same frequency as Main menu  
**Consistency (ACID)**: is not critical   
**Subtasks**: Mother Task is not needed. No decomposition needed.

**Abstract Code**

* User clicked on ***household average by radius*** link from **View reports/query data** form:
* User input valid postal code and radius, run **search for postal code** task.
* Invalid input will return error message.
* Upon:
  + User clicked on ***submit*** button:
  + Run **reports by searching postal code and radium** task
    - display postal code and radius.
    - Display table with count of household, count of household type, average square footage, average heating temperature and average cooling temperature of public utilities are used, count of “off-the-grid” homes, count of homes with power generation, the most common generation method, average monthly power generation, count of households with battery storage.