Table of Contents:

Alternakraft Data Types

Alternakraft Constraints

Task Decomposition with Abstract Code:

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

Table of contents

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

Table of contents

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

Table of contents

➢ **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.

Table of contents

Main menu
Task Decomp

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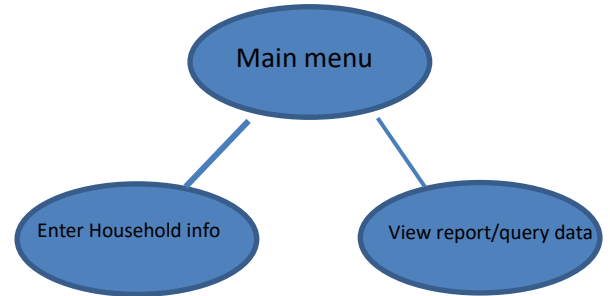**Number of Locks**: multiple
Enabling Conditions: None
Frequency: Around 200 per day
Consistency (ACID): is not critical
Subtasks: Mother task is not required to coordinate subtasks. Order is not necessary.

Abstract Code

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

Enter household info
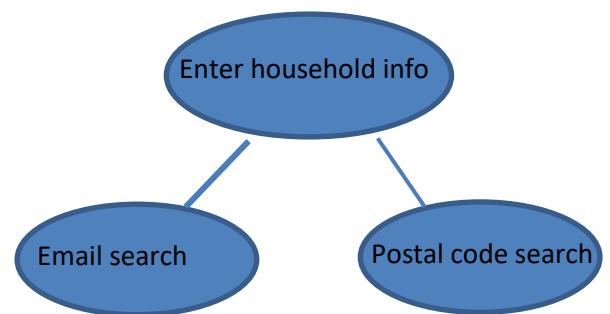## Task Decomp

Lock Types: CanNotDelete
Number of Locks: multiple
Enabling Conditions: None
Frequency: Around 200 per day
Consistency (ACID): is not critical
Subtasks: Mother task is required to coordinate subtasks. Order is not necessary.

Abstract Code

- User clicked on *Enter my household info* link from **Main menu**:
- Run the **Enter Household info** task: enter information about the user's *email, postal code, home type, square footage,* select *thermostat setting for heating* and *cooling, public utilities*.
- Enter *email*, run **search for email** task, invalid input returns error message
- Enter *postal code*, run **search for postal code** task, invalid input returns error message.
- upon:
    - Click *Next* button- Jump to the **Add Appliance** form.
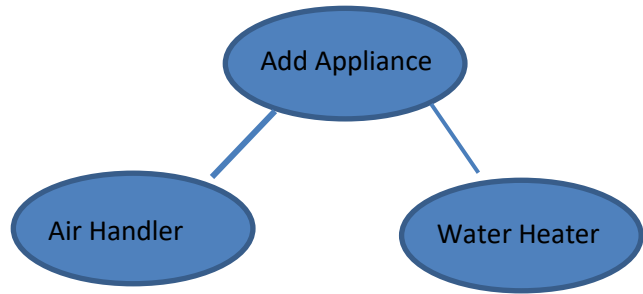
Add Appliance
Task Decomp

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.

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.

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.

Table of contents

Add power generation
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 *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.

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

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

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

- 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
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 **Top 25 manufacturers** link from **View reports/query data** form:
- Run **list of top 25 manufacturer with appliance** 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
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 run **searching for manufacturer/model name** task, invalid input will return error message.
- Upon:
  - User clicked on **submit** button-run **report of searching for manufacturer/model** task, display table with manufacturers' name and its models' name; matched string must highlight with light green background.

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

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 **Water heater statistics by states** link from **View reports/query data** form:
- Run **water heater reports by state** 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:

o Click *state name* link- 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

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
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 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.

Table of contents