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Tools-4-Rent! Data Types

Tools-4-Rent! Constraints

Task Decomposition with Abstract Code

Data Types

User

Attribute	Data type	Allow Null
firstName	String	Not Null
middleName	String	Not Null
lastName	String	Not Null
email	String	Not Null
password	String	Not Null
userName	String	Not Null

Customer

Attribute	Data type	Allow Null
zipCode	String	Not Null
street	String	Not Null
city	String	Not Null
state	String	Not Null

Clerk

Attribute	Data type	Allow Null
dateOfHire	DateTime	Not Null

empNum	Integer	Not Null
hasLoggedInBefore	Boolean	Not Null

Phone Number

Attribute	Data type	Allow Null
areaCode	String	Not Null
extension	String	Null
phoneNumber	String	Not Null

Credit Card

Attribute	Data type	Allow Null
credNumber	String	Not Null
name	String	Not Null
CVC	Integer	Not Null
expDate	DateTime	Not Null
expMonth	Integer	Not Null
expYear	Integer	Not Null

Sale Order

Attribute	Data type	Allow Null
transactionNum	Integer	Not Null
salesPrice	Float	Not Null
forSalesDate	DateTime	Not Null

Service Order Request

Attribute	Data type	Allow Null
totalNum	Integer	Not Null
cost	Float	Not Null
startDate	DateTime	Not Null
endDate	DateTime	Not Null

Reservation

Attribute	Data type	Allow Null
reservationId	Integer	Not Null
totalRentPrice	Float	Not Null
totalDepositPrice	Float	Not Null
startResDate	DateTime	Not Null
endResDate	DateTime	Not Null
daysRented	Integer	Not Null

Tool

Attribute	Data type	Allow Null
width	Float	Not Null
length	Float	Not Null
weight	Float	Not Null
manufacturer	String	Not Null
material	String	Null
sellStatus	String	Not Null
repairStatus	String	Not Null

depositAmt	Float	Not Null
purchasePrice	Float	Not Null
toolNumber	Integer	Not Null
NumberOfRentals	Integer	Not Null
description	String	Not Null
abbrevDescription	String	Null
rentalPrice	Float	Not Null
isAvailable	Boolean	Not Null

SubOption

Attribute	Data type	Allow Null
option	String	Not Null

Screwdriver Tool

Attribute	Data type	Allow Null
screwSize	Integer	Not Null

Socket Tool

Attribute	Data type	Allow Null
driveSize	Float	Not Null
saeSize	Float	Not Null
deepSocket	Boolean	Null

Ratchet Tool

Attribute	Data type	Allow Null
driveSize	Float	Not Null

Plier Tool

Attribute	Data type	Allow Null
adjustable	Boolean	Not Null

Gun Tool

Attribute	Data type	Allow Null
gaugeRating	Integer	Null
capacity	Integer	Not Null

Hammer Tool

Attribute	Data type	Allow Null
antiVibration	Boolean	Not Null

Garden Tool

Attribute	Data type	Allow Null
handleMaterial	String	Not Null

Pruning Tool

Attribute	Data type	Allow Null
bladeMaterial	String	Null

bladeLength	Float	Not Null

Striking

Attribute	Data type	Allow Null
headWeight	Float	Not Null

Digging Tool

Attribute	Data type	Allow Null
bladeWidth	Float	Null
bladeLength	Float	Not Null

Rake Tool

Attribute	Data type	Allow Null
tineCount	Integer	Not Null

WheelBarrow Tool

Attribute	Data type	Allow Null
binMaterial	String	Not Null
binVolume	Float	Null
wheelCount	Integer	Not Null

Ladder Tool

Attribute	Data type	Allow Null
stepCount	Integer	Null
weightCapacity	Float	Null

Straight Ladder Tool

Attribute	Data type	Allow Null
rubberFeet	Boolean	Null

Step Ladder Tool

Attribute	Data type	Allow Null
pailShelf	Boolean	Null

Power Tool

Attribute	Data type	Allow Null
voltRating	Float	Not Null
ampRating	Float	Not Null
minRPMRating	Integer	Not Null
maxRPMRating	Integer	Null

Power Drill Tool

Attribute	Data type	Allow Null
adjustableClutch	Boolean	Not Null
minTorqueRating	Float	Not Null
maxTorqueRating	Float	Null

Power Saw Tool

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Attribute	Data type	Allow Null
bladeSize	Float	Not Null

Power Sander Tool

Attribute	Data type	Allow Null
dustBag	Boolean	Null

Power Air-Compressor Tool

Attribute	Data type	Allow Null
tankSize	Float	Not Null
pressureRating	Float	Null

Power Mixer Tool

Attribute	Data type	Allow Null
motorRating	Float	Not Null
drumSize	Float	Null

Power Generator Tool

Attribute	Data type	Allow Null
powerRating	Float	Not Null

Power Tool Accessories

Attribute	Data type	Allow Null
accessoryDescription	String	Not Null

Cordless Power Tool

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Attribute	Data type	Allow Null
voltage	String	Not Null
amp	String	Not Null
quantity	Integer	Not Null

Battery Type

Attribute	Data type	Allow Null
voltage	Float	Not Null
amp	Float	Not Null
quantity	Integer	Not Null

<u>Business Logic Constraints</u>

Users:

- Customer:
    - Customers who are new to Tools for rent must register first.
    - Customers who already have a Tools for rent account under a certain username, should not be allowed to register with the same username.
    - A Customer should not be allowed to sign in as a Clerk.
    - All Credit cards are assumed to be valid for use (Since no external checking is done.)
    - Once a customer profile is created, it may not be edited. The customer is allowed to change the Credit card info during pick up process, but must be assisted by the clerk.
    - A Customer cannot rent more than 10 tools per reservation.
- Clerk
    - A clerk's registration info is logged by the system administrator.
    - If this is the first time the clerk has logged in using a temporary password, then the Clerk is prompted to enter a new password twice.

Tools:
- Any tool (where only 1 exists in entire inventory) with an existing reservation should not be listed in available tools for the same day.
- If an identical tool requested is due to return within the next 24 hours from the time of the request, a notice is given to the user telling them the date/time when that tool is expected to become available so they can decide if they want to rent it later or make an alternate selection.
- Tools which are either 'in-repair' or 'for-sale/sold' should not show on the available list since sale/service records exists for the same dates.
- Available inventory of tools must be available for rent from start date to end date.
- While adding a tool, the Clerk should not be allowed to choose a sub-type without first selecting a tool type and power-source.
- we assume the Database Administrator (you) have already setup the correct power-source/sub-type/sub-option constraints for the Clerk to choose from. Both power-source and sub-types are predetermined drop down lists which guide the Clerk to the correct combinations (e.g. power cordless Saw circular).
- When tools are rented 50 times, they are automatically marked "for-sale" by the system's automated virtual clerk.
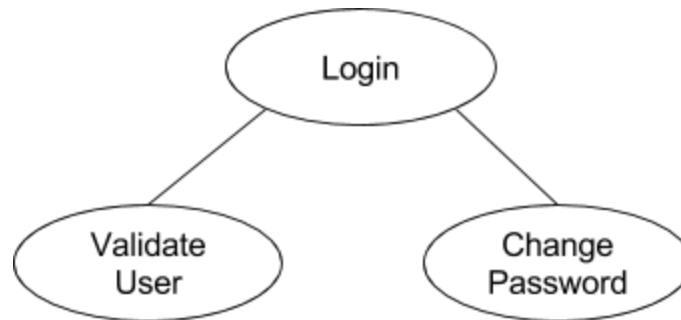- A clerk can manually add a tool for sale.

Repair Tool State:
- While the tool is in repair the tool is not available for rent.

Other:
- There is no hourly option for renting, it is only per day.
- Deposit price - 40% of purchase price.
- Sale price - 50% of purchase price.
- The purchase price must be known while the clerk is adding the tool to the inventory.
- The clerk determines the repair-cost at the time of placing a service request.
- No reservation should be successful if any of the tools being reserved are already reserved over the same time period.
- Concurrency consideration: assume if CustomerA has a specific tool in the pending reservation status (where only one of that tool is available in the system), if CustomerB selects the same tool for the same day and hits "Submit" before the CustomerA, CustomerB is given the tool and a notice of unavailability of the specific tool is displayed to CustomerA prompting them to make another selection. (Pending tool reservations do not guarantee availability until they are confirmed.)

Login

Task Decomp

Lock Types: Read-only on Customer or Read/Write on Clerk
Number of Locks: Several different schema constructs are needed
Enabling Conditions: Clerk Change Password is enabled after Validate User only on the first time login.
Frequency: Around 200 logins per day
Consistency (ACID): Order is critical, validation needs to occur before changing password on the Clerk.
Subtasks: Validate User is required but Change Password is only used for first time Clerk login. Mother task is needed to coordinate first time Clerk logins.

Abstract Code
- User enters *username* and *password* into input fields
- User select *user type* in the radio buttons.
- If data validation is successful for both *username* and *password* input fields, then:
- When ***Sign in*** button is clicked:
    - If *user type* is Customer, then:
        - If user record is not found:
            - Go to the **Registration** form.
        - Else if user record is found but *password* is incorrect:
            - Go back to **Login** form, with error message.
        - Else:
            - Go to **Customer Main Menu** form.
    - Else if *user type* is Clerk, then:
        - If user record is not found:
            - Go back to **Login** form, with error message.
        - Else if user record is found but *password* is incorrect:
            - Go back to **Login** form, with error message.

- ■ Else if not *User.hasLoggedInBefore* logging in:
    - ● Change password by entering new password twice
    - ● If both passwords are the same, then:
        - ○ Write new password to *User.password*
        - ○ Go to **Clerk Main Menu** form.
    - ● Else go back to Enter new password twice again
- ■ Else:
    - ● Go to **Clerk Main Menu** form.
- ○ Else *email* and *password* input fields are invalid, display Login form, with error message.

Customer Main Menu / Navigation

Task Decomp

Lock Types: Read-only on Customer
Number of Locks: Single
Enabling Conditions: When customer log in to the system.
Frequency: High, every time the user finishes a task.
Consistency (ACID): not critical.
Subtasks: Mother Task is not needed. No decomposition needed.

Abstract Code
- Show View Profile, Check Tool Availability, Make Reservation, Purchase Tool, and Exit (or Logout) links
- Get the user *firstname* and display "Welcome *firstname*!" in the navigation bar.
- Upon:
    - Click **View Profile** link - Jump to the **View Profile** task.
    - Click **Check Tool Availability** link - Jump to the **Check Availability** task.
    - Click **Make Reservation** link - Jump to the **Make Reservation** task.
    - Click **Purchase Tool** link - Jump to the **Purchase Tool** task.
    - Click **Exit (or Logout)** link - Logout from the system.

Register

Task Decomp

Lock Types: Write on User, Customer, Phone Number, Credit Card
Number of Locks: Several different schema constructs are needed
Enabling Conditions: When the customer try to login but is not registered.
Frequency: Assuming around 300 new registrations per day
Consistency (ACID): Consistency critical, order is critical. User followed by Customer, then Phone Number and Credit Card.
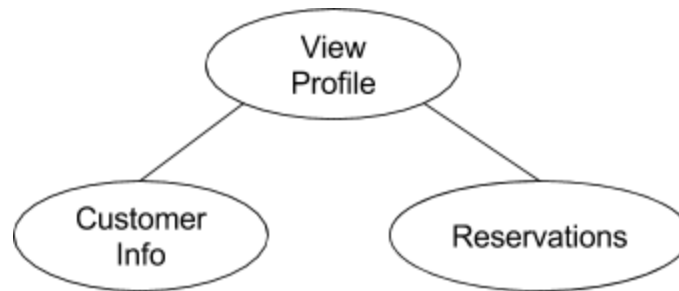**Subtasks:** Mother Task is not needed. No decomposition needed.

Abstract Code

- User enters *first name*, *middle name*, *last name*, *home phone*, *work phone*, *cell phone*, *username, email, password, street address, city, state,* and *zip code* into input fields plus select *primary phone number.* In addition, the user enters the credit card information, which includes: *name on credit card*, *credit card number*, *expiration month*, *expiration year* and *CVC.*
    - The primary phone number selected cannot be null.
- If data validation is successful for all input fields, then:
- When *Register* button is clicked:
    - If *username* already exists, then:
        - Go back to **Registration** form, already populated but with error message on *username*
    - Else:
        - Save respective information to *User*, *Customer*, *Phone Number*, and *Credit Card*

View Profile

Task Decomp

Lock Types: Read-only on Customer and Reservation
Number of Locks: Several different schema constructs are needed
Enabling Conditions: All 2 are enabled by a user's login
Frequency: Low, all 2 have the same frequency
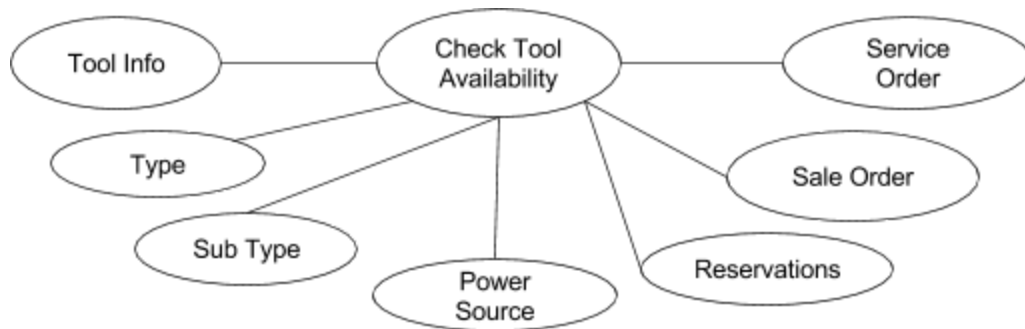**Consistency (ACID):** not critical, order is not critical.
Subtasks: All tasks must be done, but can be done in parallel. Mother task is required to coordinate subtasks. Order is not necessary.

Abstract Code
- User clicked on *View Profile* link from **Main Menu / Nav Bar** form.
- Run the **View Profile** task: query the information about the customer and their reservations where $username is the username of the current user using the system from the HTTP session/cookie.
  - Find the current Customer information: *email*, *full name*, *phone numbers*, and *address*
  - Find all Reservation for the current Customer ordered from most recent to oldest
  - For each Reservation for the Customer:
    - Find the: *reservation ID, tools, start date, end date, pick-up clerk, drop-off clerk, number of days, total deposit price*, and *total rental price*
- When ready, customer selects next action from **Customer Main Menu / Nav Bar**.

Check Tool Availability

Task Decomp

Lock Types: Read-only on Tool, Type, Sub-Type, Power Source, Sale Order, Reservation and Service Order
Number of Locks: Several different schema constructs are needed
Enabling Conditions: All 7 are enabled by a user's login
Frequency: Medium, all 7 have the same frequency
Consistency (ACID): not critical, order 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.
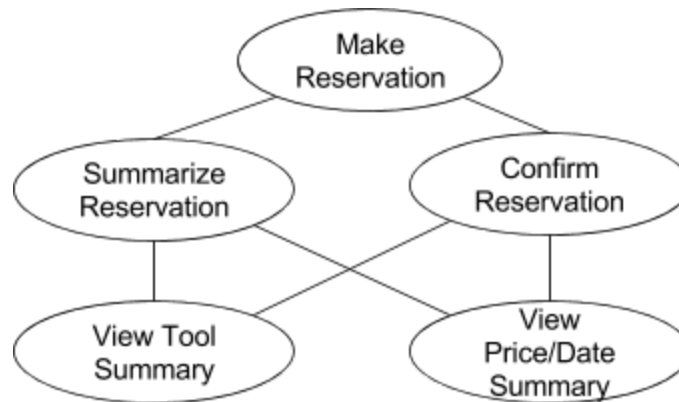
Abstract Code

- User clicked on *Check Tool Availability* link from **Customer Main Menu / Nav Bar** form.
- Run the **Check Tool Availability** task: query the Tool, Type, Sub-Type, Power Source, Sale Order, Reservation, and Service Order to find the available tools based on a search criteria from the customer.
  - *Tool Types* are displayed.
    - *All Tools, Hand Tool, Garden Tool, Ladder* and *Power Tool* are displayed.
  - If *Hand Tool* is selected
    - Power-Source is set to *Manual*
    - Sub-types drop-down is loaded with *Screwdriver, Socket, Ratchet, Wrench, Pliers, Gun* and *Hammer.*
  - If *Garden Tools* is selected
    - Power-Source is set to *Manual*
    - Sub-types drop-down is loaded with *Digger, Pruner, Rakes, Wheelbarrows* and *Striking.*
  - If *Ladder* is selected
    - Power-Source is set to *Manual*

- - - ■ Sub-types drop-down is loaded with *Straight* and *Step.*
    - ○ If *Power* is selected
      - ■ Power-Source drop-down is loaded with *A/C, D/C* and *Gas.*
        - ● If Power-Source A/C is selected
          - ○ Sub-types drop-down is loaded with *Drill, Saw, Sander, Air-Compressor* and *Mixer.*
        - ● If Power-Source D/C is selected,
          - ○ Sub-types drop-down is loaded with *Drill, Saw* and *Sander*
        - ● If Power-Source Gas is selected
          - ○ Sub-types drop-down is loaded with *Air-Compressor, Mixer* and *Generator.*
    - ○ Customer fill in *start date, end date, custom search, type, sub-type* and *power source* input fields for the search criteria
    - ○ Click the ***Search*** button.
    - ○ Find all Tool that are available
      - ■ Get all tools based on the search criteria and not "for-sale" and not "reserved" and not "in-repair"
      - ■ If more than 10 tools retrieved on the query, then:
        - ● Prompt user to specify a more unique search by entering more criteria
      - ■ Else:
        - ● Display the <u>tool ID</u>, <u>description</u>, <u>rental price</u>, <u>deposit pric</u>e
          - ○ The <u>description</u> is a link for the customer to pop-up the **Tool Details** form.
  - ● When ready, customer selects next action from **Customer Main Menu / Nav Bar**.

Make Reservation

Task Decomp

Lock Types: Read-only on Tool, Type, Sub-Type, Power Source, Sale Order, and Service Order. Read/Write on Reservation.

Number of Locks: Several different schema constructs are needed

Enabling Conditions: The mother task is enabled by a user's login. Summarize Reservation will enable Confirm Reservation.

Frequency: Medium, Summarize Reservation will occur more frequently than Confirm Reservation. For each store, it is expected that new online service will handle about 200 reservations per day.

Consistency (ACID): critical, order is critical.

Subtasks: All tasks must be done sequentially. Mother task is required to coordinate subtasks. Order is necessary.

Abstract Code
- User clicked on *Make Reservation* link from **Customer Main Menu / Nav Bar** form.
- Run the **Check Tool Availability** task to load the tools
  - To each tool loaded, add a checkbox (unchecked by default), which is going to be used to add a tool to the reservation.
- User add tools to the reservation by checking the box on the tool
  - When the tool is checked,
  - If tool is due to return within the next 24 hours
    - Display notification with date and time when that tool is expected to become available.
      - "You have the option to rent the tool later or make an alternate selection."
  - Else If tools added to reservation is greater than 10, then:

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- - - ■ Display error message prompting the user to reduce the number of tools in the current reservation to 10.
    - ○ Else
      - ■ The tool is moved to the "Tools Added to Reservation" area.
      - ■ Display the _tool ID_, _description_, _rental price_, _deposit pric_e and a check box.
        - ● The checkbox (checked by default) is to remove the tool from the reservation.
- ● User can repeat the previous steps to search for other tools and keep modifying the reservation.
- ● When the _Calculate_ button is pressed, the **Summarize Reservation** task is executed.
- ● The **Reservation Summary** form is loaded with the following 2 section details, which are filled out by executing the **Summarize Reservation** task (handle with concurrency in mind):
  - ○ The **View Price/Date Summary** task will be executed to fill out the top section of the Reservation Summary, which includes Reservation Dates, Number of days rented, Total Deposit Price, and Total Rental Price
    - ■ The Number of days rented is calculated based on the Reservation start and end dates.
    - ■ The Total Deposit is calculated as the sum of the deposit price for each individual tool.
    - ■ The Total Rental Price is calculated as the sum of the rental price for each individual tool, multiplied by the Number of days over which they are rented.
  - ○ The **View Tool Summary** task will be executed to fill out the bottom section of the Tools details for the reservation which includes the _ToolID_, _description_, _deposit price_ and _rental price_
    - ■ The rental price is calculated as the sum of the rental price multiplied by the number of days.
  - ○ When the **Submit** button is pressed, then insert the reservation information to the database, which includes:
    - ■ Execute query to verify the tools has not been reserved by another customer.
      - ● Query the database to verify tools are available for reservation
      - ● If all tools available, then:
        - ○ Insert the reservation information to the database, which includes: List of _ToolIDs_, _confirmationNum_, _reservationID_, _number of days rent_, _total deposit price_, _total rental price_, _reservationDate_ (start date and end date).
        - ○ The **Reservation Confirmation** form is displayed.
      - ● Else
        - ○ Display error message specifying the reservation was unsuccessful because a tool is not available.

- - - ■ Include tool ID and description on error message
      - ■ Go back to **Make Reservation** form.
    - ○ When the **Reset** button is pressed the reservation is deleted from the local cache.
      - ■ The **Main Menu / Nav Bar** is displayed.
      - ■ When ready, customer selects next action from **Customer Main Menu / Nav Bar**.
  - ● When the **Reservation Confirmation** form is loaded, the **Confirm Reservation** task is executed.
    - ○ The **Reservation Confirmation** form is the same as the **Reservation Summary** but the title is "Reservation Confirmation" plus it includes the *Reservation ID* underneath the title.
  - ● When ready, customer selects next action from **Customer Main Menu / Nav Bar**.

Purchase Tool

Task Decomp

Lock Types: Read-only on Tool, Type, Sub-Type, and Power Source. Read/Write on Sale Order.
Number of Locks: Several different schema constructs are needed
Enabling Conditions: All 3 are enabled by a user's login. Summarize Purchase is enabled after Search Inventory and Confirm Purchase is enabled after Summarize Purchase.
Frequency: Medium, Search For-Sale Inventory will have more frequency than Summarize Reservation, and Summarize Reservation will have more frequency than Confirm Reservation.
Consistency (ACID): critical, order is critical.
Subtasks: All tasks must be done sequentially. Mother task is required to coordinate subtasks. Order is necessary.

Abstract Code
- User clicked on **Purchase Tool** link from **Customer Main Menu / Nav Bar** form.
- Run the **Purchase Tool** task: query the Tool, Type, Sub-Type, Power Source, and Sale Order to find the available tools based on a search criteria from the customer.
  - Find all the Type
    - Populate Type radio buttons, including one for "All Tools"
  - Find all the Power Source
    - Populate Power Source dropdown
  - Find all the Sub-Type
    - Populate Sub-Type dropdown
  - Customer fill in *custom search, type, sub-type* and *power source* input fields for the search criteria
  - Click the **Search** button.
  - Find all Tool that are available for-sale by executing the **Search For-Sale Inventory** task:

- Get all tools marked for-sale on the Sale Order table based on the search criteria
- If more than 10 tools retrieved on the query, then:
    - Prompt user to specify a more unique search by entering more criteria
- Else:
    - Display the *tool ID*, *current status*, *description*, *purchase price*, and a purchase tool button.
        - The *description* is a link for the customer to pop-up the **Tool Details** form.
        - The purchase tool button is to add a tool to the purchase order.
- User add tools to the purchase order by pressing the button on the tool
    - When the **Purchase Tool** button is pressed,
        - The tool is moved to the "Tools Added to Purchase" area.
        - Display the *tool ID*, *description*, *purchase price*, and a remove tool button.
            - The **Remove Tool** button is to remove the tool from the reservation.
- User can repeat the previous steps to search for other tools and keep modifying the purchase order.
- When the *Calculate* button is pressed, the **Summarize Purchase** task is executed.
- The **Purchase Summary** form is loaded with the following, which are filled out by executing the **Summarize Purchase** task:
    - The **View Tool Summary** task will be executed to fill out the bottom section of the Tools details for the reservation which includes the *ToolID*, *description*, and *sale price,* as well as the total sale price.
        - Total Sale Price is calculated by the sum of all the tools sale price.
    - When the **Submit** button is pressed,
        - Execute query to verify the tools has not been purchased by another customer.
            - Query the database to verify tools are available for purchase
            - If all tools available, then for each tool:
                - then insert the *customer ID* and *soldDate* to the Sale Order instance in the database.
                - The **Purchase Confirmation** form is displayed.
            - Else
                - Display error message specifying the reservation was unsuccessful because a tool is not available.
                    - Include tool ID and description on error message
                    - Go back to **Purchase Tool** form.
    - When the **Reset** button is pressed the purchase is deleted from the local cache.

- ■ The **<u>Customer Main Menu / Nav Bar</u>** is displayed.
- ■ When ready, customer selects next action from **<u>Customer Main Menu / Nav Bar</u>**.
- When the **<u>Purchase Confirmation</u>** form is loaded, the **Confirm Purchase** task is executed.
  - ○ The **Purchase Confirmation** task have 2 sub-tasks that can run in parallel:
    - ■ **View Purchase Information** task is executed to display the top section of the Purchase Confirmation form, which includes:
      - Date, Total Sale Price, and _Credit Card Number_
        - ○ Total Sale Price is calculated by the sum of all the tools sale price.
    - ■ The bottom section is loaded by the **View Tool Summary** task, which is described under the **Summarize Purchase** task.
  - ○ When the **Print Receipt** button is pressed, the host operating system's print dialog box will open.
- When ready, customer selects next action from **<u>Customer Main Menu / Nav Bar</u>**.

Clerk Main Menu / Navigation

Task Decomp

Main Menu /
Navigation

Lock Types: Read-Only on Clerk
Number of Locks: Single
Enabling Conditions: Trigger by Clerk successful Login or finishing of another Clerk task.
Frequency: High. Main Menu shows to Clerk on Login as well as following the completion of any other form.
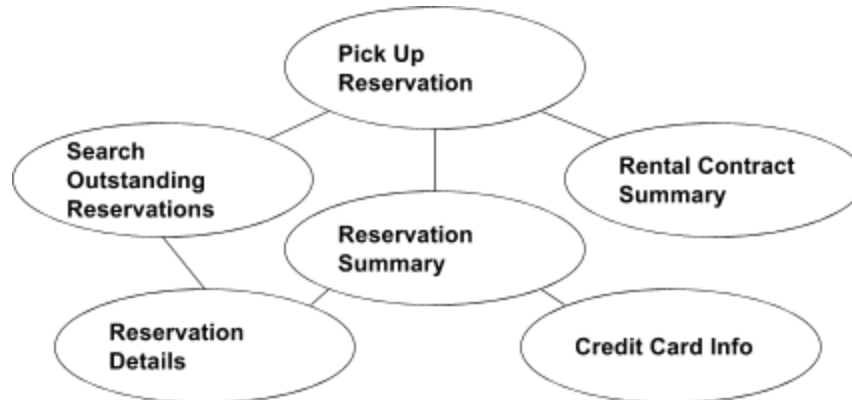**Consistency (ACID):** not critical, order is not critical.
Subtasks: Mother Task is not needed. No decomposition needed.

Abstract Code

- Show Pick-Up Reservation, Drop-Off Reservation, Add New Tool, Service Order, Service Status, Sell Tool, Sale Status, Generate Reports and Logout links.
- Get the user *firstname* and display "Welcome *firstname*!" in the navigation bar.
- Upon:
    - Click *Pick-Up Reservation* link - Jump to the **Pick-Up Reservation** task.
    - Click *Drop-Off Reservation* link - Jump to the **Drop-Off Reservation** task.
    - Click *Add New Tool* link - Jump to the **Add/View Tool Details** task.
    - Click *Service Order* link - Jump to the **Request Service Order** task.
    - Click *Service Status* link - Jump to the **View Service Status** task.
    - Click *Sell Tool* link - Jump to the **Sell Tool** task
    - Click *Sale Status* link - Jump to the **View Sell Status** task
    - Click *Generate Reports* link - Jump to the **Generate Reports** task.
    - Click *Logout* - Logout from the system.

Pick Up Reservation

Task Decom

Lock Types: Read/Write on Credit Card Info and Reservation.
Number of Locks: Multiple. Different schema constructs are required.
Enabling Conditions: Search Reservations is enabled by Clerk clicking on *PickUp Reservation*. Reservation Summary is triggered by clicking *PickUp* from **Reservation** form. Rental Contract Summary is triggered by clicking *Confirm Pick Up* from **Reservation Summary**. **Reservation Details** are triggered by clicking on a reservation in either the **Reservations** Form or **Reservation Summary** form. Credit Card Info is queried if Clerk clicks on *Existing* in the **Reservation Summary** form.
Frequency: Medium: Search Reservations has higher frequency than Reservations Summary. Reservation Summary has higher frequency than Credit Card Info and Rental Contract Summary. Reservation Details has higher frequency as multiple reservations can be queried per transaction.
Consistency (ACID): Consistency is critical. Order is critical. Reservations must follow credit card info and finally Contract Summary. Reservation Details do not have to be queried in order.
Subtasks: All tasks must be done, in sequence. Mother task is required to coordinate subtasks. Order is necessary.
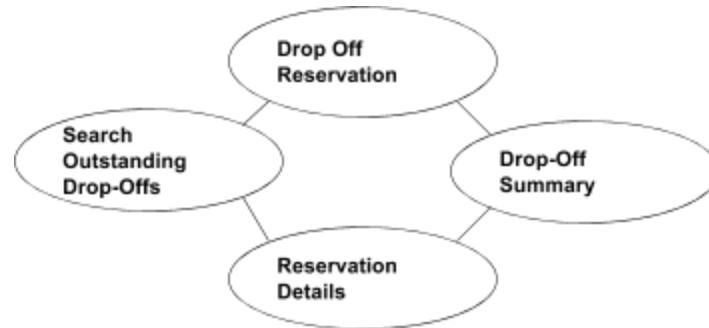
Abstract Code

- Clerk clicked *Pick Up Reservation* from the **Clerk Main Menu/Navigation**.
  - Run **Search Outstanding Reservations** to query all outstanding reservations.
    - For each reservation in the database, query and display the *Customer, CustomerID, Reservation Start Date and Reservation End Date.*
  - If a specific Reservation is clicked
    - Display the **Reservation Details**
    - For the reservation, query and display *Customer Name, Total Deposit and Total Rental Price*.
  - Specific reservation is entered and the button *Pick Up* is clicked

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- ■ The **Rental Pick-Up Summary** is displayed
- ● Clerk entered a specific reservation number and clicked the button *Pick Up* on **Pick Up Reservations** page
    - ○ Load **Rental Pick-Up Summary** page to query the selected reservation
        - ■ For the specific reservation, populate text fields with *Reservation ID, Customer Name, Total Deposit, Total Rent Price and the Customer Credit Card Information.*
    - ○ If the Customer wants to use the Existing Credit Card
        - ■ Clerk selected the Existing radio button.
        - ■ Query and display the Credit Card fields *Name on Credit Card, Credit Card #, CVC, Expiration Month and Expiration Year.*
    - ○ If the Customer wants to use a New Credit Card
        - ■ Clerk selected the "New" radio button.
        - ■ Expiration Month and Expiration Year are auto-populated with available DateTime values.
        - ■ Clerk inputs the *Name on Credit Card, Credit Card #, CVC, Expiration Month and Expiration Year* of the Customer Credit Card.
    - ○ *Confirm Pick Up* is clicked when all information is entered
        - ■ If New Credit Card information was entered, it is stored to the database.
- ● Clerk clicked the button *Confirm Pick Up* on the **Rental Pick-Up Summary** page
    - ○ Display **Rental Contract Summary** page
        - ■ Query and populate *Pick-Up Clerk, Customer Name, Credit Card #, Start Date, End Date, Tool IDs* being reserved, *Tool Names* being reserved, *Deposit Price* for each tool and *Rental Price* for each tool.
    - ○ If a Tool Name is clicked, the **Tool Details** are displayed for the tool
    - ○ Upon clicking *Print Contract*
        - ■ OS Print dialog is opened.
- ● Upon printing summary, return to **Clerk Main Menu/Navigation**

Drop Off Reservation

Task Decom

Lock Types: Read/Write on Reservations
Number of Locks: Multiple. Different schema constructs are required.
Enabling Conditions: Search Drop-Offs are triggered by Clerk clicking on Drop Off Reservation. Drop-Off Summary is Triggered when Clerk selects a specific Reservation to Drop Off from the Drop-Off Form. Reservation Details is queried when Clerk clicks on any Reservation.
Frequency: Search Drop-Offs has higher frequency than Drop-Off Summary. Reservation Details occurs at higher frequency as Clerk can query multiple Reservation Details per one transaction.
Consistency (ACID): Consistency is critical. Order is critical. Reservations must follow Rental Contract Summary. Reservation Details do not have to be queried in order.
Subtasks: All tasks must be done, in sequence. Mother task is required to coordinate subtasks. Order is necessary.

Abstract Code

- Clerk clicked *Drop Off Reservation* from the **Clerk Main Menu/Navigation**.
  - **Search Outstanding Drop-Offs** to query all reservations that having been picked-up, waiting to be dropped-off.
    - For each reservation in the database, query and display the *Customer, CustomerID, Reservation Start Date and Reservation End Date.*
  - If a specific Reservation is clicked
    - Display the **Reservation Details**
    - For the reservation, query and display *Customer Name, Total Deposit and Total Rental Price*.
  - Specific reservation is entered and the button **Drop Off** is clicked
    - The **Rental Drop-Off Summary** is displayed
- Clerk entered a specific reservation number and clicked the button *Confirm Drop Off* on **Drop Off Reservations** page
  - Load **Rental Drop-Off Summary** page to query the selected reservation

- For the specific reservation, populate text fields with *Reservation ID, Customer Name, Total Deposit, Total Rent Price and the Total Due, Tool IDs* being dropped-off, *Tool Names* being dropped-off, *Deposit Price* for each tool and *Rental Price* for each tool.
  - If a ***Tool Name*** is clicked, the **<u>Tool Details</u>** are displayed for the tool
  - Upon clicking ***Drop Off***
    - OS Print dialog is opened.
- Upon printing summary, return to **<u>Clerk Main Menu/Navigation</u>**

<u>View Tool Details</u>

Task Decom

Lock Types: Read-Only on Tool
Number of Locks: Single
Enabling Conditions: Trigger by Clerk clicking on a specific Tool Name
                            Trigger by Customer clicking on a specific Tool Name
Frequency: High
Consistency (ACID): Consistency is not critical.
Subtasks: No mother task is required.

Abstract Code

- Clerk or Customer clicked on View Tool Details**.**
  - Query the *Tool ID, Tool Type, Short Description, Full Description, Deposit Price, Rental Price*, and *Accessories* for the selected tool.

Update Tool Status (Helper Task - not shown in IFD)

Task Decom

Lock Types: Write-Only on Tool, Service Order Request and Sale Order
Number of Locks: single
Enabling Conditions: Enabled by **Add Tool, Service Tool, Service Status**, and **Sell Tool** Forms.
Frequency: High
Consistency (ACID): Critical. None of the tasks depend on each other or run in parallel.
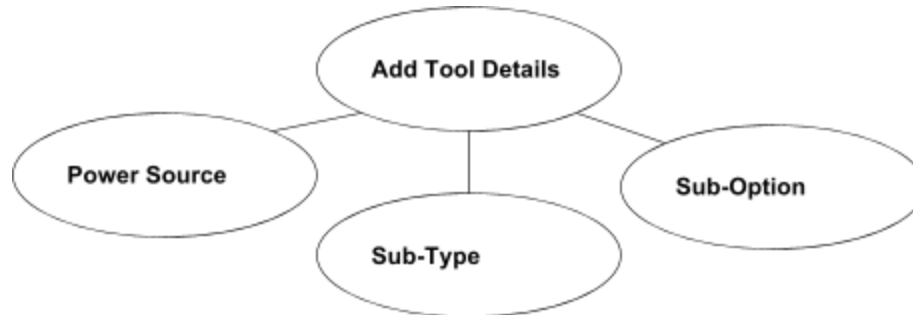**Subtasks:** No mother task necessary.

Abstract Code

- If task called from **Add Tool** form
    - A new tool is added to the database including all associated attributes and tool status is set to *"Available"* in the Tool table.
- If task called from **Request service Order** form
    - The tool being serviced has status updated from *"Available"* to *"In-Service"* in the Service Order Request table.
- If task called from **View Service Order** form
    - Set specified tool status to *"Available"*, the end date is set to *current date* and change *associated clerk* to that of who clicked the Fix-Now button to the Service Order Request table.
- If task called from **Sell Tool** form
    - The tool being sold has status updated from *"Available"* to *"For-Sale"*, with unique *sale transaction number tool number, customer who bought the tool, clerk who marked tool 'for sale', sale price, for-sale date*, and *sale date* to the Sale Order table.

Add Tool Details

Task Decom

Lock Types: Read-Only on Tool
             Note: Write is taken care by helper task **Update Tool Status**
Number of Locks: Multiple
Enabling Conditions: Initial display form triggered by Clerk clicking on **Add New Tool**.
Power-Source triggered when Clerk selects a specific tool type radio button. Sub-Type triggered
when Clerk selects specific Power-Source. Sub-Option triggered when Clerk selects specific
Sub-Type.
Frequency: 10x per week
Consistency (ACID): Consistency is not critical. All tasks are read-only.
Subtasks: All tasks must be done. Mother task is required for coordination since Sub-type must
follow PowerSource selection and Sub-Option must follow Sub-Type selection.

Abstract Code

- Clerk clicked **Add New Tool** from the **Clerk Main Menu/Navigation**.
  - **Tool Types** are displayed.
    - *Hand Tool, Garden Tool, Ladder* and *Power Tool* are displayed.
  - If *Hand Tool* is selected
    - Power-Source is set to *Manual*
    - Sub-types drop-down is loaded with *Screwdriver, Socket, Ratchet, Wrench, Pliers, Gun* and *Hammer*.
    - If Screwdriver Sub-Type is selected
      - Sub-options drop-down for the Screwdriver are loaded with *phillips (cross), hex, torx* and *slotted(flat).*
      - Clerk must select sub-option and fill in *screw-size*.
    - If Socket Sub-Type is selected
      - Sub-options drop-down for the Socket are loaded with *deep* and *standard.*
      - Clerk must select sub-option and fill in *drive-size, sae-size* and optionally *deep socket*.

- ■ If Ratchet Sub-Type is selected
  - ● Sub-options drop-down for the Ratchet are loaded with *adjustable* and *fixed.*
  - ● Clerk must select sub-option and fill in *drive-size*.
- ■ If Wrench Sub-Type is selected
  - ● Sub-options drop-down for the Wrench are loaded with *crescent, torque* and *pipe.*
  - ● Clerk must select sub-option.
- ■ If Pliers Sub-Type is selected
  - ● Sub-options drop-down for the Pliers are loaded with *needle nose, cutting* and *crimper.*
  - ● Clerk must select sub-option and optionally fill in *adjustable*.
- ■ If Gun Sub-Type is selected
  - ● Sub-options drop-down for the Gun are loaded with *nail* and *staple.*
  - ● Clerk must select sub-option and fill in *gauge-rating* and *capacity*.
- ■ If Hammer Sub-Type is selected
  - ● Sub-options drop-down for the Hammer are loaded with *claw, sledge* and *framing.*
  - ● Clerk must select sub-option and optionally fill in *anti-vibration*.
- ■ Clerk additionally must enter the corresponding *Purchase Price, Manufacturer, Width, Width Fraction, Width Unit, Length, Length Fraction, Length Unit, Weight* and optionally *Material,* then clicks **Confirm**.
- ○ If *Garden Tools is* selected
  - ■ Power-Source is set to *Manual*
  - ■ Sub-types drop-down is loaded with *Digger, Pruner, Rakes, Wheelbarrows* and *Striking.*
  - ■ If Digger Sub-Type is selected
    - ● Sub-options drop-down for the Digger is loaded with *pointed shovel, flat shovel, scoop shovel* and *edger.*
    - ● Clerk must select sub-option and fill in *handle-material, blade-length* and optionally *blade-width*.
  - ■ If Pruner Sub-Type is selected
    - ● Sub-options drop-down for the Pruner are loaded with *sheer, loppers* and *hedge.*
    - ● Clerk must select sub-option and fill in *handle-material, blade-length* and optionally *blade-material*.
  - ■ If Rakes Sub-Type is selected
    - ● Sub-options drop-down for the Rakes are loaded with *leaf, landscaping* and *rock.*
    - ● Clerk must select sub-option and fill in *handle-material* and optionally *tine-count*.
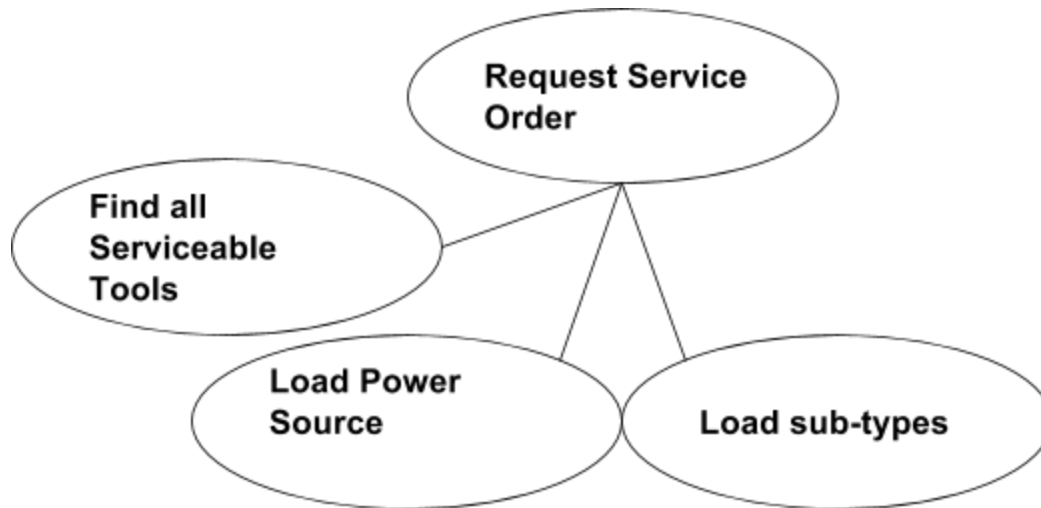 - ■ If Wheelbarrows Sub-Type is selected

- Sub-options drop-down for the Wheelbarrows are loaded with *1-wheel* and *2-wheel.*
- Clerk must select sub-option and fill in *handle-material, bin-material, wheel-count* and optionally *bin-volume*.
  - If Striking Sub-Type is selected
    - Sub-options drop-down for the Striking are loaded with *bar pry, rubber mallet, tamper, pick axe* and *single bit axe.*
    - Clerk must select sub-option and fill in *handle-material* and *head-weight*.
  - Clerk additionally must enter the corresponding *Purchase Price, Manufacturer, Width, width Fraction, Width Unit, Length, Length Fraction, Length Unit, Weight* and optionally *Material,* then clicks **Confirm**.
- If *Ladder* is selected
  - Power-Source is set to *Manual*
  - Sub-types drop-down is loaded with *Straight* and *Step.*
  - If Straight Sub-Type is selected
    - Sub-options drop-down for the Straight is loaded with *rigid* and *telescoping.*
    - Clerk must select sub-option and optionally fill in *step-count, weight capacity* and *rubber-feet*.
  - If Step Sub-Type is selected
    - Sub-options drop-down for the Step are loaded with *folding* and *multi-position.*
    - Clerk must select sub-option and optionally fill in *step-count, weight capacity* and *pail-shelf*.
  - Clerk additionally must enter the corresponding *Purchase Price, Manufacturer, Width, width Fraction, Width Unit, Length, Length Fraction, Length Unit, Weight* and optionally *Material,* then clicks **Confirm**..
- If *Power* is selected
  - Power-Source drop-down is loaded with *A/C, D/C* and *Gas.*
    - If Power-Source A/C is selected
      - Sub-types drop-down is loaded with *Drill, Saw, Sander, Air-Compressor* and *Mixer*.
      - If Drill Sub-Type is selected
        - Sub-options drop-down for the Drill is loaded with *driver* and *hammer.*
        - Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating, min-torque-rating* and optionally *max-rpm-rating, adjustable-clutch* and *max-torque-rating*.
      - If Saw Sub-Type is selected
        - Sub-options drop-down for the Saw is loaded with *circular, reciprocating* and *jig.*

- - - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating, blade-size* and optionally *max-rpm-rating*.
      - ○ If Sander Sub-Type is selected
        - ■ Sub-options drop-down for the Sander is loaded with *finish, sheet, belt* and *random orbital.*
        - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating* and optionally *max-rpm-rating* and *dust-bag*.
      - ○ If Air-Compressor Sub-Type is selected
        - ■ Sub-options drop-down for the Air-compressor is loaded with *reciprocating.*
        - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating, tank-size* and optionally *max-rpm-rating* and *pressure-rating*.
      - ○ If Mixer Sub-Type is selected
        - ■ Sub-options drop-down for the Mixer is loaded with *concrete.*
        - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating, motor-rating* and optionally *drum-size*.
  - If Power-Source D/C is selected,
    - ○ Sub-types drop-down is loaded with *Drill, Saw* and *Sander*
    - ○ If Drill Sub-Type is selected
      - ■ Sub-options drop-down for the Drill is loaded with *driver* and *hammer.*
      - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating, min-torque-rating* and optionally *max-rpm-rating, adjustable-clutch* and *max-torque-rating*.
    - ○ If Saw Sub-Type is selected
      - ■ Sub-options drop-down for the Saw is loaded with *circular, reciprocating* and *jig.*
      - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating, blade-size* and optionally *max-rpm-rating*.
    - ○ If Sander Sub-Type is selected
      - ■ Sub-options drop-down for the Sander is loaded with *finish, sheet, belt* and *random orbital.*
      - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating* and optionally *max-rpm-rating* and *dust-bag*.

- ○ Battery Type drop-down is loaded with available battery types *Li-Ion, Ni-Cd, Ni-MH*.
  - ■ Clerk must select the *battery-type* for the D/C Power Tool.
- ● If Power-Source Gas is selected
  - ○ Sub-types drop-down is loaded with *Air-Compressor, Mixer* and *Generator.*
  - ○ If Air-Compressor Sub-Type is selected
    - ■ Sub-options drop-down for the Air-compressor is loaded with *reciprocating.*
    - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating, tank-size* and optionally *max-rpm-rating* and *pressure-rating*.
  - ○ If Mixer Sub-Type is selected
    - ■ Sub-options drop-down for the Mixer is loaded with *concrete.*
    - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating, motor-rating* and optionally *drum-size*.
  - ○ If Generator Sub-Type is selected
    - ■ Sub-options drop-down for the Generator is loaded with *electric.*
    - ■ Clerk must select sub-option and fill in *volt-rating, amp-rating, min-rpm-rating,* and *power-rating*.
- ■ Accessories are optional to be paired with power-tool:
  - ● Available accessories are *Drill bits, Saw Blade, Soft Case, Hard Case, D/C Batteries 7.2-80V, D/C Battery Charger, Safety Hat, Safety Pants, Safety Goggles, Safety Vest, Hose* and *Gas Tank*.
  - ● Clerk must enter *accessory-description* and *quantity* if an accessory is desired to be added to the power tool.
- ○ If a Tool Name is clicked, the **Tool Details** are displayed for the tool
- ○ Clerk additionally must enter the corresponding *Purchase Price, Manufacturer, Width, Width Fraction, Width Unit, Length, Length Fraction, Length Unit, Weight* and optionally *Material,* then clicks **Confirm**.
  - ■ Execute the **Update Tool Status** task to add the tool and all of its associated attributes to the database.
  - ■ Clerk is returned to **Clerk Main Menu/Navigation**

Request Service Order

Task Decom

Lock Types: Read-only on Tools

        Note: Write is taken care by helper task **Update Tool Status**

Number of Locks: Multiple

Enabling Conditions: Initial display form trigger by Clerk clicking on **Request Service Order**. Power-Source triggered when Clerk selects a specific tool type radio button. Sub-Type triggered when Clerk selects specific Power-Source.

Frequency: Serviceable Tools Search more frequent than Power Source which is more frequent than sub-types.

Consistency (ACID): Consistency is not critical. All tasks are read-only.

Subtasks: Mother task is required for coordination since Sub-type must follow PowerSource selection which itself follows finding of all Serviceable Tools search.

Abstract Code

- Find all serviceable tools.
- *Tool Types* are displayed.
    - *All Tools, Hand Tool, Garden Tool, Ladder* and *Power Tool* are displayed.
- If *Hand Tool* is selected
    - Power-Source is set to *Manual*
    - Sub-types drop-down is loaded with *Screwdriver, Socket, Ratchet, Wrench, Pliers, Gun* and *Hammer.*
- If *Garden Tools* is selected
    - Power-Source is set to *Manual*
    - Sub-types drop-down is loaded with *Digger, Pruner, Rakes, Wheelbarrows* and *Striking.*
- If *Ladder* is selected

- ○ Power-Source is set to *Manual*
  - ○ Sub-types drop-down is loaded with *Straight* and *Step.*
- ● If *Power* is selected
  - ○ Power-Source drop-down is loaded with *A/C, D/C* and *Gas.*
    - ■ If Power-Source A/C is selected
      - ● Sub-types drop-down is loaded with *Drill, Saw, Sander, Air-Compressor* and *Mixer*.
    - ■ If Power-Source D/C is selected,
      - ● Sub-types drop-down is loaded with *Drill, Saw* and *Sander*
    - ■ If Power-Source Gas is selected
      - ● Sub-types drop-down is loaded with *Air-Compressor, Mixer* and *Generator.*
  - ○ Clerk can click on "Service Tool" button to auto-populate Tool ID in the Tool ID field.
  - ○ Clerk enters the corresponding *Start Date, End Date, Tool ID* and *Service Cost* and click "Confirm".
- ● For each serviceable tool
  - ○ *Tool ID, Description, Rental Price* and *Deposit Price* is displayed.
- ● If a Tool Name is clicked, the **Tool Details** are displayed for the tool.
- ● Upon click "Confirm"
  - ○ Execute the **Update Tool Status** task that the tool is *"in-service"* and not "*available*" for rent.
  - ○ Clerk is returned to **Clerk Main Menu/Navigation**

View Service Status

Task Decom

Lock Types: Read-only on Tool

        Note: Write is taken care by helper task **Update Tool Status**

Number of Locks: Single

Enabling Conditions: Trigger by Clerk clicking on *View Service Status*

Frequency: Low

Consistency (ACID): Order is not critical, read-only.
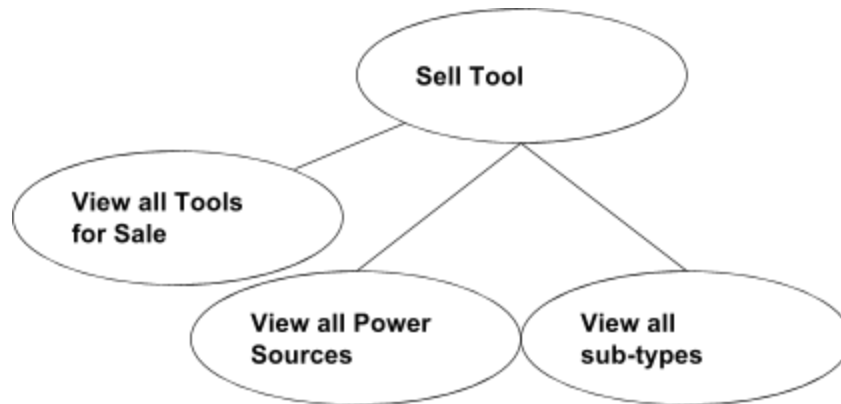
Subtasks: Mother task is not needed.

Abstract Code

- Load all tools currently in Service.
- For each serviceable tool
  - *Service ID, Tool ID, Description, Start Date, End Date, Repair Costi and* Clerk ID is displayed.
- If a Tool Name is clicked, the **Tool Details** task is executed.
- If Clerk clicks *Fix-Now* button
  - Execute **Update Tool Status** task.
- Upon:
  - Closing of window, Clerk is returned to **Clerk Main Menu/Navigation.**

<u>Sell Tool</u>

Task Decom

Lock Types: Read-only on Tool
         Note: Write is taken care by helper task **Update Tool Status**
Number of Locks: Multiple
Enabling Conditions: Initial display form trigger by Clerk clicking on **Sell Tool**. Power-Source triggered when Clerk selects a specific tool type radio button. Sub-Type triggered when Clerk selects specific Power-Source.
Frequency: 10x per week. Viewing all Tools for sale more frequent than Power Sources which is more frequent than viewing sub-types.
Consistency (ACID): consistency is not critical. All tasks are read-only
Subtasks: Mother task is required for coordination since Sub-type must follow PowerSource selection which itself follows finding of all Sellable Tools.

Abstract Code
- Load all available tools for sale
- *Tool Types* are displayed.
  - *All Tools, Hand Tool, Garden Tool, Ladder* and *Power Tool* are displayed.
- If *Hand Tool* is selected
  - Power-Source is set to *Manual*
  - Sub-types drop-down is loaded with *Screwdriver, Socket, Ratchet, Wrench, Pliers, Gun* and *Hammer.*
- If *Garden Tools* is selected
  - Power-Source is set to *Manual*
  - Sub-types drop-down is loaded with *Digger, Pruner, Rakes, Wheelbarrows* and *Striking.*
- If *Ladder* is selected
  - Power-Source is set to *Manual*
  - Sub-types drop-down is loaded with *Straight* and *Step.*

- If *Power* is selected
    - Power-Source drop-down is loaded with *A/C, D/C* and *Gas.*
        - If Power-Source A/C is selected
            - Sub-types drop-down is loaded with *Drill, Saw, Sander, Air-Compressor* and *Mixer*.
        - If Power-Source D/C is selected,
            - Sub-types drop-down is loaded with *Drill, Saw* and *Sander*
        - If Power-Source Gas is selected
            - Sub-types drop-down is loaded with *Air-Compressor, Mixer* and *Generator.*
- For each tool for sale
    - *Tool ID, Description, Rental Price* and *Deposit Price* is displayed.
- If a Tool Name is clicked, the **Tool Details** are displayed for the tool
- Upon click "Sell Tool"
    - Execute **Update Tool Status** task
- Upon:
    - Closing of window, Clerk is returned to **Main Menu/Navigation.**

View Sell Status

Task Decom

Lock Types: Read-only on Sale Order table
Number of Locks: Single
Enabling Conditions: Trigger by Clerk clicking on *View Sell Status*
Frequency: Low
Consistency (ACID): not critical. Order is not critical
Subtasks: Mother Task is not needed. No decomposition needed

Abstract Code

- Load all items for sale or already sold
- For each tool for sale or sold:
    - *Sale ID, Current Status, Tool ID, Description, Customer ID, Sale Price, Sale Date* and *Clerk ID* is displayed.
- If a Tool Name is clicked, the **Tool Details** are displayed for the tool.
- Upon:
    - Closing of window, Clerk is returned to **Main Menu/Navigation.**

Generate Reports

Task Decom

Lock Types: Read-only on Clerk, Customer and Tool tables.
Number of Locks: Several different schema constructs are needed
Enabling Conditions: All sub-tasks are triggered by Clerk clicking on *Generate Reports* and selecting the specific report.
Frequency: Once a month for all three reports.
Consistency (ACID): not critical. Order is not critical
Subtasks: All tasks must be done.

Abstract Code
- User clicked on *Generate Reports* link from **Clerk Main Menu**.
- If **Clerk Report** is selected all clerks' information is queried
  - Each clerk's *Clerk ID, first Name, Middle Name, Last Name, E-mail, Hire Date, Number of Pick-Ups, Number of Drop-Offs* and *Combined Total* are displayed.
  - Upon clicking *Back to Report Menu*
    - Clerk is returned to **Select a Report** menu
- If **Customer Report** is selected, all customers' information is queried
  - Each customer's *Customer ID, View Profile, First Name, Middle Name, Last Name, E-mail, Total # Reservations* and *Total # Tools Rented* are displayed.
  - If *View Profile* is clicked, the customers **View Profile** if queried.
  - Upon clicking *Back to Report Menu*
    - Clerk is returned to **Select a Report** menu
- If **Tool Inventory Report** is selected, all tools in the inventory are displayed
  - Each Tool's *Tool ID, Current Status, Date, Description, Rental Profit, Total Cost,* and *Total Profit* are displayed.
  - If a Tool Name is clicked, the **Tool Details** are displayed for the tool.
  - Upon clicking *Back to Report Menu*
    - Clerk is returned to **Select a Report** menu

- Upon:
  - Closing of window, Clerk is returned to **Main Menu/Navigation.**