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Tools4Rent Data Types

1. Users

Attribute	Data type	Allow Null
username	string	Not Null
password	string	Not Null

2. Registration

Attribute	Data type	Allow Null
username	string	Not Null
password	string	Not Null
email_address	string	Not Null
first_name	string	Not Null
middle_name	string	NULL
last_name	string	Not Null
address	string	Not Null
home_phone	integer	Not Null
work_phone	integer	Not Null
cell_phone	integer	Not Null
phone_extension	string	NULL

3. Check Tool Availability

Attribute	Data type	Allow Null
start_date	date	Not Null
end_date	date	Not Null
keyword_search	string	Not Null
type	string	Not Null
power_source	string	Not Null
sub_type	string	NULL

4. Make Reservation

Attribute	Data type	Allow Null
start_date	date	Not Null
end_date	date	Not Null
keyword_search	string	Not Null
type	string	Not Null
power_source	string	Not Null
sub_type	string	Not Null

5. Purchase Tool

Attribute	Data type	Allow Null
keyword_search	string	Not Null
type	string	Not Null
power_source	string	Not Null
sub_type	string	NULL

6. Pick-Up Reservation

Attribute	Data type	Allow Null
reservation_number	string	NULL
credit_card_name	string	Not Null
credit_card_number	integer	Not Null
cvc	integer	Not Null
expiration_month	string	Not Null
expiration_year	integer	Not Null

7. Drop-Off Reservation

Attribute	Data type	Allow Null
reservation_number	string	NULL

8. Add Tool

Attribute	Data type	Allow Null
category	string	Not Null
sub_type	string	Not Null
sub_option	string	Not Null
purchase_price	integer	Not Null
manufacturer	string	Not Null
width	float	Not Null
width_fraction	varchar	Not Null
width_unit	string	Not Null
weight_lbs	float	Not Null
length	float	Not Null
length_fraction	varchar	Not Null
length_unit	string	Not Null
drive_chuck_size	varchar	Not Null
power_source	string	Not Null
gauge_unit	string	Not Null
capacity_unit	integer	Not Null
ac_volt_rating	integer	Not Null
amp_rating	float	Not Null
amp_unit	string	Not Null
power_generated	float	Not Null
power_fraction	varchar	Not Null
power_unit	string	Not Null
torque_min	float	Not Null
torque_max	float	Not Null
pressure_min	float	Not Null

pressure_max	float	Not Null
speed_min	float	Not Null
speed_max	float	Not Null
accessory_quantity	integer	Not Null
accessory_description	string	Not Null
battery_type	string	Not Null
battery_quantity	integer	Not Null
dc_volt_rating	float	Not Null

9. Repair Tool

Attribute	Data type	Allow Null
start_date	date	Not Null
end_date	date	Not Null
keyword_search	string	Not Null
type	string	Not Null
power_source	string	Not Null
sub_type	string	Not Null
tool_number	integer	Not Null
service_cost	float	Not Null

10. View Service Status Page

Attribute	Data type	Allow Null
keyword_search	string	Not Null
type	string	Not Null

11. Sell Tool

Attribute	Data type	Allow Null
start_date	date	Not Null
end_date	date	Not Null

keyword_search	string	Not Null
type	string	Not Null
power_source	string	Not Null
sub_type	string	Not Null

12. View Sale Status Page

Attribute	Data type	Allow Null
keyword_search	string	Not Null
type	string	Not Null

13. Generate reports

Attribute	Data type	Allow Null
select_report	string	Not Null

14. Generate Tool Report

Attribute	Data type	Allow Null
keyword_search	string	Not Null
type	string	Not Null

Tools4Rent Business Logic Constraints

Check Tool Availability

1. If more than 10 tools are returned in the list, the UI should prompt the user to specify a more unique search (by entering more criteria)
2. Any tool (where only 1 exists in entire inventory) with an existing reservation should not be listed in available tools for the same day

Make Reservation (Customer role):

1. 'One Day' is defined as a 24 hour increment: 12:00:00 AM-11:59:59 PM for any given date.
2. All tools are only available for daily rental (no hourly option).
3. Daily rental prices are 15% of the original purchase price rounded up to nearest cent.

4. Deposit prices are 40% of the original purchase price rounded up to nearest cent.
5. Sale prices are 50% of the original purchase price rounded up to nearest cent.
6. Purchase price is required when the Clerk uses the “Add-Tool” interface while the other prices are derived based on this original purchase price (not stored).
7. A customer is allowed to rent no more than ten tools per reservation. Once the 11th tool is requested, an error message should be displayed prompting the user to reduce the number of tools in the current reservation to 10.

Make Reservation (Clerk Role):

1. Concurrency consideration: If two customers are trying to reserve the only specific tool in the system, then the tool is reserved for the customer who hits submit button first.
2. Pick-up can only happen after a valid reservation entry.
3. When a tool is not available right now, 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.

Add Tool (Clerk role):

1. The Clerk should not be allowed to choose a sub-type without first selecting a tool type and power-source. Data input fields which are invalid based on tool type, power source, and sub-type selected (in that order) are to be hidden/disabled to prevent data corruption.

Tool Description:

1. For the purposes of the demo, a tool’s full-description, while stored in the database as separate attributes, will be combined into a single concatenated string in the UI output as shown in Figure-6. Teams may need to add semantic chars ‘()’ or ‘W’ ‘x’ or ‘L’ or ‘#’ as needed.
2. Show dimensions first and manufacturer last.

Registration:

1. Phone numbers should also account for hyphens ‘-’, non-international area codes with optional extensions.
2. For this project, Customers are allowed to have only one single Address. It should contain separate fields: street, city, state, 9-digit zip code plus the hyphen ‘-’.
3. If a valid Customer exists with that username, regardless of if password entered was correct, the user should not be allowed to register as a new customer.

Purchase Tool:

1. All sales are final. There is no refund policy

Clerks:

1. All email addresses for Clerks contain the domain name.

2. If the Clerk tries to login as a Customer or with the incorrect password, error messages should be displayed.
3. Clerk may also be a Customer

Sell Tool :

1. As soon as the 50th rental is returned, that tool is automatically marked 'for-sale' in the store at 50% of the original purchase price (rounded up to nearest cent).
2. If a tool has not been previously marked 'for-sale' by a clerk, the customer cannot purchase it.
3. A sale order cannot be placed over an existing reservations, sale orders or service orders for same date. (no duplicates)

Repair Tool:

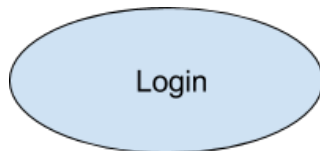
1. If a service order exists for a specific tool, a Clerk cannot enter a duplicate service request on the same tool (even in the future).
2. A service order cannot be placed over an existing rental reservations, sale orders or service orders for same date.

Task Decomposition (TD) and Abstract Code (AC)

Login:

Task Decomposition:

- **Lock types:** Read emails and passwords from the database for both customer and clerk
- **Number of locks:** 1
- **Enabling Conditions:** None
- **Frequency:** 500 logins per day for customer and 50 logins per day for clerk
- **Consistency (ACID):** Not critical
- **Subtasks:** Mother task in not needed



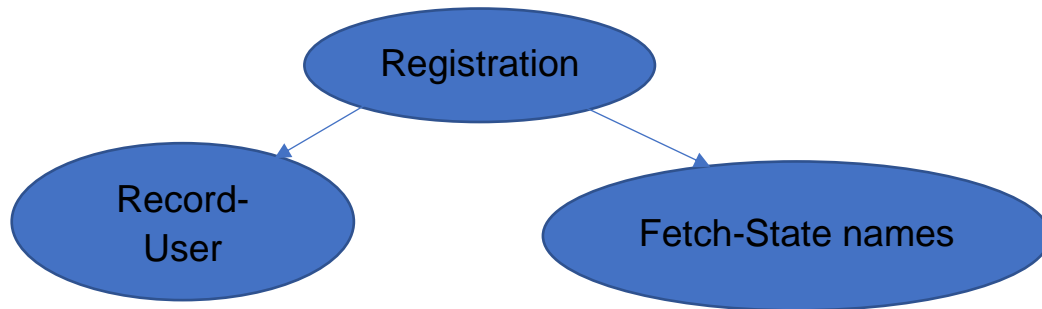
Abstract Code:

- If user selects **Customer/clerk** radio button and enters *email* and *password* into input fields, then:
 - If data validation is successful for both email and password input fields, then:
 - When **Sign-in** button is clicked:
 - If User record is found but password is incorrect:
 - Go back to **Login** form, with error message
 - Else:

- Go to **main menu form** of user (customer/clerk)
- Else email and password input fields are invalid, display **Login form**, with error message
- Else, with error message, there is no clerk/customer with username

Registration:

- **Lock types:** One read only lookup for state names and one write operation to Insert customer information (username, name, phone number, email address, password and address)
- **Number of locks:** 2
- **Enabling Conditions:** Enables only if no valid customer exists with that username
- **Frequency:** different frequency
- **Consistency (ACID):** Not critical
- **Subtasks:** Mother task is needed



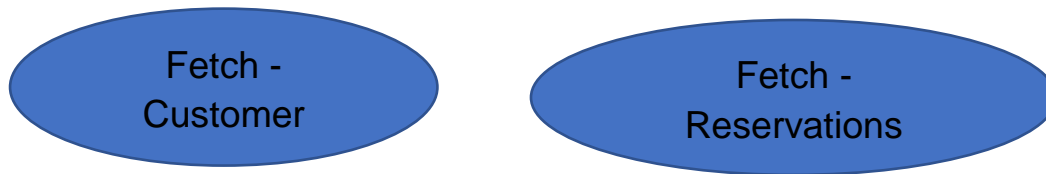
Abstract Code:

- Populate all the input fields
- Step 1: If username doesn't exist, then:
 - Select at least one phone number (either home, work or cell) as primary phone number
 - Select state from the dropdown
 - Push the **Register** button.
- Else: populate another username and go to step 1

View Profile:

- **Lock types:** lookup of customer information and information on reservations for a customer
- **Number of locks:** 2
- **Enabling Conditions:** Enabled by a customer's login
- **Frequency:** all two have same frequency
- **Consistency (ACID):** Not critical
- **Subtasks:** All two must be done, so mother task is needed

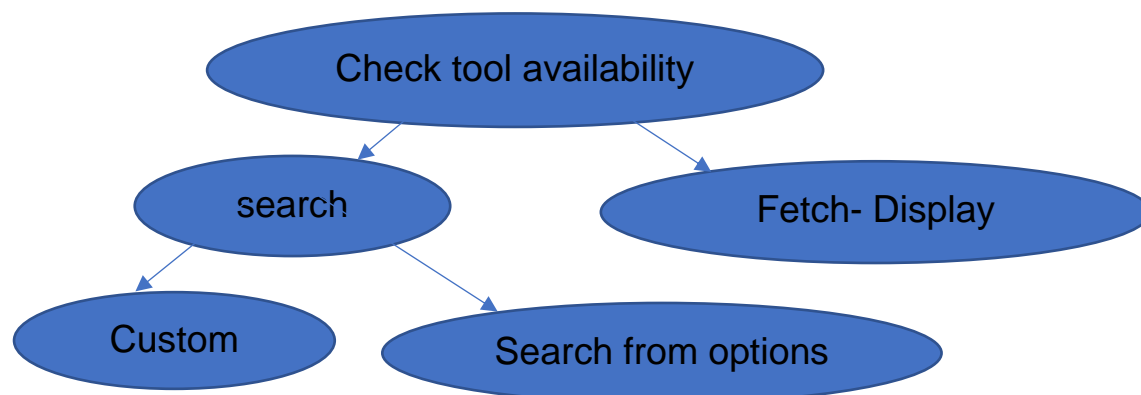


**Abstract Code:**

- When the **view profile** button is pushed on the main menu, **view profile** form is displayed
- Display customers email, full name, available phone numbers and address
- Display reservations of the customers
- Read each reservation of the customer ordered from most recent to oldest and display names of clerk, tool details, date details and price details

Check Tool Availability:

- **Lock types:** One lookup for keyword search or search by option. Insert information in search options. No Lookup needed for display details (it is an aggregation over data lookedup)
- **Number of locks:** 1
- **Enabling Conditions:** all lookups are enabled by a customer's login
- **Frequency:** different frequency
- **Consistency (ACID):** critical and order is important. Lookup of keyword search done first followed by details display
- **Subtasks:** Mother task is needed

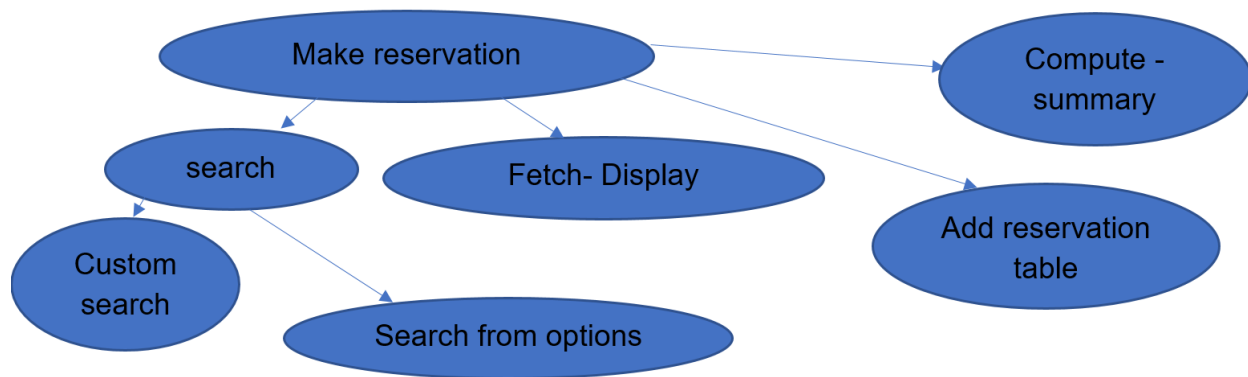


Abstract Code:

- When the **check tool availability** button is pushed on the main menu
- Populate input fields in keyword search section (*start/end dates, tool category, power-source/sub-types*)
- Step 1: push **Search** button
- If number of tools returned is less than 10, then:
 - Find the input fields and display available inventory information (tool number, a short-description, deposit price per reservation, rental price per day)
 - If customer wishes to see further details on a specific tool and clicks on **full description** button, then
 - Find the tool and display the description of the tool (Tool id, Tool type, Short description, Full description, Deposit price and rental price)
 - Else: just display available inventory information
- Else: modify key search words and go to Step 1

Make Reservation:

- **Lock types:** 1 read only lookup from tools table and read-write lookup from reservation table
- **Number of locks:** 3 (2 read and 1 write)
- **Enabling Conditions:** Enabled by a customer's login
- **Frequency:** Different frequency (may be one third of the login times user makes reservation)
- **Consistency (ACID):** critical and order is important. Lookup of keyword search done first followed by writes to reservation table
- **Subtasks:** Mother task in needed

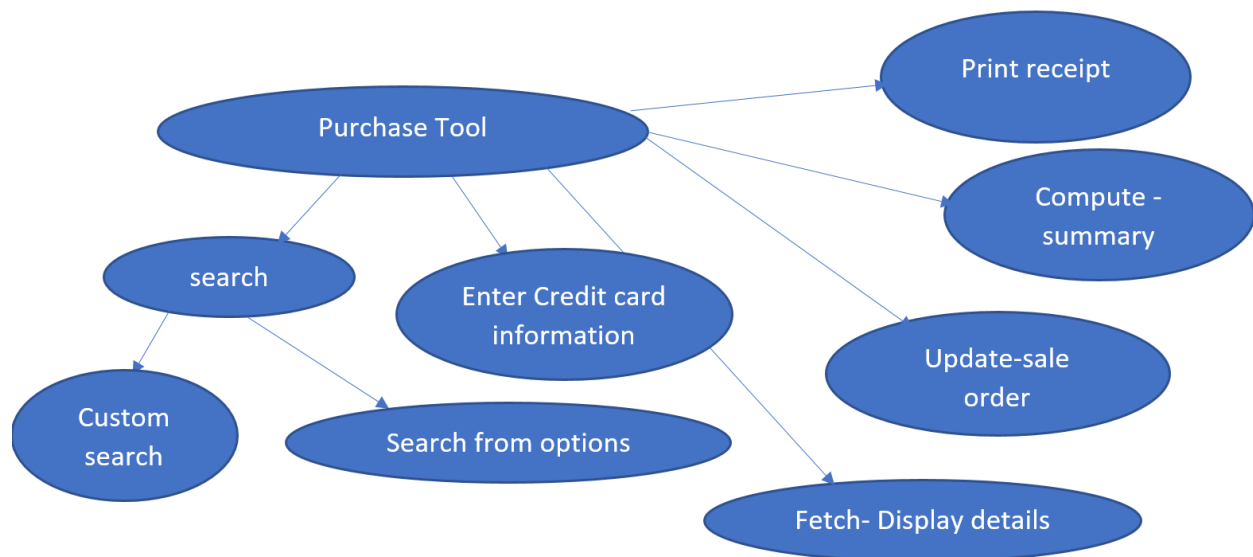


Abstract Code:

- When the **Make Reservation** button is pushed on the main menu
- Step 1: Populate input fields in keyword search section (*start/end dates, tool category, power-source/sub-types, type*)
- Push **Search** button
- Find the input fields and display available inventory information (tool number, a short-description, deposit price per reservation, rental price per day)
- Push the **add** button on all the required tools
- If number of added tool is 11th, then:
 - An error message is displayed
- Else:
 - Go to next step
- If any of the added tool available inventory reached zero, then
 - As error message is displayed
 - If identical tool requested is due to return within the next 24 hours, then
 - A notice is given to the user telling them the date when the tool is expected to become available
 - Else: go to next step
 - When customer is done with adding all the required tools
- Push the **calculate Total** button is pushed
- A reservation summary form is popped displaying total deposit price, rental price, number of days
- If we wished to complete the reservation, then
 - Push the **submit** button.
 - If any of the reserving tools is already reserved by another customer, then:
 - Display notice of unavailability and go to step 1
 - Else: go to next step
 - Find reservation confirmation form pops-up displaying total deposit price, rental price, number of days
- **Else:** Push the **reset** button and go to step 1

Purchase tool:

- **Lock types:** 1 read only lookup from tools table, 1 read-write lookup from sales order table, 1 write operation to credit card table with user id if needed
- **Number of locks:** 4 (2 read and 2 write)
- **Enabling Conditions:** all lookups are enabled by a customer's login. Entry of sale order.
- **Frequency:** different frequency
- **Consistency (ACID):** Critical and order is important. Lookup of keyword search done first followed by number of writes and reads.
- **Subtasks:** Mother task is needed



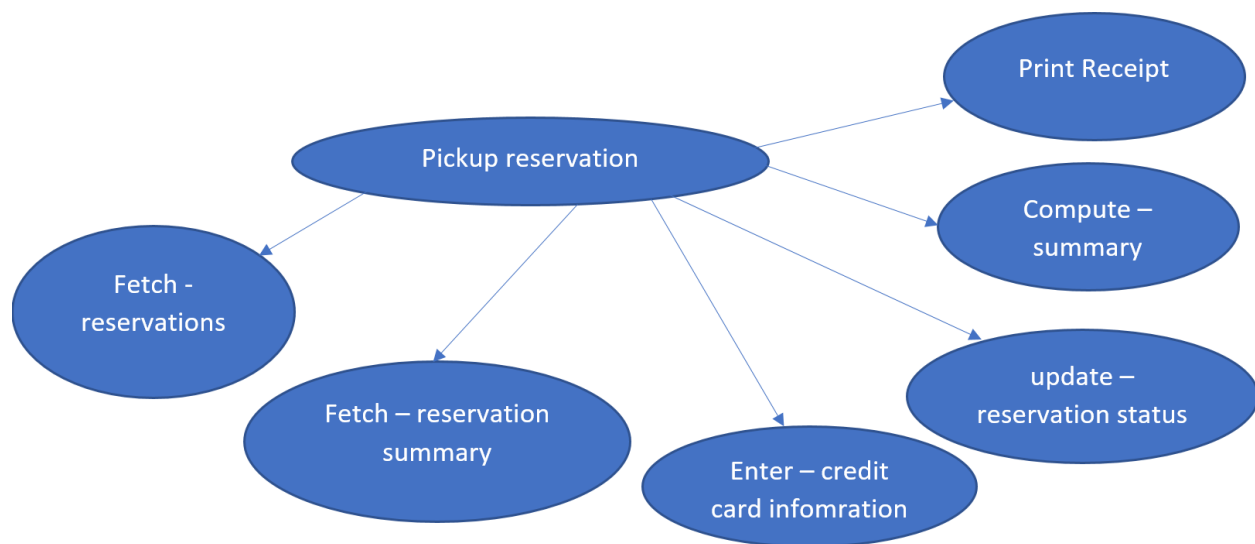
Abstract Code:

- When the **Purchase Tool** button is pushed on the main menu
- Step 1: Populate input fields in keyword search section (*start/end dates, tool category, power-source/sub-types, type*)
- Push **Search** button
- Read the available tools for sale and display tool description and purchase price
- Select the tools from the list and push the **submit** button
- If the credit file is not on file, then
 - Customer is required to enter the information
- Else:
 - Purchase confirmation form pops-up displaying total purchase price and sold-date

Clerks:

Pick-up reservation

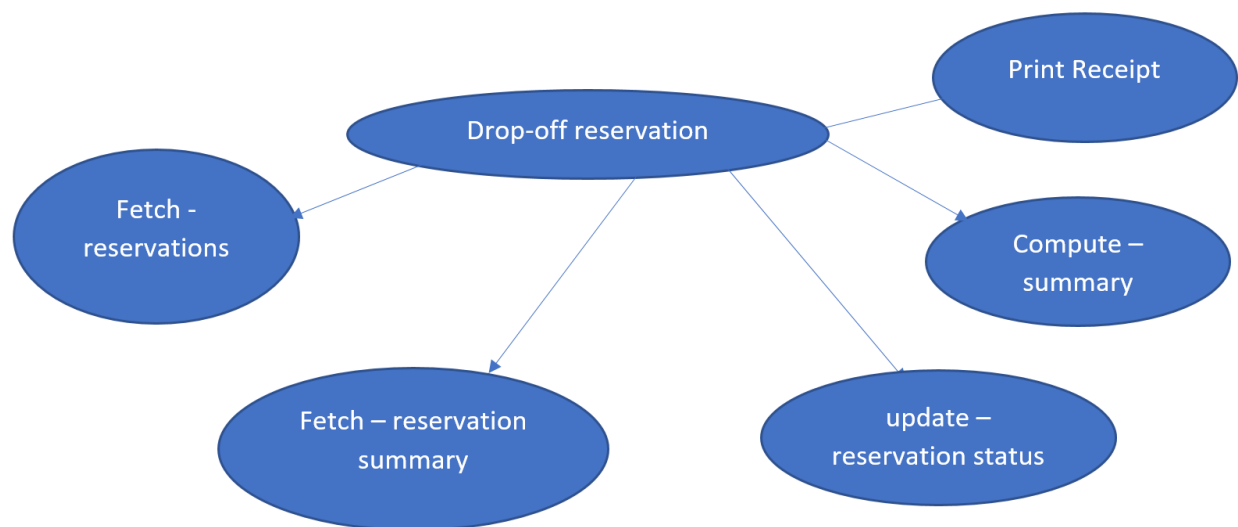
- **Lock types:** Read from reservation table, read and write (if needed) operation to credit card table, write the status to the reservation table
- **Number of locks:** 4 (2 reads and 2 write)
- **Enabling Conditions:** all lookups are enabled by a clerk's login and from reservations made by the customer
- **Frequency:** few times in a day
- **Consistency (ACID):** Critical and order is important. Reservations made by the customer, clerk picking up the reservation, credit card payment, reservation summary and issuing rental contract
- **Subtasks:** Mother task in needed

**Abstract Code:**

- When the **Pick-up reservation** button is pushed on the main menu
- Read all the reservations which are waiting to be picked up
- Select a reservation either by entering the specific reservation number and pushing **Pick-up** button or click a link
- Display summary of the reservation
- If the credit card information does not exist in the customer's profile, then:
 - Step 1: Clerk should enter the customer's credit card information (number, name on card, expiration month as a drop down, expiration year as a drop down, cvc 3 digit number)
- Else:
 - Leave as it is
- Push the **confirm Pick-up** button
- If the information is valid, then:
 - Display rental contract with summary for the transaction
- Else:
 - Go to step 1

Drop-off reservation

- **Lock types:** Read from reservation table, read credit card table, write the status to the reservation table
- **Number of locks:** 3 (2 reads and 1 write)
- **Enabling Conditions:** All lookups are enabled by a clerk's login
- **Frequency:** few times in a day
- **Consistency (ACID):** Critical and order is important. Reservations made by the customer, clerk picking up the reservation, display of the picked reservations, select the reservation for drop off, payment, compute drop-off summary and print receipt
- **Subtasks:** Mother task in needed

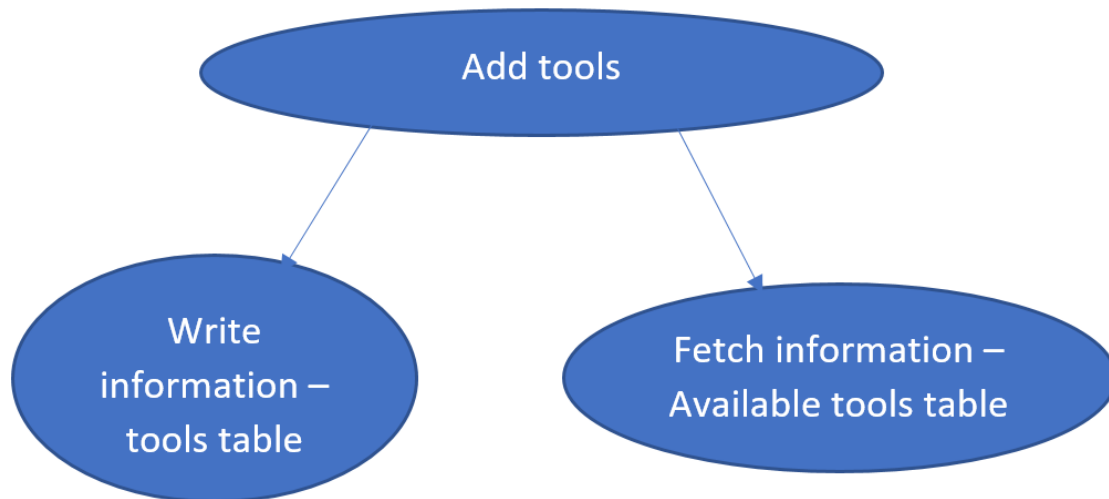
**Abstract Code:**

- If user ***Drop-off reservation***_button is pushed on the main menu, then:
 - Read all the reservations which are waiting to be dropped-off
 - Display reservations and option to get summary to the clerk
 - Select a reservation either by entering the specific reservation number by:
 - By pushing ***drop off*** button or
 - by clicking a link
 - Final receipt pops-up up (user can optionally print for their own records)
- Else: remain as it is

Add tools

- **Lock types:** read information from available tools table, write information to the tools table
- **Number of locks:** 2 (read and write)

- **Enabling Conditions:** All lookups are enabled by a clerk's login
- **Frequency:** different frequency
- **Consistency (ACID):** Order is not critical
- **Subtasks:** Mother task in needed



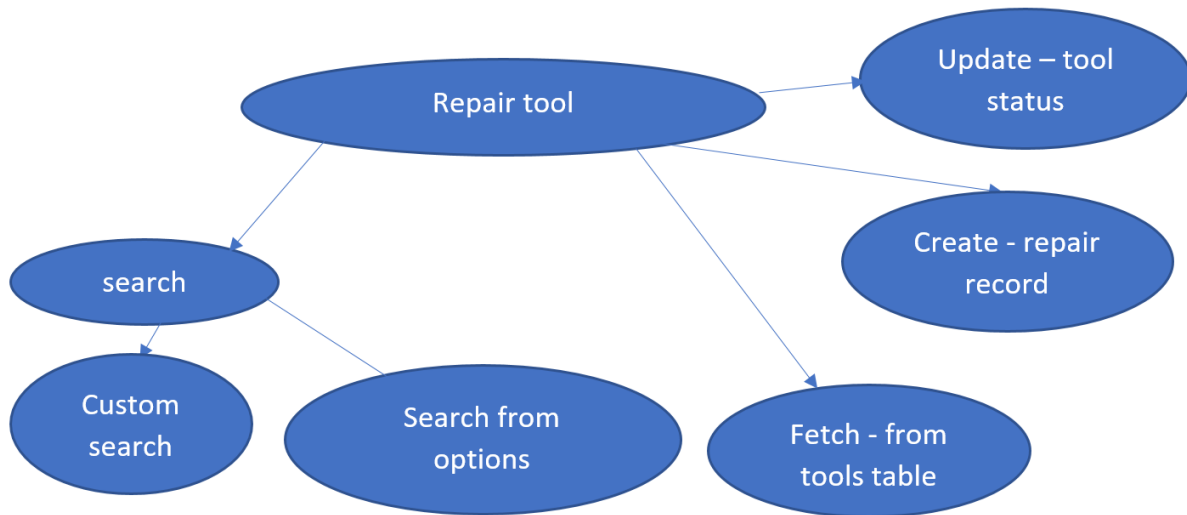
Abstract Code:

- When the **Add tool** button is pushed on the main menu, **Add tool form** is displayed
- If any of the categories entered first, then
 - If selected category is hand tool, garden tool or ladder, then:
 - If next entered is sub-type, then
 - Populate suboption
 - Enable sub-option dropdown
 - Else: Error message displaying sub-type should be entered first
 - Else: Power tool form pops-up
 - if next entered value is power source
 - if subtype is cordless tools only, then:
 - Cordless Tools only form pops-up
 - Populate the fields
 - Else: populate other fields in the Power Tools Only form
 - Else: Error message displaying power source should be entered first
- Else: Error message displaying category should be entered first

Repair tool

- **Lock types:** 1 read only from tools table, write operation to repair record table, write operation for updating tool status

- **Number of locks:** 3 (1 read, 2 write)
- **Enabling Conditions:** All lookups are enabled by a clerk's login and tools added by clear
- **Frequency:** different frequency
- **Consistency (ACID):** Order is critical
- **Subtasks:** Mother task in needed

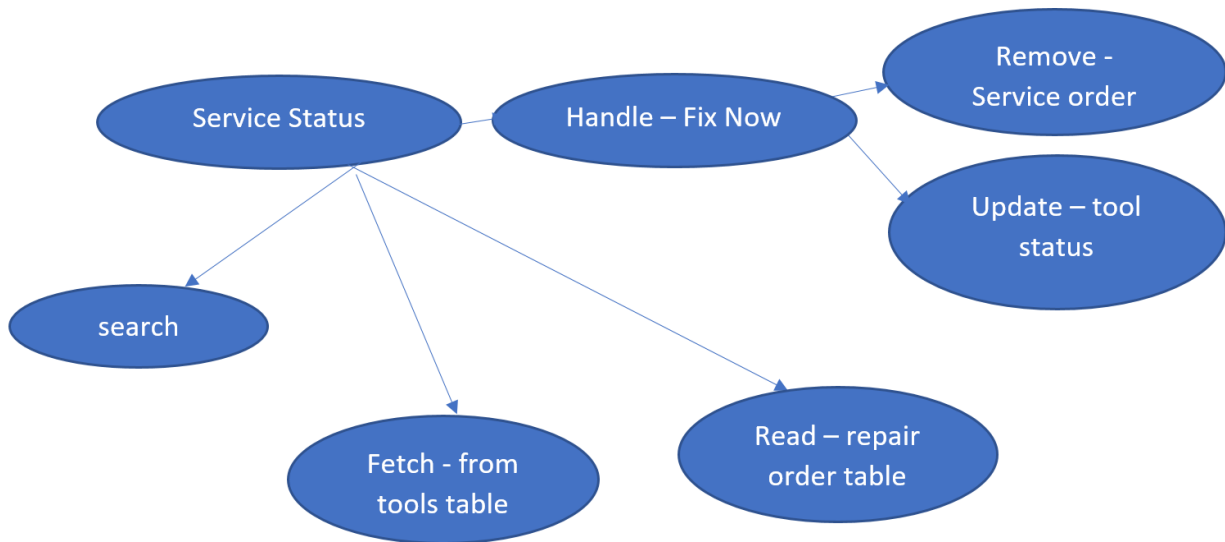


Abstract Code:

- When the **Repair tool** button is pushed on the main menu, **Repair Tool form** is displayed
- Populate input fields in keyword search section (*start/end dates, tool category, power-source/sub-types, type*)
- Read all the tools which are "In-repair" status with key word search
- Enter Tool ID number and service cost, push **confirm** button

View service status page

- **Lock types:** 1 read only from tools table, write operation to tools table, 1 read and write from repair order table
- **Number of locks:** 4 (2 read and 2 write)
- **Enabling Conditions:** All lookups are enabled by any of the clerk's login
- **Frequency:** different frequency
- **Consistency (ACID):** Order is critical
- **Subtasks:** Mother task in needed

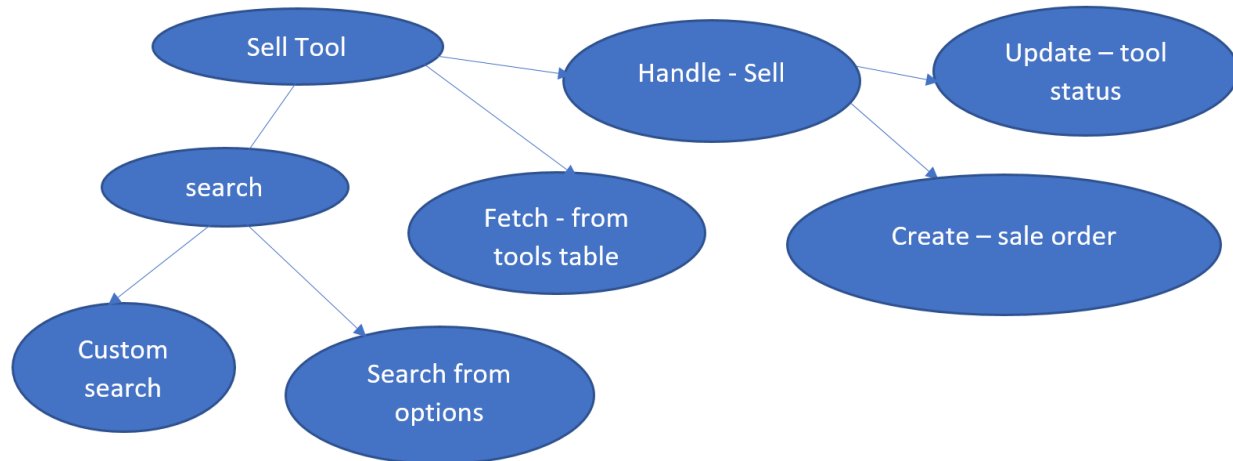


Abstract Code:

- When the **View repair status page** button is pushed on the main menu, view repair status page form is displayed
- Populate input fields in keyword search section (*start/end dates, tool category, power-source/sub-types, type*)
- Read all the tools which are “In-repair” status with key word search
- If clerk wishes to restrict results of the tool, then:
 - Use filter option on any combination of input (clerk names, sort by dates, repair cost, keyword description etc.)
 - Read all the tools which are “In-repair” status with key word search and restrictions applied using filters
 - Go to step 1
 - Else: go to step 1
- If clerk wishes to sort any of the field, then:
 - Clerk selects the required field (service/tool ID, short-description, repair start date, current repair end date, repair cost)
 - Go to step 1
 - Else: go to step 1
- Step 1: if clerk wants to override the “in-repair” status for any of the displayed tools, then:
 - Push on the ***fix now*** button
 - Repair end date of the tool changes to now() and returns back to available inventory and drops off the **service status page**
 - Else: Remain as it is

Sell tool

- **Lock types:** 1 read only from tools table, write operation to sale order table, read and write operation to tools table
- **Number of locks:** 4 (2 read and 2 write)
- **Enabling Conditions:** All lookups are enabled by any of the clerk's login
- **Frequency:** different frequency
- **Consistency (ACID):** Order is critical
- **Subtasks:** Mother task is needed

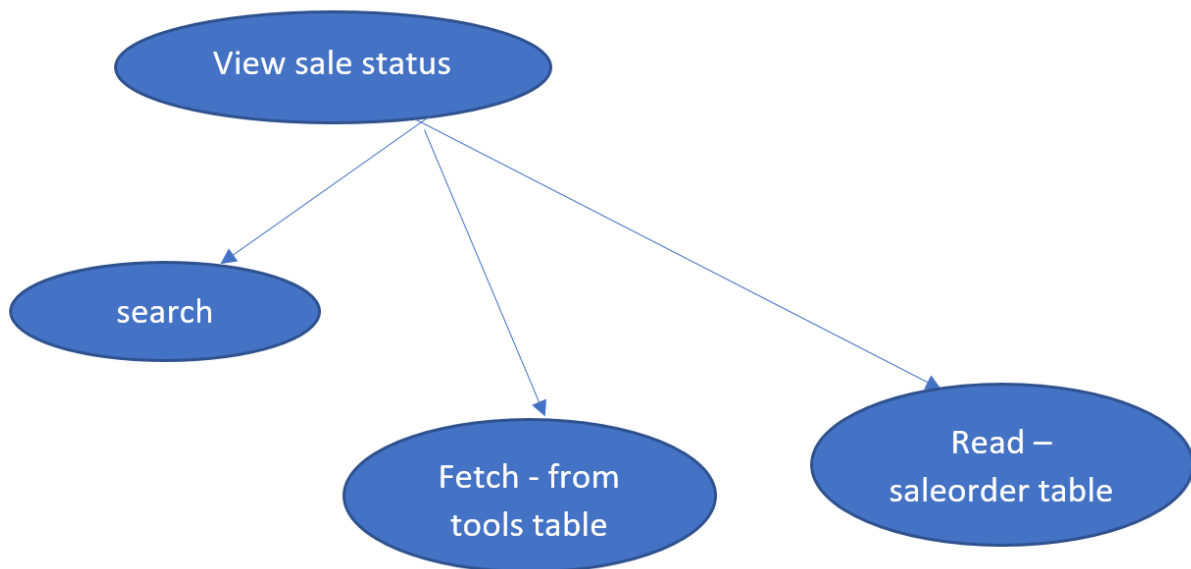
**Abstract Code:**

- When the ***sell tool*** button is pushed on the main menu, ***sell tool page form*** is displayed
- Populate input fields in keyword search section (*start/end dates, tool category, power-source/sub-types, type*)
- Read all the tools displaying description, rental and tool price with key word search
- If clerk wishes to restrict results of the tool, then:
 - Use filter option on any combination of input (rental price, deposit price, etc.)
 - Read all the tools which are available with key word search and restrictions applied using filters
 - Go to step 1
- Step 1: if clerk wants to sell tool for any of the displayed tools, then:
 - Push on the ***Sell tool*** button
 - Unique sale transaction number is created which tracks the tool number, customer who bought the tool, clerk who marked tool 'for sale', sale price, for sale date, and sale date
 - Else: Remain as it is

View sale status page

- **Lock types:** 2 read lookups (sale order and tools table)
- **Number of locks:** 2
- **Enabling Conditions:** All lookups are enabled by clerk's login

- **Frequency:** same frequency
- **Consistency (ACID):** Order is not very critical
- **Subtasks:** Mother task is needed



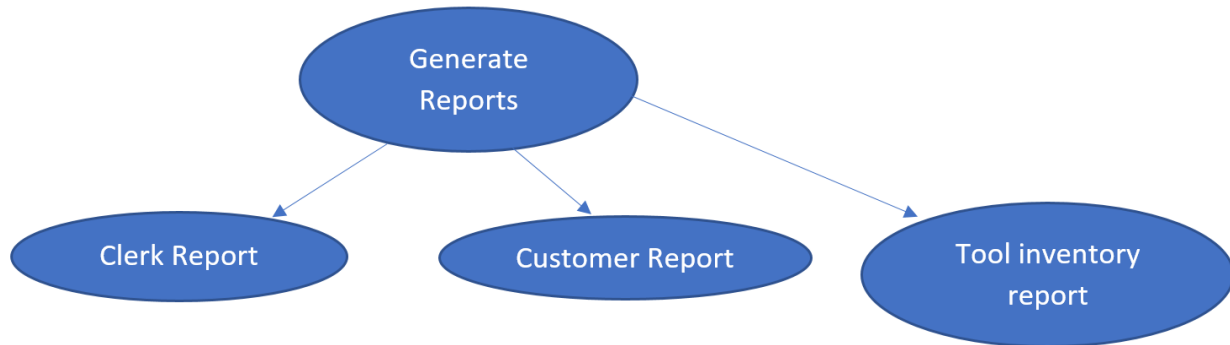
Abstract Code:

- When the **View sale status page** button is pushed on the main menu, **view sale status page form** is displayed
- Populate input fields in keyword search section (*start/end dates, tool category, power-source/sub-types, type*)
- Read all the tools which are under for sale status with key word search
- If clerk wishes to restrict results of the tool, then:
 - Use filter option on any combination of input (clerk names, sort by dates, repair cost, keyword description etc.)
 - Read all the tools which are “In-repair” status with key word search and restrictions applied using filters
- Else: Remain as it is
- Display the current status of each tool with tool id, description, sale price, sale date and clerk id
- If the current status of the tool is sold, then:
 - The tool is marked as sold in black back ground
 - Display customer name
- Else: The tool is marked as “For sale” in grey back ground

Generate Reports

- **Lock types:** 1 lookup page
- **Number of locks:** 1

- **Enabling Conditions:** All lookups are enabled by clerk's login
- **Frequency:** same frequency
- **Consistency (ACID):** Order is not critical
- **Subtasks:** Mother task is needed



Abstract Code:

- When the ***generate reports*** button is pushed on the main menu, **generate reports** form is displayed
- Display a page with clerk report, customer report and tool inventory report buttons

Generate Clerk Reports

- **Lock types:** 2 read lookup pages
- **Number of locks:** 2
- **Enabling Conditions:** All lookups are enabled by clerk's login
- **Frequency:** same frequency
- **Consistency (ACID):** Order is not critical
- **Subtasks:** Mother task is needed

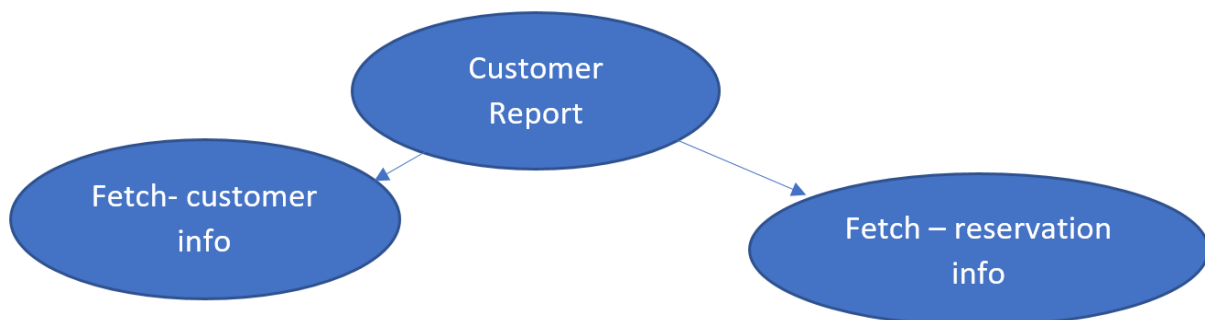


Abstract Code:

- When the ***clerk reports*** button is pushed on the generate reports form, **Clerk report** form is displayed
- Find clerk information
- Display name, email, hire date and number of the clerk
- Find pickups and drop-offs for the clerk
- Display pickup, drop-off and their sum in the report

Generate Customer Reports

- **Lock types:** 2 read lookup pages
- **Number of locks:** 2
- **Enabling Conditions:** All lookups are enabled by clerk's login
- **Frequency:** same frequency
- **Consistency (ACID):** Order is not critical
- **Subtasks:** Mother task is needed

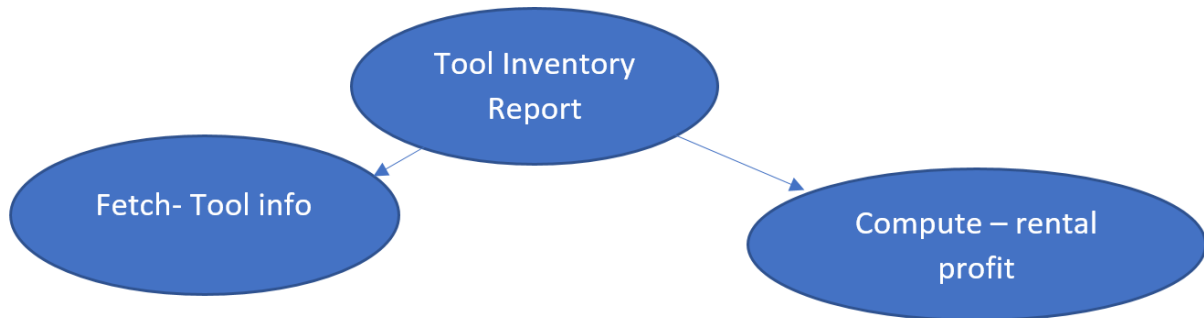
**Abstract Code:**

- When the ***customer reports*** button is pushed on the generate reports form, **Customer report** form is displayed
- Find customer information
- Display name, email, phone, profile link and number of the customer
- Find reservations made by customer
- Display reservation number and computed tool number

Tool inventory report

- **Lock types:** 2 read lookup pages
- **Number of locks:** 2

- **Enabling Conditions:** All lookups are enabled by clerk's login
- **Frequency:** same frequency
- **Consistency (ACID):** Order is not critical
- **Subtasks:** Mother task is needed



Abstract Code:

- When the ***tool inventory report*** button is pushed on the generate reports form, **tool inventory form** is displayed
- Populate the tool type options and display custom search option
- Find the information from tools table
- Display current status, description, rental profit, total cost and total profit