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Data Types

User		
Attribute	Data Type	Allow Null
Password	String	Not Null
Username	String	Not Null
Email	String	Not Null
FirstName	String	Not Null
MiddleName	String	Not Null
LastName	String	Not Null
Customer		
Attribute	Data Type	Allow Null
HomePhone_AreaCode	String	Not Null
HomePhone_Number	String	Not Null
HomePhone_Extension	String	Null
WorkPhone_AreaCode	String	Not Null
WorkPhone_Number	String	Not Null
WorkPhone_Extension	String	Null
CellPhone_AreaCode	String	Not Null
CellPhone_Number	String	Not Null
CellPhone_Extension	String	Null
PrimaryPhone	String	Not Null
Street	String	Not Null
City	String	Not Null
State	String	Not Null
Zip	String	Not Null

CardNumber	String	Not Null
Name	String	Not Null
CVC	Integer	Not Null
ExpirationMonth	Integer	Not Null
ExpirationYear	Integer	Not Null
Clerk		
Attribute	Data Type	Allow Null
DateofHire	Date	Not Null
EmployeeNumber	Integer	Not Null
TempPassword	String	Not Null
Reservation		
Attribute	Data Type	Allow Null
ToolNumbers	List of Integers	Not Null
ReservationNumber	Integer	Not Null
BookingDate	Date	Not Null
StartDate	Date	Not Null
EndDate	Date	Not Null
PickupClerk_Username	String	Null
DropoffClerk_Username	String	Null
CustomerUsername	String	Not Null
TotalRental	Double	Not Null
Total Deposit	Double	Not Null
SaleOrder		
Attribute	Data Type	Allow Null
ToolNumbers	List of Integers	Not Null
ForSaleDate	Date	Not Null
SoldDate	Date	Not Null
SellClerkUsername	String	Not Null
CustomerUsername	String	Not Null

Service Order		
Attribute	Data Type	Allow Null
ToolNumbers	List of Integers	Not Null
EnterClerkUsername	String	Not Null
StartDate	Date	Not Null
EndDate	Date	Not Null
Cost	Double	Not Null
Status	String	Not Null
Sale Order		
Attribute	Data Type	Allow Null
ToolNumbers	List of Integers	Not Null
SoldDate	Date	Not Null
ConfirmationNum	String	Not Null
ForSaleDate	Date	Not Null
SellPrice	Double	Not Null
Tool		
Attribute	Data Type	Allow Null
ToolNumbers	List of Integers	Not Null
Width	Double	Not Null
OriginalCost	Double	Not Null
Length	Double	Not Null
Material	String	Null
Manufacturer	String	Not Null
Weight	Double	Not Null
Power Tool		
Attribute	Data Type	Allow Null
AmpRating	Double	Not Null
MinRpmRating	Double	Not Null
MaxRpmRating	Double	Null
VoltRating	Double	Not Null

Power Mixer		
Attribute	Data Type	Allow Null
MotorRating	Double	Not Null
DrumSize	Double	Null
Power Saw		
Attribute	Data Type	Allow Null
BladeSize	Double	Not Null
Power Sander		
DustBag	Boolean	Null
Power Generator		
Attribute	Data Type	Allow Null
PowerRating	Double	Not Null
Power Drill		
Attribute	Data Type	Allow Null
AdjustableClutch	Boolean	Not Null
MinTorqueRating	Double	Not Null
MaxTorqueRating	Double	Null
Power Air Compressor		
Attribute	Data Type	Allow Null
PressureRating	Double	Null
TankSize	Double	Not Null
Garden Tool		
Attribute	Data Type	Allow Null
HandleMaterial	String	Not Null
Pruning Tool		
Attribute	Data Type	Allow Null
BladeLength	Double	Not Null

BladeMaterial	Double	Null
Striking Tool		
Attribute	Data Type	Allow Null
HeadWidth	Double	Not Null
Digging Tool		
Attribute	Data Type	Allow Null
BladeLength	Double	Not Null
BladeWidth	Double	Null
Rake Tool		
Attribute	Data Type	Allow Null
TimeCount	Double	Not Null
Wheelbarrow Tool		
Attribute	Data Type	Allow Null
BinMaterial	String	Not Null
BinVolume	Double	Null
WheelCount	Integer	Not Null
Hand Tool		
Screw Driver		
Attribute	Data Type	Allow Null
ScrewSize	Double	Not Null
Socket		
Attribute	Data Type	Allow Null
DriveSize	Double	Not Null
DeepSocket	Double	Null
SaeSize	Double	Not Null
Ratchet		
Attribute	Data Type	Allow Null

DriveSize	Double	Not Null
Piler		
Attribute	Data Type	Allow Null
Adjustable	Boolean	Not Null
Hand Gun		
Attribute	Data Type	Allow Null
GaugeRating	Double	Not Null
Capacity	Double	Not Null
Hand Hammer		
Attribute	Data Type	Allow Null
AntiVibration	Boolean	Not Null
Ladder Tool		
Attribute	Data Type	Allow Null
WeightCapacity	Double	Null
StepCount	Integer	Null
Straight Ladder		
Attribute	Data Type	Allow Null
RubberFeet	Boolean	Null
Step Ladder		
Attribute	Data Type	Allow Null
PailShelf	Boolean	Null
Category		
Attribute	Data Type	Allow Null
Name	String	Not Null
Power Source		
Attribute	Data Type	Allow Null

Name	String	Not Null
Subtype		
Attribute	Data Type	Allow Null
Name	String	Not Null
Suboption		
Attribute	Data Type	Allow Null
Name	String	Not Null

Business Logic Constraints

User

- If no Customer exists in the system with that username, then a new registration interface will prompt the user
- Customers are required to select the primary phone prior to finishing the registration process
- The Customer's Address should contain zip code with hyphens
- Registration of a username that already exists should present error messages
- If the Clerk tries to login as a Customer or with the incorrect password, error messages should be displayed
- If the credit card information does not exist in the Customer's profile, the Clerk is prompted to enter the Customer's credit card number,

Tool

- All accessories must be paired at the time of rental and/or sale with their applicable power tool.
- Creation of full description full-description: "[dimensions]+[sub-option]+[sub-type]+ [...other descriptors...]+[manufacturer]" for each sub type
- Formatting and displaying of units will be done by the business logic. The database will store items in a default unit then convert as needed. (See section of spec about tool dimensions for details)

Reservation / Profile / Tool Availability

- Sorting of names and making all columns sortable
- Prompt for unique search if more than 10 tools exist for a reservation
- Daily rental prices are 15% of the original purchase price rounded up to nearest cent. Deposit prices are 40% of the original purchase price rounded up to nearest cent. Sale prices are 50% of the original purchase price rounded up to nearest cent.
- Once a specific tool available inventory reaches zero, e.g. (1) 18.0V cordless drill available in the inventory, Customer requests (2), an error message should be displayed to Customer.
- 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

- The rental price is calculated as the sum of the rental prices for all tools rented, multiplied by the number of days over which they are rented. The total deposit price is the sum of the deposits required for each individual tool. Both totals: rental and deposit should be itemized separately as shown
- No reservation should be successful if any of the tools being reserved are already reserved over the same time period
- 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.)
- When the Pick-up Reservation form is loaded, it will automatically show all reservations which are waiting to be picked up
- Every tool inserted should have an abbreviated description, an original purchase price, rental price of 25% of purchase price (per day), a deposit amount of 40% of purchase price (per reservation), and a detailed information applicable to the specific tool. The deposit and rental prices are automatically filled for the Clerk based on the purchase price entered.
- When batteries are added to a cordless power tool, the tool's power requirement is based on the battery information entered to the system as accessories. In other words, when an 18.0 V battery is entered on a cordless tool, the tool is inherently expected to run on 18.0V. The clerk should not be allowed to type in A/C Voltage of 120V and select 18V for D/C Cordless tool. They must be guided to select cordless first.
- The Clerk should not be allowed to choose a sub-type without first selecting a category and power-source
- Once the end date of service passes midnight or if the Clerk hits the 'fix-me' button, that tool is automatically added back to the 'available' inventory.
- The same functionality for locating a tool to repair by dates, tool category, power-source/sub-types, and/or keyword applies in this interface. If an service order exists for a specific tool, a Clerk cannot enter a duplicate service request on the same tool (even in the future).
- Status is depicted as different colors, in-repair red and green fix now button
- Additionally, Clerks can restrict the results of the tool status page by any combination of input: filter by Clerk usernames, sort by dates, repair cost < or > \$X.XX, keyword description
- As new tools are added to the inventory, old tools need to be taken out of circulation. Prior analysis has shown the cost to maintain older tools outweighs the profits. When tools are rented 50 times, they are automatically marked "for-sale" by the system, therefore the number of times a tool is rented needs to be tracked. As soon as the 50th rental is returned, that tool is automatically marked 'forsale' in the store at 50% of the original purchase price (rounded up to nearest cent).
- In the case of the automated 50th entry, the 'clerk' in this case will be "Jill Watson" (jwatson@tools4rent.com, clerk_id=1, doh: 11/10/2016) the system's automated virtual clerk.
- the actual sale date will be filled in whenever the Customer purchases a tool marked 'for-sale' on the Customer's "Purchase Tool" UI. If a tool has not been previously marked 'for-sale' by a clerk, the customer cannot purchase it.
- On View Sale status page, every tool should only have a status: 'for-sale' (GREY), or 'sold' (BLACK) showing applicable colors in the user interface. All columns on the tool status page are sortable (ascending/ descending) by any field the user selects (sale ID, tool ID, colored tool status (either 'for-sale' or 'sold'), short-description (aggregate), username of Customer who bought tool (if sold), fsale price, sale date (if sold), Clerk who marked tool 'for-sale')

- The report lists the Clerk employee number, full name, email, hire date (format: MM/DD/YYYY), the number of pick-ups handled this month, the number of dropoffs handled this month, and the sum of the two. It is ordered by the total number of pick-ups and drop-offs.
- Tool inventory Report status colors. Green for available, yellow for rented, red for in repair, grey for sale and black for sold
- A service order cannot be placed over an existing rental reservations, sale orders or service orders for same date.
- A sale order cannot be placed over an existing reservations, sale orders or service orders for same date. (no duplicates)
- The short-description for all tool-detail links in tables is based on aggregate of data: [power-src]+[sub-option]+[sub-type].
- o If power source is 'Manual' it is not displayed in the UI tool descriptions (links/tables) since it is inferred.
- The full-description is highly variable based on the tool instance: "[dimensions]+[power-src]+[sub-option]+[sub-type] + [...other descriptors...] + [manufacturer]"

Task Decomposition with Abstract Code (AC)

Main Menu

Abstract Code

- Customer
 - Show "Login", "View Profile", "Check Tool Availability", "Make Reservation", "Purchase Tool", and "Logout" link
- Clerk
 - "Login", "Pick-Up", "Drop-Off", "Add New Tool", "Service Tool", "Service Status", "Sell Tool", "Sale Status", "Reports" and "Logout"
- Upon
 - User
 - Click **Login** button - Jump to the **Login** task
 - Click **Logout** button - Invalidate login session and go back to the **Login** form
 - Customer
 - Click **View Profile** button - Jump to the **View Profile** task
 - Click **Check Tool Availability** button - Jump to the **Check Tool Availability** task
 - Click **Make Reservation** button - Jump to the **Make Reservation** task
 - Click **Purchase Tool** button - Jump to the **Purchase Tool** task
 - Click **Logout** button - Jump to **Login** form
 - Clerk
 - Click **Pick-up Reservation** button - Jump to the **Pick-Up Reservation** task
 - Click **Drop-off Reservation** button - Jump to the **Drop-Off Reservation** task

- Click **Add New tool** button - Jump to the **Add New Tool** task
- Click **Service Order** button - Jump to the **Service Order / Repair Tool** task
- Click **Service Status** button - Jump to the **Service Status** task
- Click **Sell Tool** button - Jump to the **Sell Tool** task
- Click **Sale Status** button - Jump to the **Sale Status** task
- Click **Reports** button - Jump to the **Generate Report** task
- Click **Logout** button - Jump to Login form

Login

Task Decomposition

Lock Types: 1 read only lock for username (including password)

Number of Locks: 1

Enabling Conditions: when click on login button

Frequency: medium (username has higher frequency to get it then get the password attached to this user and compare)

Consistency (ACID): order important

SubTasks: Mother Task is not needed. No decomposition needed. click on customer button then enter username and password to check if this user exists or not then match password in database with submitted one.



Abstract Code

- User clicks **Login** button from **Main Menu**
- Requires user to enter both *username* and *password*, before submission; Displays error if either field is empty.
- User select **Customer** radio button
 - User enters *username* and *password*
 - When User clicks **Enter** button
 - Find Username and verify password
 - If Username does not exist
 - Go to **Registration** form
 - If Password does not match,
 - Redirect back to **Login**, Display prompt for user to enter password again
 - If Password matches
 - Go to **Main Menu**
- User selects **Clerk radio button**
 - User enters *username* and *password*

- When User clicks **Enter** button
- Find Username in Clerk.Username
- Find Username in Customer.Username
 - If found
 - Display error message
- If Username not found in either
 - Display error message
- If Password does not match,
 - Redirect back to **Login**, Display prompt for user to enter password again
- If Password matches
 - If TempPassword is not NULL
 - Display **Change Password** form
 - User clicks **Save button**
 - Update Password in Client
 - Go to **Main Menu**

Registration

Task Decomposition

Lock Types: 1 write lock for registration, that affects all inputs in form of registration. Or you can consider a lock for each data column that is in the registration form.

Number of Locks: 1

Enabling Conditions: When hit registration page.

Frequency: low frequency.

Consistency (ACID): Not critical

SubTasks: Mother Task is not needed. No decomposition needed.

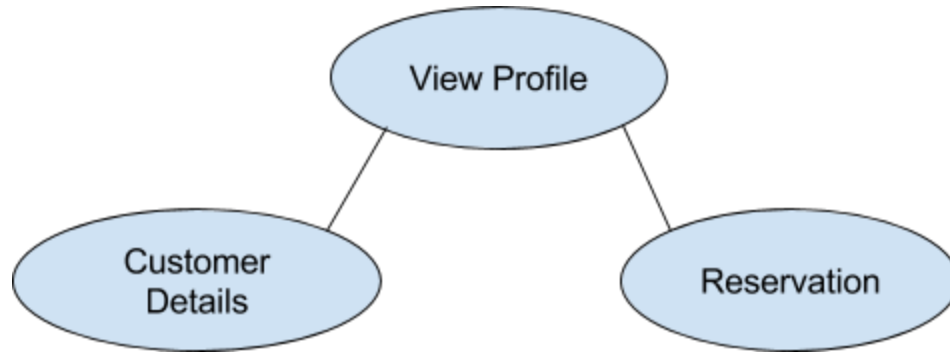


Abstract Code

- User clicks **Login** on the **Customer Login** form with incorrect user information or clicks **Create Account** button
- User enters *username, email address, full name (first, middle, last), home phone, work phone, cell phone, address (City, State, Zipcode), password (twice)*
- User enters Credit Card details, *credit card name, credit card number, expiration month, expiration year, CVC*
- Validate that at least one primary phone number is entered.
- User clicks **Register** button
 - If the username exists
 - Prompt user to pick another username
 - Else
 - Update Customer, Phone, and CreditCard
 - Go to **Login** form

View Profile

Task Decomposition



Lock Types: 2 read-only lookups of Customer Details and Reservation for a Customer.

Number of Locks: 2

Enabling Conditions: When accesses view profile page.

Frequency: low (same frequency)

Consistency (ACID): Not critical.

SubTasks: All tasks must be done but can be done in parallel. Mother task coordinates retrieving data at same time and displaying together.

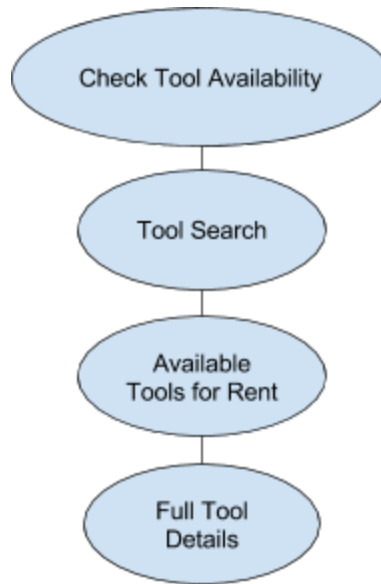
Abstract Code

- User clicks on **View Profile** button from the **Main Menu**
- Run the **View Profile** task: query for information about the user and his/her profile where \$username is the current user using the HTTP Session/Cookie
 - **View Customer** task
 - Find the User using the Username; Display the email, full name
 - For each Phone under this Customer.Username
 - Display the phone number
 - Find Address using Customer.Username; Display address (city, street, state, zip)
 - **View Reservations** task
 - Find rental history
 - For each Reservation for the Customer.Username
 - Display Reservation Number, StartDate, EndDate,
 - Calculate Number of Days from StartDate/EndDate
 - Find Tool based on Tool.Number; Display Name, Deposit Price, Rental Price
 - Find Clerk based on Drop-off Clerk.Number, Pick-up Clerk.Number; Display Clerk.Name for both Pick-Up and Drop-Off clerk

- Users clicks **Close** button, go to **Main Menu** form

Check Tool Availability

Task Decomposition



Lock Types: 1 read only lock for Tool.. Multiple locks for Tool Search and/or Full Details.

Number of Locks: 1+; Additional locks may be required in Tool Search or Full Details task

Enabling Conditions: When clicks search or click Tool title.

Frequency: Medium frequency

Consistency (ACID): Non critical

SubTasks: All tasks must be done, but can be done in parallel. Mother task is required to coordinate subtasks.

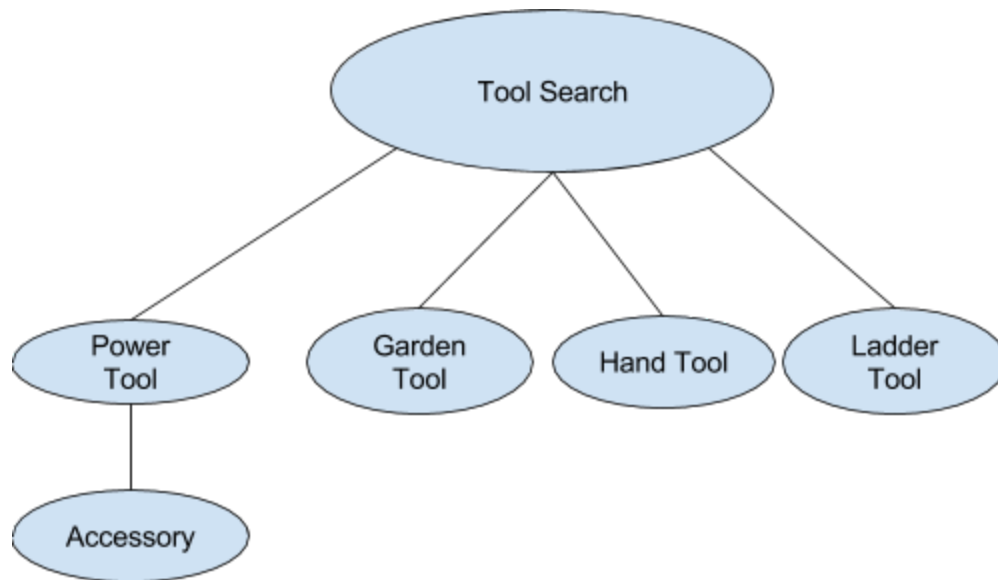
Abstract Code

- User clicks **Check Availability** link
- User inputs *Start Date, End Date, Keywords, Power Source, Sub-Type* and/or *Type*
- Run **Tool Search** task where `Reservation.ToolNumber` equals `ToolNumbers` from search and `Reservation.StartDate...EndDate` not equal to *Start Date, End Date*
 - If more than 10 tools are returned
 - Display prompt for user to specify more criteria
 - Else
 - For each Tool; Display Tool Number, Description (aggregate), Rental Price, Deposit Price
- User clicks **Tool** details link,
 - Find Tool using `Tool.Number`; Display Description, Deposit Price, Rental Price

- Run **Full Tool Details** task; Display Tool ID, Tool Type, Short Description, Full Description (concatenated) , Deposit Price, Rental Price.
- Users clicks **Close** button, go to **Main Menu** form

Tool Search

Task Decomposition



Lock Types: 5 read only locks for the main types of tool searches including accessories.

Number of Locks: 2 - 5+; Depends on the type of search

Enabling Conditions: When user clicks Search

Frequency: High frequency; Search button is located on several pages

Consistency (ACID): Not critical

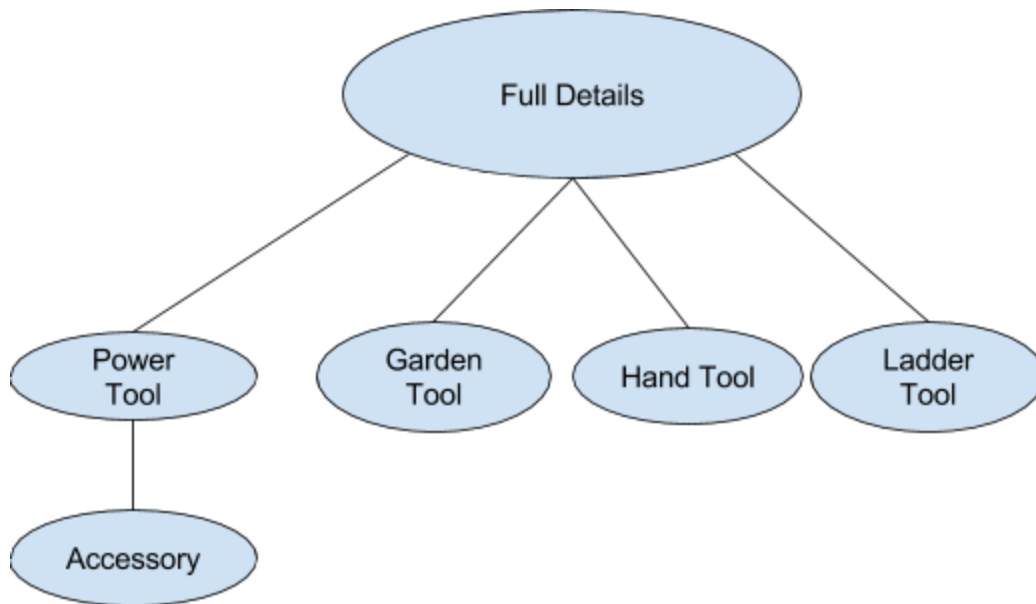
SubTasks: All tasks must be done, but can be done in parallel. Mother task is required to coordinate subtasks.

Abstract Code

- * This task encompasses the Search logic included in many other task
- User clicks **Search** button
 - For each Tool that matches the ToolNumber.ToolType, PowerSource, SubTypes, and/or keyword search.
 - Return Tool.Number, Tool.Name, RentalPrice, and DepositPrice

Full Tool Details

Task Decomposition



Lock Types: 5 read only locks for the main types of tool searches including accessories.

Number of Locks: 2 - 5+; Depends on the type of search

Enabling Conditions: when hit tool details

Frequency: Medium frequency; Full details link located on several pages

Consistency (ACID): Not critical

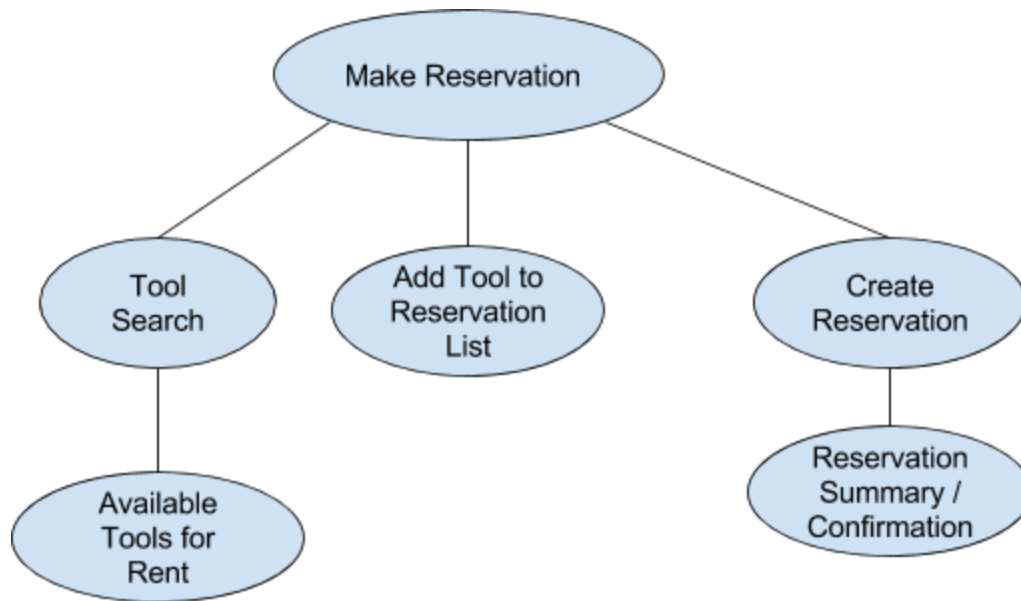
SubTasks: All tasks must be done, but can be done in parallel. Mother task is required to coordinate subtasks.

Abstract Code

- User clicked button that requires detailed description
- Find Hand, Garden, Ladder, Power, etc. (including accessories, materials, etc) based on Tool.Number; Display full description

Make Reservation

Task Decomposition



Lock Types: 1 read only lock for Tool. Multiple locks for Tool Search and/or Full Details. 1 write lock for writing reservation. 1 read only lock for Reservation Summary, and Confirmation.

Number of Locks: 3+; Additional locks may be required in Tool Search or Full Details task

Enabling Conditions: User clicks search, calculate total, submit, or add.

Frequency: Medium

Consistency (ACID): Critical, because a reservation must include all tools added only if availability is guaranteed.

SubTasks: All tasks must be done, but can't be done in parallel, as search needs to be done first, then show available tools to rent, finally create reservation and show the summary and confirmation after summary. Mother task is required to coordinate make reservation and creating reservation.

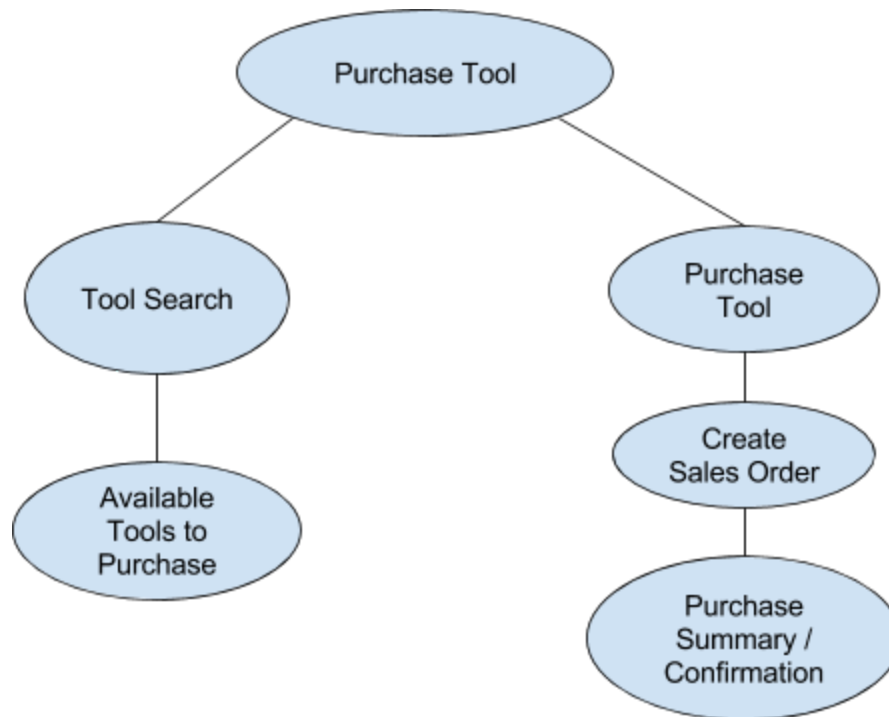
Abstract Code

- User clicks **Make Reservation** button from **Main Menu**
- User enters *Start Date, End Date, Keywords, Power Source, Sub-Type* and/or *Type*
- Run **Tool Search** task where Reservation.ToolNumber equals ToolNumbers from search and Reservation.StartDate...EndDate not equal to *Start Date, End Date*
 - For each Tool; Display Tool Number, Short Description, Rental Price, Deposit Price
- User clicks **Add** button

- If less than 11 tools already added
 - If tool count reaches 0
 - Display error message
 - Else
 - Add tool to reservation list section
- Else
 - Display error message for user to reduce the number of tools in the current reservation to 10.
- If the tool is being returned within next 24 hours
 - Display info message
- User clicks **Remove button**
 - Remove item from reservation list section
- User clicks **Calculate Total** button
 - Run **Reservation Summary** task
 - Displays Reservation Dates, Number of Days
 - Calculate total deposits, and rental price; Display Total Deposit, Rental Price
 - User clicks **Submit** button
 - For each tool to be reserved, find ToolNumber
 - If ToolNumber is not in Reservation with open EndDate
 - Write new Reservation record, return ReservationNumber
 - Update Reservation Summary to be Reservation Confirmation
 - Display ReservationNumber
 - Else
 - Redirect User to **Make Reservation** form
 - Remove item from Tools Added to Reservation list
 - Update Available Tools For Rent list
 - User clicks **Reset button**
 - Reset values in **Make Reservation** form to initial state value
- Go to **Main Menu** form

Purchase Tool

Task Decomposition



Lock Types: 1 read only lock for Available Tools. Multiple locks for Tool Search and/or Full Details. 1 write lock for writing Sale Order. 1 read only lock for Purchase Summary, and Confirmation.

Number of Locks: 3+; Additional locks may be required in Tool Search or Full Details task

Enabling Conditions: Click Purchase Tool

Frequency: low

Consistency (ACID): Critical since a tool purchase must create a sale order when confirmed for any tool purchased.

SubTasks: All tasks must be done, but can't be done in parallel, as check availability needs to be done first then show available tools to purchase then click on which ones to purchase then a sale confirmation would appear. Mother task is required to coordinate subtasks.

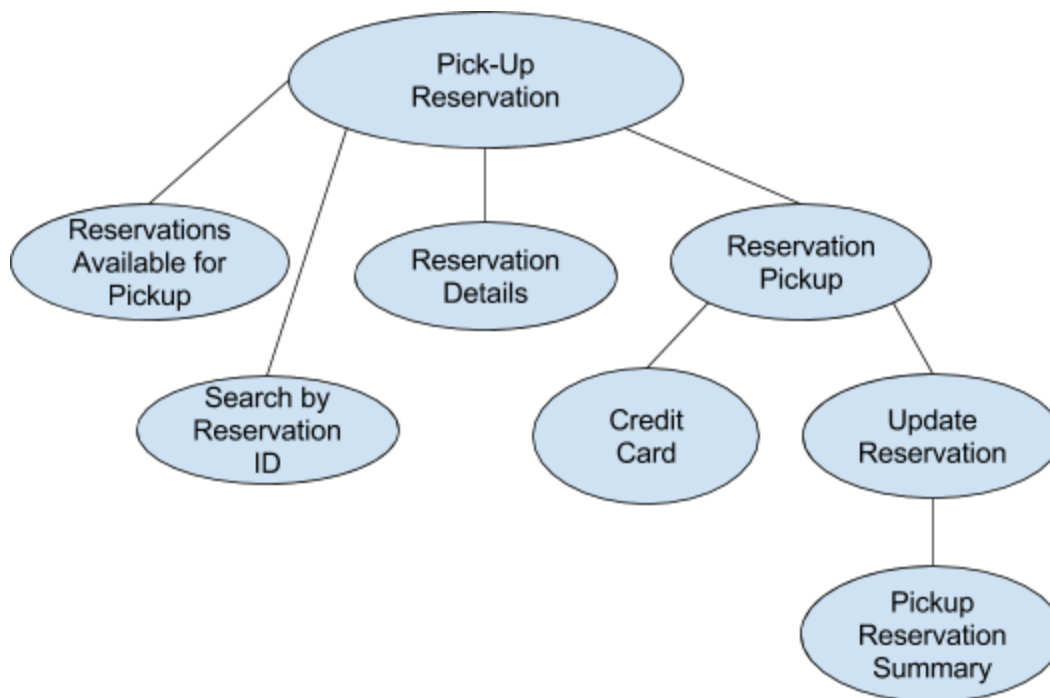
Abstract Code

- User clicks **Purchase Tool** button from **Main Menu**
- User enters *Keyword, Type, Sub-Type, and/or Power Source*
- User clicks **Search** button
 - Run **Tool Search** task: find tools w/ no SoldDate in SaleOrder
 - User clicks **Purchase Tool** button
 - Add tool to purchase list

- User clicks **Submit** button
 - Find each SaleOrder for ToolNumber
 - Find Credit Card using Customer.Username
 - Process CreditCard.Number for Customer.Username
 - Run **Purchase tool task**
 - Update SoldDate -> now() and Customer.Number for SaleOrder
 - Run **Purchase Confirmation task**
 - Display ConfirmationNumber
- Go to **Main Menu** form

Pick-Up Reservation

Task Decomposition



Lock Types: 4 read only locks for Reservation, Customer, CreditCard and Tools. 1 write only lock for Reservation

Number of Locks: 5

Enabling Conditions: When user click on Pickup tools or confirm.

Frequency: High

Consistency (ACID): Critical, Credit Card update must be completed and then reservation can be created.

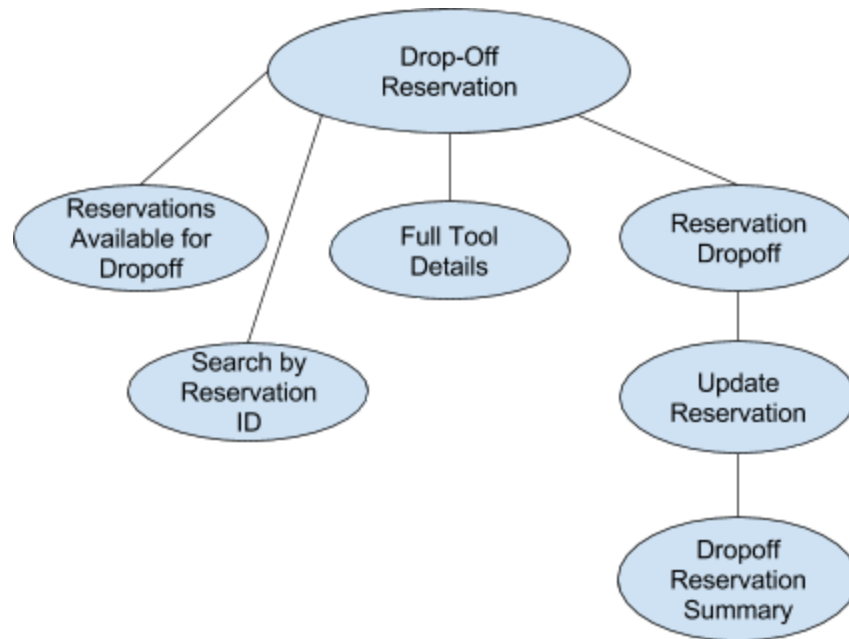
SubTasks: All tasks must be done, but can't be done in parallel, as all reservation ready to pick up show, then searching for selected reservation to show details, then check for credit card info, then show summary of reservation. Mother task is required to coordinate subtasks.

Abstract Code

- User clicks **Pick-Up button** from **Main Menu**
- Run **Pick-Up Reservation task**
 - For each Reservation where Reservation.EndDate is NULL
 - Find the Customer.Name from Customer using Reservation.CustomerNumber
 - Display ReservationNumber, CustomerNumber, CustomerName, StartDate, and EndDate
- User clicks **ID link** or enters ID and clicks **Pick-Up** button
- Run **Pick-Up Reservation Summary task**
 - Find the Customer.name from Reservation.CustomerNumber
 - Display TotalDeposit, CustomerName, TotalRentalRice
 - Find CreditCard with Reservation.CustomerNumber
 - If User clicks **New** button
 - Run **Credit Card Information task**
 - User enters *credit card name, credit card number, CVC, expiration month, and expiration year*
 - If user clicks **Confirm Pick Up** button
 - Insert Customer.Number, CreditCardName, CreditCardNumber, CVC, ExpirationDate in CreditCard
 - Insert Customer.Number, CreditCard.Number in CustomerCreditCard
- User clicks **Confirm Pick Up** button
- Run **Rental Contract task**
 - Update Reservation with Pick-Up clerk's Clerk.Number, BookingDate -> now()
 - Display Pick-UpClerkName, CustomerName, CreditCard XXXX, Start Date, End Date
 - For each Tool.Number in Reservation
 - Find Tool.Name, DepositPrice, RentalPrice
 - User clicks **Print Contract** button
 - Go to **Main Menu** form

Drop-Off Reservation

Task Decomposition



Lock Types: 3 read only locks for Reservation, Customer, and Tools. 1 write lock on Reservation.

Number of Locks: 4

Enabling Conditions: When user clicks Dropoff reservation or Search.

Frequency: High

Consistency (ACID): Critical, gets all reservation ready for drop off, then search by id or get more details if needed (those are same not critical), then show summary reservation and final receipt.

SubTasks: All tasks must be done, but can't be done in parallel, as all reservation ready to drop off appears, then search by id or get more details of certain reservation appears, then summary of reservation and final receipt. Mother task is required to coordinate subtasks.

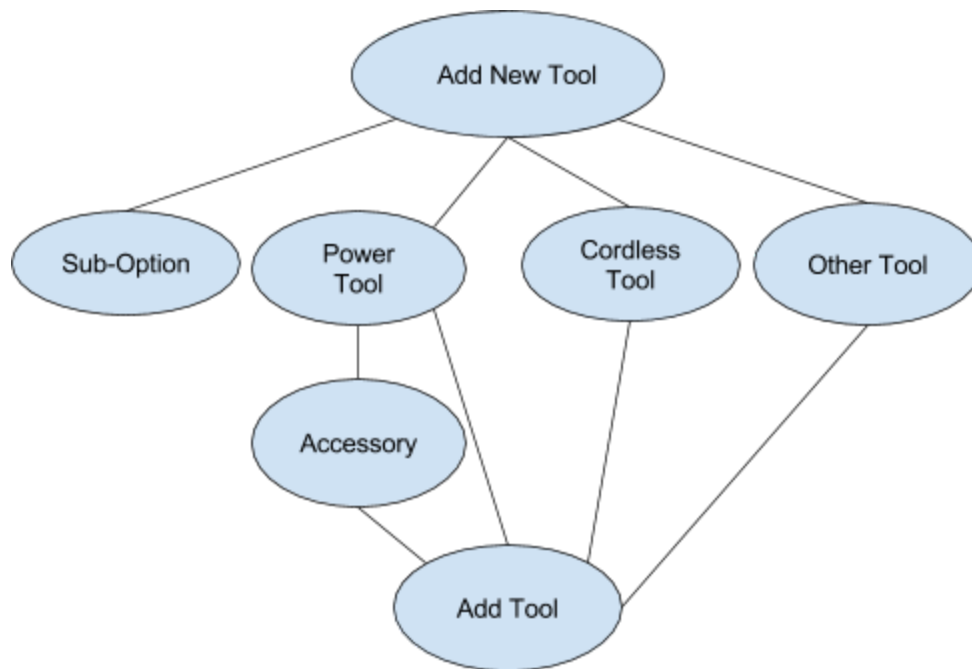
Abstract Code

- User clicks **Drop-Off button** from **Main Menu**
- Run **Drop-Off Reservation** task
 - For each Reservation with Reservation.DropOffClerk is NULL

- Find the Customer.Name from Reservation.CustomerNumber
 - Display, ReservationNumber, CustomerNumber, CustomerName, StartDate, and EndDate
- User clicks **ID link** or enters ID and clicks **Drop-Off button**
- Run **Drop-Off Reservation Summary** task
 - Find the Customer.Name from Reservation.CustomerNumber
 - Display TotalDeposit, CustomerName, TotalRentalPrice
 - Calculate TotalDue; Display TotalDue
- Run **Rental Contract** task
 - Update Reservation with Drop-Off clerk's Clerk.Number
 - Display Drop-OffClerk.Name, CustomerName, CreditCard XXXX, Start Date, End Date
 - For each Tool.Number in Reservation
 - Find Tool.Name, DepositPrice, RentalPrice
 - User clicks **Tool Name** link
 - Run **Full Tool Details** task
 - User can clicks **Print Contract** button or **Close** button
 - Go to **Main Menu** form

Add New Tool

Task Decomposition



Lock Types: 6+ write only locks, for tool, power source, and other related entities for the specified tool.

Number of Locks: 6+

Enabling Conditions: When user clicks add new tool

Frequency: Low

Consistency (ACID): Critical, when adding tool since all related attributes must be created all at the same time.

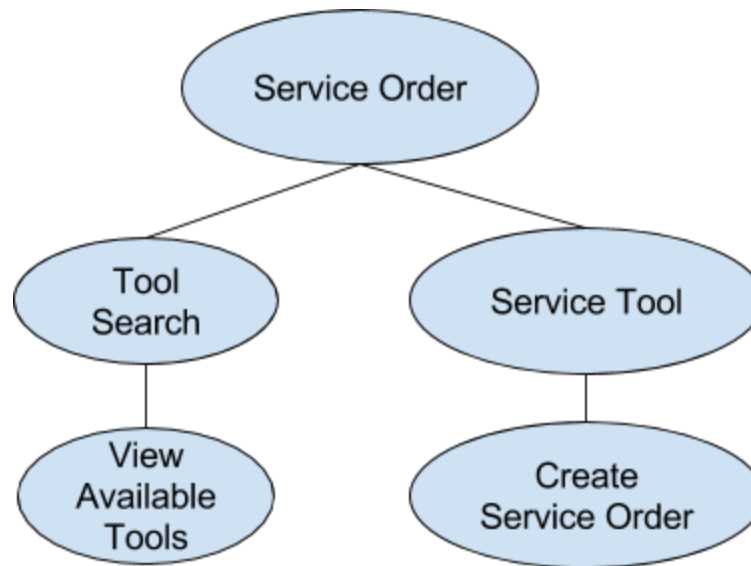
SubTasks: Mother task coordinates subordinates.

Abstract Code

- User clicks **Add Tool** from **Main Menu**
- User selects *Type*
- Run **Sub-Type/Sub-Option** task
 - Find Sub-Type based on Type; Populate Sub-Type menu
 - Validate that tool type and power-source are selected first before allowing sub-type and sub-options
 - Find Sub-Option based on Type, Sub-Type; Populate Sub-Option menu
- User enters *Purchase Price*
- Calculate the *Deposit Price and Rental Prices*
- User select **Hand Tool** radio button
 - Update menu options
 - User enters *Manufacturer, Width, Width Fraction, Width Unit, Length, Weight, Length Fraction, Length Unit, Drive/Chuck Size (if applicable)*
- User select **Power Tool** radio button
 - Find Power Source based on Type, Sub-Type; Populate Power Source menu
 - Update menu options
 - User enters *Power :Source, Gauge Unit, Capacity Unit, A/C Volt Rating, Power Generated, Power Fraction, Power Unit, Torque Min/Max, Pressure Min/Max, Speed Min/Max*
 - User enters *Power Tool Accessory Quantity, Description*
 - User clicks **Add Accessory** button
 - Add another accessory input fields
 - Validate User enters multiple speed for variable speed devices and one speed for single speed devices
- User select **Cordless Tool** option
 - Update menu options
 - User enters *Battery Type, Quantity, D/C Volt Rating*
- Convert measurements
- Validate all fields have values based on type
- User clicks **Add Tool** button
 - Insert Tool price, weight, etc. into Tool
- Go to **Main Menu** form

Service Order / Repair Tool

Task Decomposition



Lock Types: 2 readonly locks and 1 write lock for create Service Order.

Number of Locks: 3+; Additional locks may be required in Tool Search

Enabling Conditions: When user clicks Search or Service Tool

Frequency: the first two has higher frequency

Consistency (ACID): Critical, the create service order depends on getting available tools and search for tool.

SubTasks: Mother task coordinates. Tool search must be completed before Viewing Tools. Also, Service Tool task must be completed before creating Service Order.

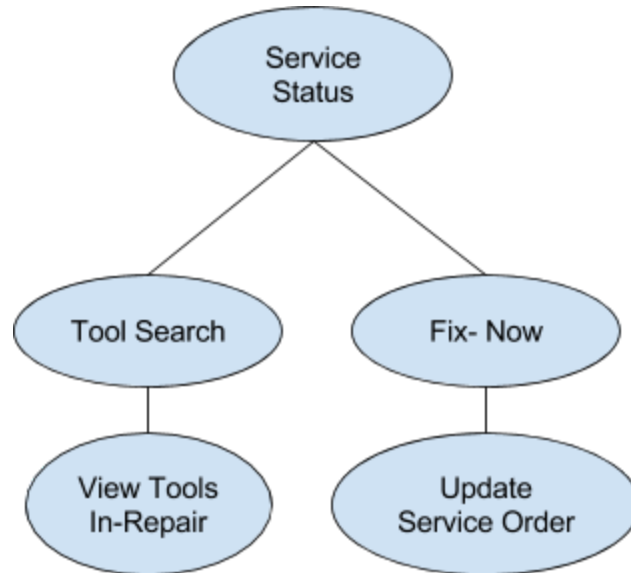
Abstract Code

- User clicks **Repair Tool** from **Main Menu**
- User enters *StartDate, EndDate, Keyword, Type, Power Source, Sub-Type*
- Run **Tool Search** task: where tools not in `ServiceOrder.ToolNumber <> Tool.Number` or `ServiceOrder.ToolNumber == Tool.Number` and `EndDate <> Null`
 - For each Tool
 - Display ToolNumber, Description, Rental Price, and Deposit Price
- User clicks **Service Tool** button
 - Update list of tools to service
- User enters *Tool ID*
 - Validate that tool does not have a service order
- User enters *Service Cost*
- User clicks **Confirm** button
 - Run **Service Tool** task

- Create ServiceOrder record with ClerkNumber, StartDate, Cost
- Go to **Main Menu** form

Service Status

Task Decomposition



Lock Types: 2 read only locks and 1 read write lock for update Service Order

Number of Locks: 3; Additional locks may be required in Tool Search

Enabling Conditions: When user clicks Search

Frequency: Medium

Consistency (ACID): Critical for updating Service Order

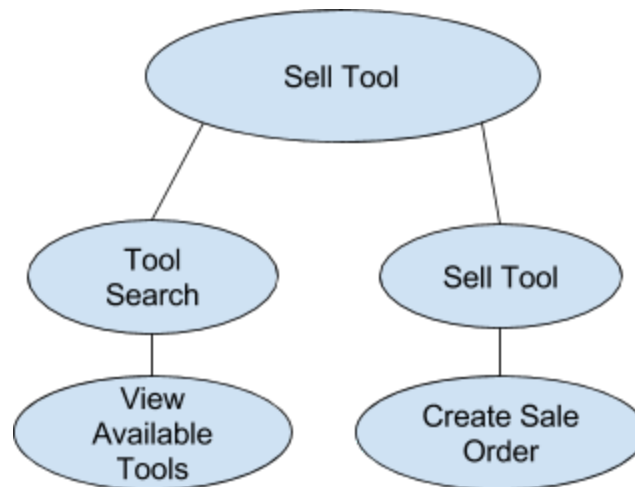
SubTasks: Mother task coordinates. Tool search must be completed before Viewing Tools. Also, Fix Now task must be completed before updating Service Order.

Abstract Code

- User clicks **Service Status** button from **Main Menu**
- User enters *StartDate, EndDate, Keyword, Type, Power Source, Sub-Type*
- Run **Tool Search** task: where ServiceOrder.EndDate is NULL
 - Display ServiceNumber, Status, ToolNumber, Description, StartDate, EndDate RepairCost, Clerk.Name
- User clicks **Fix Now? Button**
 - Update EndDate to now(), ClerkNumber to current Clerk
- Users clicks **Close** button, go to **Main Menu** form

Sell Tool

Task Decomposition



Lock Types: 2 read only locks and 1 write lock for create Sale Order

Number of Locks: 3+; Additional locks may be required in Tool Search

Enabling Conditions: User clicks Search or clicks Sell Tool

Frequency: Low; Tool search and view available tools same frequency, while create sale order higher.

Consistency (ACID): Critical for create Sale Order.

SubTasks:

Abstract Code

- User clicks on **Sell Tool** button from **Main Menu**
- User enters *StartDate, EndDate, Keyword, Type, Power Source, Sub-Type*
- Run **Tool Search** task: where count of Reservation.EndDate is greater than or equal to 50
 - For each Tool
 - Display ToolNumber, Description, RentalPrice, DepositPrice
- User clicks **Sell Tool**
 - Create SaleOrder, with ToolNumber, ForSaleDate
- Users clicks **Close** button, go to **Main Menu** form

Sale Status

Task Decomposition



Lock Types: 2 read only locks for Tools and Sale Orders.

Number of Locks: 2

Enabling Conditions: When user clicks Search button

Frequency: Low

Consistency (ACID): Not critical

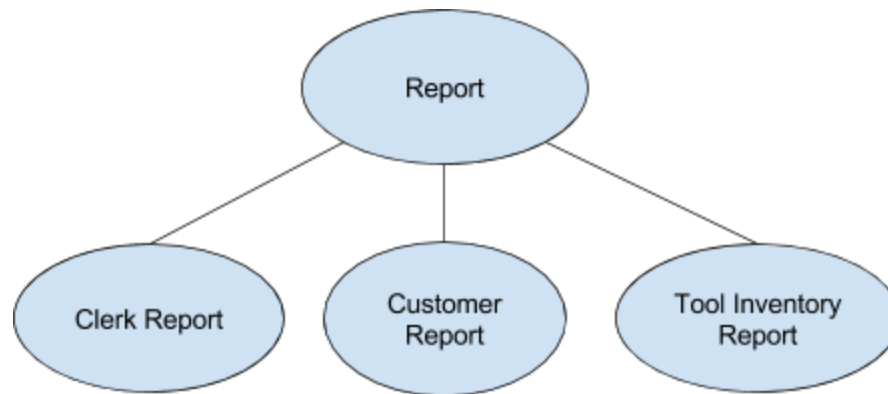
SubTasks: Mother task coordinates. Tool search run before displaying Tools Sale.

Abstract Code

- User clicks **Sale Status** button from Main Menu
- User enters *StartDate, EndDate, Keyword, Type, Power Source, Sub-Type*
- Run **Tool Search** task: where ServiceOrder exists
 - Display ServiceNumber, Status (ServiceOrder.EndDate <> NULL -> Sold), ToolNumber, Description, StartDate, EndDate RepairCost, Clerk.ID
 - If "Sold" (ServiceOrder.EndDate <> NULL -> Sold)
 - Display SalePrice, SaleDate
- Users clicks **Close** button, go to Main Menu form

Generate Report

Task Decomposition



Lock Types: 3 read only locks for Clerk, Customer, and Tool.

Number of Locks: 3

Enabling Conditions: User clicks Report

Frequency: Low

Consistency (ACID): Not critical

SubTasks: Mother task coordinate, sub-task are not run in parallel since only one report accessed at a time.

Abstract Code

- User clicks **Reports** button from **Main Menu**
- Display Clerk Report link, Customer Report link, and Tool Inventory link
- User clicks **Clerk Report** link
 - Go to **Clerk Report**
 - For each Clerk
 - Display Number, First Name, Middle Name, Last Name, Email, Hiring Date
 - Sum number of pickups and dropoffs with Clerk.Number
 - Calculate Total; Display Number of Pickups, Dropoffs, Combined Total
- User clicks **Customer Report** link
 - Go to **Customer Report**
 - For each Customer
 - Display Customer Number, First Name, Middle Name, Last Name, Email, Phone
 - Count Reservation with Customer.Number; Display Total Reservations
 - Count Reservation.ToolNumber with Customer.Number; Display Total Tools Rented
 - User clicks **View Profile**, then go to **View Profile** page

- User clicks ***Tool Inventory*** link
 - Go to **Tool Inventory Report**
 - User enters *All Tools, Hand Tool, Garden Tool, Ladder, Power Tool, Keyword i*
 - User clicks ***Search button***
 - Run **Tool Search** task
 - For each Tool
 - Display ToolNumber, Description,
 - Find CurrentStatus, Date; Display CurrentStatus Date
 - Sum all rental prices collected and subtract cost
 - Sum all cost, original cost, repairs;
 - Calculate Total Profit; Display Rental Profit, Total Cost, Total Profit
- Users clicks ***Close*** button, go to **Main Menu** form