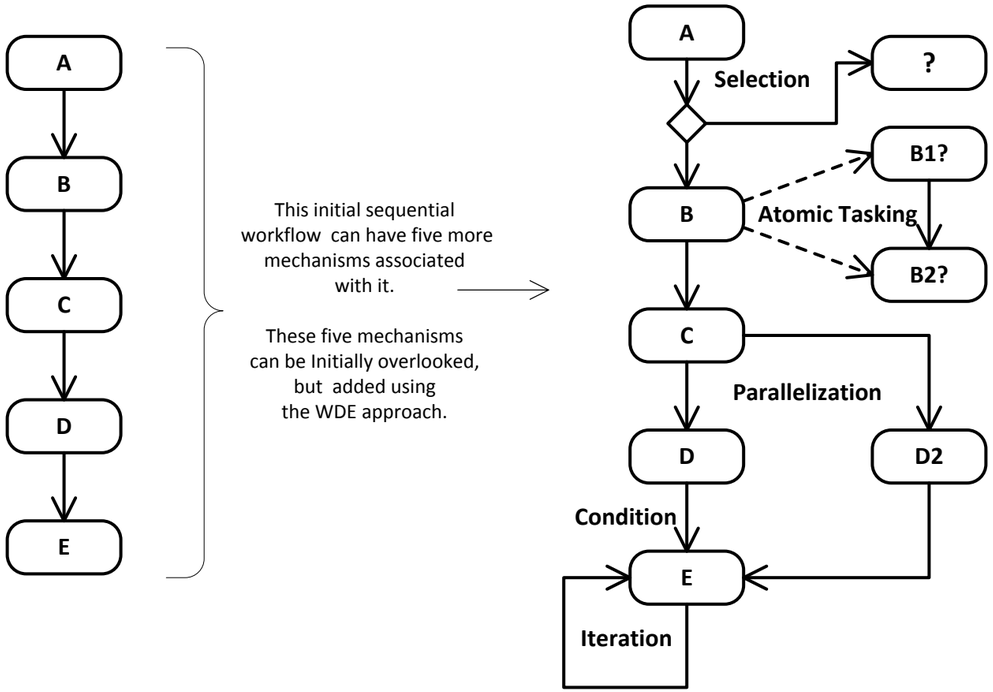
Workflow Driven Elicitation: Definition

The WDE approach works as follows: the RE elicits from the stakeholder a workflow that describes the process that requires a software implementation (e.g. automated) solution. The initial workflow can be as high level as comfortably expressed by the stakeholder. This means the initial workflow can be strictly sequential; focusing on the major tasks in the general order in which they are to occur. The understanding is that the actual, complete, workflow is likely to be more complex, exhibiting the six mechanisms common to most workflows, namely: Sequence, Selection, Atomic tasking, Parallelization, Conditions, and Iterations. But rather than try to conceive the complete workflow, the stakeholder is allowed initially to focus on Sequence. The other five mechanisms are later elicited using a checklist of questions that are designed to weed out the need for selecting a different path, subdividing a task into smaller tasks, carrying out a separate process in parallel, conditionally transitioning from one task to another, and iterating through a given task several times. Once the workflow has been completed, the tasks can be elaborated into User Stories. Generally speaking, the WDE approach precedes from a high level of abstraction (the initial workflow sequence) and progresses toward greater and greater detail in the form of detailed User Stories. This is similar to how someone might draw a complex, detailed, drawing by starting with more abstract circles and squares.



Selection
Is there an alternative path from a given task?

Atomic Tasking
Can a given task be subdivided?

Parallelization
Is there a task that runs concurrently with a given task?

Condition
Is the transition between two given tasks conditional?

Iteration
Does the given task execute multiple times before going to the next task?

These five mechanisms can be Used as the basis for a five Question checklist.

WDE Checklist

Selection
Is there an alternative path from a given task?

Atomic Tasking
Can a given task be subdivided?

Parallelization
Is there a task that runs concurrently with a given task?

Condition
Is the transition between two given tasks conditional?

Iteration
Does the given task execute multiple times before going to the next task?

Selection means that a sequential path has more than one option as to where to transition next in the sequence. Atomic tasking is the subdividing of tasks into smaller tasks, until the task cannot be divided further, and thus, is considered functionally atomic. Parallelization refers to concurrent processes that can occur in a workflow. Conditions can prevent or allow transitions between two given tasks. Iterations are a given task's need to execute more than once.

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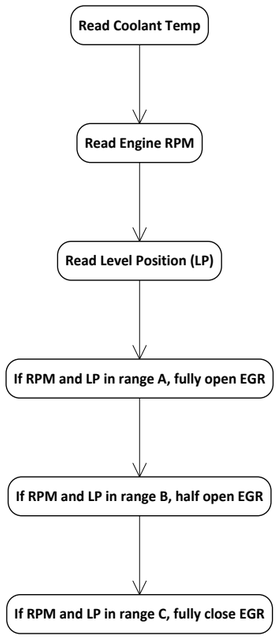
Workflow Driven Elicitation: Detailed Progression of EGR Example

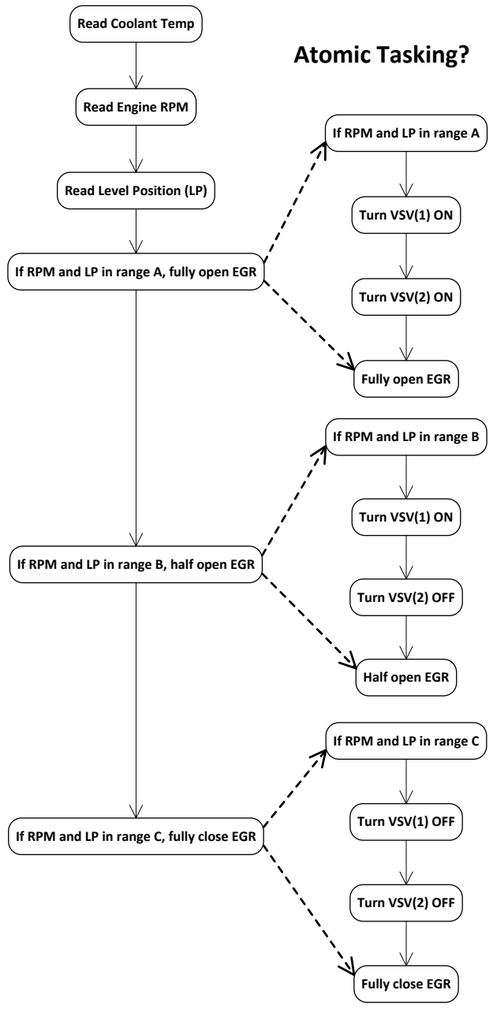
This example applies the WDE approach to the part of an engine ECU that controls the Exhaust Gas Recirculation (EGR) valve. The EGR valve is in turn controlled by two Vacuum Switch Valves (VSV). The goal of the EGR system is to allow a controlled amount of a car's exhaust back into the intake manifold, reducing the combustion temperature, which reduces engine knocking, among other benefits. Three measured parameters (Temp, RPM, and Lever position) are factored into the EGR control algorithm. Details aside, the important thing to note in this example is that the initial workflow on the left was described by the stakeholder in a very straight forward, sequential manner; detail was then added to the sequence via elicitation, as guided by the WDE checklist. The example shows the step-wise progression from initial workflow to a more complete workflow. Each step in the progression corresponds to a question pertaining to Atomic Tasking?, Parallelization?, Condition?, Selection?, and Iteration? Note that these questions do not need to be asked in any specific order. Nor do all questions need to result in a step progression.

Initial Workflow

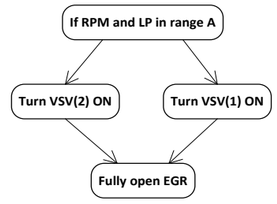


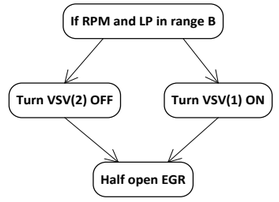
Apply WDE Checklist

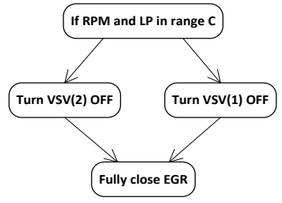
Atomic Tasking?



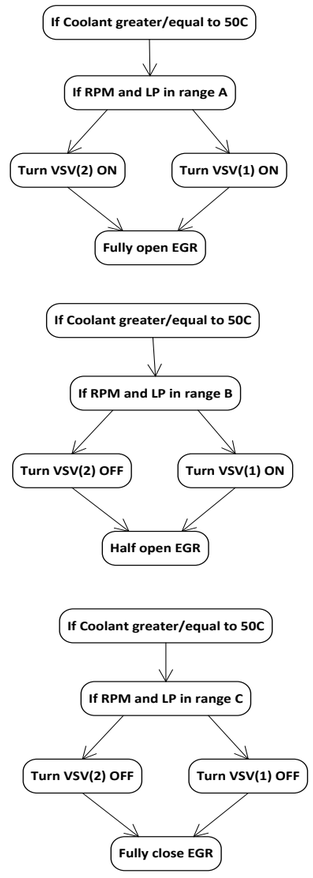
Parallelization?



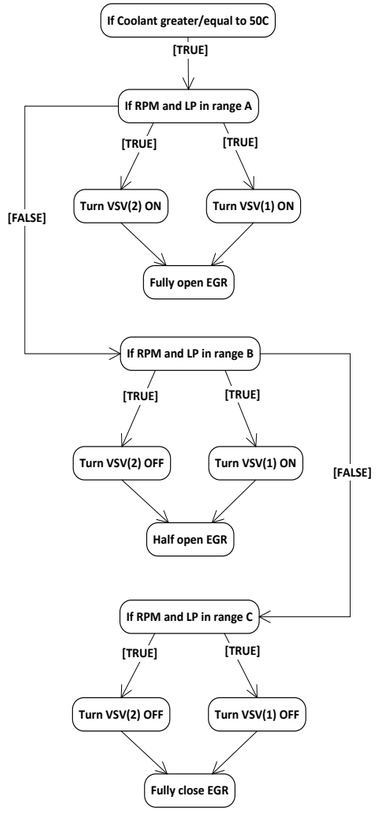




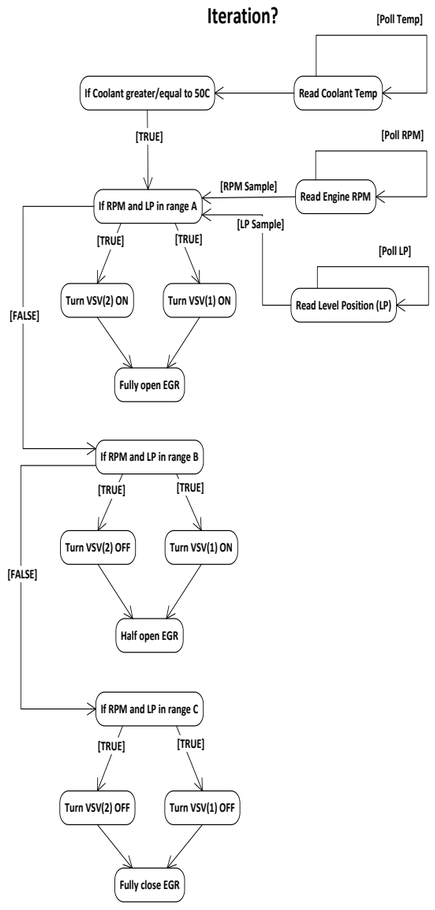
Conditions?



Selection?



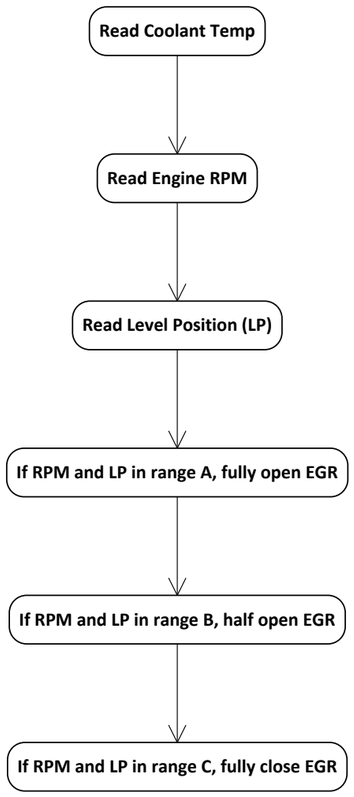
Iteration?



Workflow Driven Elicitation: EGR Example Summary

This summarizes the EGR example and shows the resulting User Stories. The progression shown here starts with the (high level) Initial Workflow described by the stakeholder. The WDE checklist of mechanism-related questions is then applied until a complete, more detailed, workflow is derived. Finally, a set of user stories is derived from the Complete Workflow. Note that each User story is not necessarily mapped to one node of the Complete Workflow. Once the Complete Workflow is derived, it is up to the Requirements Engineer to decide how the User Stories should be worded. The goal of WDE is to facilitate the elicitation of a more complete and detailed set of requirements, by guiding the stakeholder through a systematic progression from a simple explanation of a workflow, to a more detailed version.

Initial Workflow



Checklist

Selection
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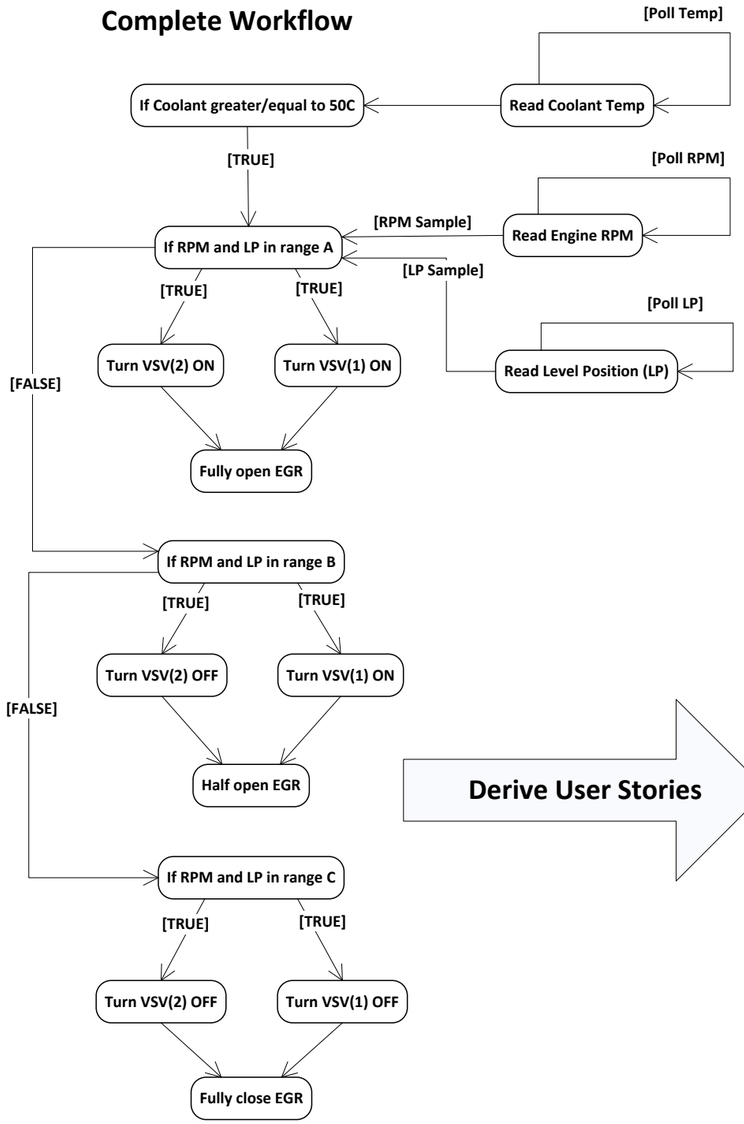
Apply Checklist

Complete Workflow



Derive User Stories

User Stories

FREQ1.1: The software shall continuously read the coolant temperature and store the value in a variable, so as to always have the engine's latest temperature.

FREQ1.1: The software shall continuously read the engine RPM and store the value in a variable, so as to always have the engine's latest RPM.

FREQ1.2: The software shall continuously read the Lever position sensor output voltage and store the value in a variable, so as to always have the sensor's latest voltage level.

FREQ1.3: If the coolant temperature is greater than or equal to 50C, and the engine RPM is greater than or equal to 2500, and the lever position is less than or equal to 3.51V, the software shall turn on both Vacuum Switch Valves 1 and 2, so as to make the EGR valve fully open and recirculate the engine's exhaust gas back into the intake air.

FREQ1.4: If the coolant temperature is greater than or equal to 50C, and the engine RPM is between 2500 and 3000 RPM, and the lever position is between 3.51V and 4.32V, the software shall turn on Vacuum Switch Valve 1 and turn off Vacuum Switch Valve 2, so as to make the EGR valve half open and recirculate half the engine's exhaust gas back into the intake air.

FREQ1.5: If the coolant temperature is greater than or equal to 50C, and the engine RPM is greater than or equal to 3000 RPM, and the lever position is between 3.51V and 4.32V, the software shall turn on both Vacuum Switch Valves 1 and 2 off, so as to fully close the EGR valve and prevent the engine's exhaust gas from flowing back into the intake air.