Case Study 2: Beginning Alloy Examples

Introduction The software Alloy was introduced in Chapter 2 as a software tool for verifying
system properties. For example, in Section 2.7.1, It was noted that the state machine model,
described in Example 2.15, can be casted as an alloy module. In this case study, we begin
with examples showing that Alloy can help to verify

$$\mathcal{M} \models \phi$$

for concrete state machine models $\mathcal{M}$. We then consider an example of the form

$$\Gamma \models \phi,$$

where Γ is a collection of first order logic formulas. While Alloy cannot guarantee to prove
such cases (such questions may be *undecidable*), testing the examples via a small but complete
scope can sometimes provide counterexamples to disprove such claims.

Preparation We assume that you have read the online Alloy tutorials on file systems. You may
also find the slides given by the developer helpful when dealing with the syntax of common
alloy constructs. Our teaching assistant will provide an in-class tutorial. The TA will

1. review examples from the online tutorials (file systems) and other sources on using
   common Alloy constructs and on writing first order logic formulas.

2. give a simple Alloy model which use a fact statement to model a concrete state machine
   $\mathcal{M}$ and an example property ϕ and show how to test $\mathcal{M} \models \phi$.

To complete this case study, develop two Alloy models, one for Part 1 and the other for Part
2 as stated below.

Part 1 (State Machine Examples) For each of the following questions, create alloy models to verify
the properties stated:

1. HR Example 2.15: Create an alloy model and verify 1, 2, 3 and 4 as given in the text.
2. HR Exercise 2.4, Question 5: Use alloy to verify if $\mathcal{M} \models \phi$ in both part a and b.

Part 2 (Relations) Exercise 2.7 Question 2a.

For each verification task, provide relevant screen shots to support your findings.

Submission The due date and the required format for this case study will be posted by our TAs
within our blackboard site.