A REGRESSION TABLES

In this appendix, we provide the full regression tables from our user study. We first present regression tables for each of the ten bugs in our taxonomy, followed by two tables investigating participants' overall correctness and confidence in their answers.

Individual Bugs

We first present, for the ten bugs from our taxonomy, logistic regression tables analyzing how the participant's assigned temporality, whether or not the given ruleset was buggy, and which scenario was seen for a bug impacted the likelihood that the participant gave the correct answer. Each table includes the odds radio (*OR*), coefficient (β), standard error (*SE*), z, and p-value. Significant p-values in each table are bolded.

Table 4: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Infinite Loop* bug.

Independent Variable	Baseline	*OR*	β	*SE*	z	p
Scenario: Two	One	0.761	-0.273	0.346	-0.790	.430
Temporal Paradigm: State–State	Event–State	0.609	-0.497	0.435	-1.142	.253
Temporal Paradigm: Event–Event	Event–State	1.127	0.119	0.409	0.291	.771
Ruleset: Buggy	Fixed	0.362	-1.017	0.475	-2.141	**.032**
Interaction of State–State & Buggy	—	1.792	0.583	0.605	0.964	.334
Interaction of Event–Event & Buggy	—	0.565	-0.571	0.568	-1.004	.315
Interaction of Scenario Two & Buggy	—	2.542	0.933	0.484	1.926	.054

Table 5: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Contradictory Action* bug.

Independent Variable	Baseline	*OR*	β	*SE*	z	p
Scenario: Two	One	0.182	-1.704	0.401	-4.248	**<.001**
Temporal Paradigm: State–State	Event–State	0.860	-0.151	0.465	-0.324	.746
Temporal Paradigm: Event–Event	Event–State	1.552	0.440	0.439	1.001	.317
Ruleset: Buggy	Fixed	0.190	-1.658	0.522	-3.176	**.001**
Interaction of State–State & Buggy	—	2.278	0.823	0.629	1.308	.191
Interaction of Event–Event & Buggy	—	0.706	-0.349	0.584	-0.597	.550
Interaction of Scenario Two & Buggy	—	6.160	1.818	0.521	3.491	**<.001**

Table 6: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Repeated Triggering* bug.

Independent Variable	Baseline	*OR*	β	*SE*	z	p
Scenario: Two	One	1.835	0.607	0.421	1.443	.149
Temporal Paradigm: State–State	Event–State	0.857	-0.154	0.517	-0.299	.765
Temporal Paradigm: Event–Event	Event–State	0.299	-1.208	0.490	-2.465	**.014**
Ruleset: Buggy	Fixed	2.835	1.042	0.625	1.666	.096
Interaction of State–State & Buggy	—	0.119	-2.132	0.758	-2.812	**.005**
Interaction of Event–Event & Buggy	—	2.427	0.887	0.732	1.211	.226
Interaction of Scenario Two & Buggy	—	1.041	0.041	0.595	0.069	.945

Table 7: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Nondeterministic Timing* bug.

Independent Variable	Baseline	*OR*	β	*SE*	*z*	*p*
Scenario: Two	One	2.414	0.881	0.468	1.881	.060
Temporal Paradigm: State–State	Event–State	0.467	-0.760	0.580	-1.310	.190
Temporal Paradigm: Event–Event	Event–State	0.557	-0.585	0.564	-1.038	.299
Ruleset: Buggy	Fixed	0.016	-4.142	0.686	-6.037	**<.001**
Interaction of State–State & Buggy	—	16.113	2.780	0.793	3.504	**<.001**
Interaction of Event–Event & Buggy	—	2.194	0.786	0.810	0.970	.332
Interaction of Scenario Two & Buggy	—	0.821	-0.197	0.639	-0.309	.757

Table 8: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Extended Action* bug (State–State only).

Independent Variable	Baseline	*OR*	β	*SE*	*z*	*p*
Scenario: Two	One	0.982	-0.018	0.621	-0.030	.976
Ruleset: Buggy	Fixed	0.164	-1.810	0.747	-2.424	**.015**
Interaction of Scenario Two & Buggy	—	2.425	0.886	1.020	0.869	.385

Table 9: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Missing Reversal* bug.

Independent Variable	Baseline	*OR*	β	*SE*	*z*	*p*
Scenario: Two	One	0.254	-1.371	0.578	-2.370	**.018**
Temporal Paradigm: State–State	Event–State	0.256	-1.363	0.878	-1.551	.121
Temporal Paradigm: Event–Event	Event–State	0.152	-1.883	0.821	-2.292	**.022**
Ruleset: Buggy	Fixed	0.156	-1.860	0.932	-1.995	**.046**
Interaction of State–State & Buggy	—	0.402	-0.911	1.038	-0.878	.380
Interaction of Event–Event & Buggy	—	5.942	1.782	0.950	1.875	.061
Interaction of Scenario Two & Buggy	—	0.716	-0.334	0.717	-0.467	.641

Table 10: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Secure-Default Bias* bug.

Independent Variable	Baseline	*OR*	β	*SE*	*z*	*p*
Scenario: Two	One	0.367	-1.004	0.496	-2.026	**.043**
Temporal Paradigm: State–State	Event–State	10.075	2.310	0.745	3.099	**.002**
Temporal Paradigm: Event–Event	Event–State	0.856	-0.153	0.509	-0.301	.763
Ruleset: Buggy	Fixed	1.212	0.192	0.568	0.339	.734
Interaction of State–State & Buggy	—	0.193	-1.646	0.851	-1.933	.053
Interaction of Event–Event & Buggy	—	0.503	-0.687	0.657	-1.046	.295
Interaction of Scenario Two & Buggy	—	0.584	-0.538	.602	-0.893	.372

Table 11: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Time-Window Fallacy* bug (Event–Event only).

Independent Variable	Baseline	*OR*	β	*SE*	*z*	*p*
Scenario: Two	One	6.448	1.864	1.066	1.748	.080
Ruleset: Buggy	Fixed	0.518	-0.658	0.686	-0.960	.337
Interaction of Scenario Two & Buggy	—	4.239	1.444	1.479	0.976	.329

Table 12: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Priority Conflict* bug (State–State only).

Independent Variable	Baseline	*OR*	β	*SE*	*z*	*p*
Scenario: Two	One	0.394	-0.932	0.645	-1.444	.149
Ruleset: Buggy	Fixed	0.154	-1.868	0.656	-2.846	**.004**
Interaction of Scenario Two & Buggy	—	9.894	2.291	0.926	2.475	**.013**

Table 13: Mixed-effects logistic regression in which the dependent variable is whether the correct (1) or incorrect (0) behavior was predicted for scenarios testing the *Flipped Triggers* bug (Event–State and Event–Event only).

Independent Variable	Baseline	*OR*	β	*SE*	*z*	*p*
Scenario: Two	One	5.894	1.773	0.682	2.600	**.009**
Temporal Paradigm: Event–Event	Event–State	0.155	-1.862	0.680	-2.738	**.006**
Ruleset: Buggy	Fixed	0.197	-1.623	0.708	-2.292	**.022**
Interaction of Event–Event & Buggy	—	4.281	1.454	0.787	1.848	.065
Interaction of Scenario Two & Buggy	—	0.819	-1.665	0.789	-2.111	**.035**

Overall Correctness and Confidence

We next present linear regression tables reflecting participants' overall correctness and confidence in their answers across all scenarios they saw based on demographic factors and their condition.

Table 14: Linear regression in which the dependent variable is each participant's overall *correctness* (percentage of scenarios answered correctly).

Independent Variable	Baseline	β	SE	t	p
Age	–	-0.001	0.001	-0.604	.547
Gender: Female	Male	0.013	0.029	0.465	.643
Gender: Prefer not to answer	Male	0.025	0.169	0.148	.883
Level of Education	–	-0.011	0.012	-0.984	.327
CS Degree or Job: Yes	No	-0.022	0.049	-0.449	.654
Prior Programming Experience: Yes	No	0.083	0.040	2.093	**.038**
Familiar with IFTTT: Yes	No	0.033	0.036	0.912	.364
Own an IoT Device: Yes	No	-0.012	0.030	-0.397	.692
Number of CRT Questions Correct	–	0.038	0.014	2.811	**.006**
Number of Tutorial Questions Correct	–	-0.001	0.014	-0.538	.591

Table 15: Linear regression in which the dependent variable is each participant's average *confidence* in their answers across all scenarios.

	Baseline	β	SE	t	p
Age	–	0.005	0.005	1.046	.297
Gender: Female	Male	0.142	0.095	1.503	.135
Gender: Prefer not to answer	Male	-0.373	0.552	-0.676	.500
Level of Education	–	0.029	0.038	0.768	.444
CS Degree or Job: Yes	No	0.000	0.160	0.002	.999
Prior Programming Experience: Yes	No	-0.363	0.130	-2.795	**.006**
Familiar with IFTTT: Yes	No	0.312	0.118	2.648	**.009**
Own an IoT Device: Yes	No	-0.109	0.098	-1.114	.267
Number of CRT Questions Correct	–	-0.040	0.044	-0.906	.366
Number of Tutorial Questions Correct	–	0.106	0.047	2.250	**.026**

B STUDY INSTRUMENT

Note that we randomized the order of the sections representing each different scenario a participant saw.

Introduction

In the coming years, as all sorts of household devices and services are connected to the internet as part of the so-called Internet of Things, consumers will need ways to tell their devices and services what they want them to do. One of the popular ways of telling devices and services what to do is by writing graphical rules.

In this study, we will show you up to 25 different scenarios with associated sets of rules that govern how internet-connected devices and services will behave. In each scenario, you will be asked to decide whether or not certain actions take place in these scenarios based on the rules presented. **For each set of rules we show, assume no other rules are present.**

We will begin with a brief tutorial to help you understand how these rules work. At the end of the tutorial, we will ask you to answer a few questions to make sure you understand. **Incorrectly answering the questions at the end of the tutorial may automatically disqualify you from continuing the study.**

Tutorial: Event-Event Only

[Shown if the temporality is event-event]

Each of the rules you see will be in the same trigger-action format as the following example:

IF **[It starts to rain]** THEN **[Turn the kitchen lights blue]**

We refer to the entire diagram you see above as a **rule**. A rule combines one IF with one THEN. We call "it starts to rain" a **trigger** because when it occurs, the rule will be triggered (will run). The trigger occurring causes the **action** specified by the rule to occur. In this case, the action is "turn the kitchen lights blue."

IMPORTANT: Every trigger you see in this study will be an event that effectively takes place in an instant. In addition, every action you see in this study will also be an event that effectively starts in an instant, even though it may take some time for the event to complete (e.g., brewing coffee for you).

Some rules might combine two or more events into a single trigger by using the word "and." For example:

IF **[It starts to rain]** AND **[I leave the house]** WITHIN **[5 min]** THEN **[Turn the kitchen lights blue]**

Note that both events in the trigger, "it starts to rain" and "I leave the house," themselves effectively take place in an instant. Because events that effectively take place in an instant will almost never occur at precisely the same moment in time, the rule provides a **time window**, denoted "within."

Each time any single event that is part of the trigger occurs, the system checks whether all other events in the trigger have also previously occurred within the specified time window. In this example, the system would require the other event to have occurred in the previous five minutes. If so, and only if so, the action occurs. For example, if it begins raining, the system will check whether the user has left the house in the previous five minutes, turning the lights blue only if they have. Similarly, if the user leaves the house, the system will check whether it began raining in the previous five minutes, turning the lights blue only if it has.

The system also supports a variant of "and," labeled "and afterward," which requires a specific order to the events in a trigger. For example:

IF **[It starts to rain]** AND AFTERWARDS **[I leave the house]** WITHIN **[5 min]** THEN **[Turn the kitchen lights blue]**

Each time the event following "afterward" occurs (in this case, "I leave the house"), the system checks whether all other events preceding the "afterward" in the trigger have occurred within the specified time window (in this case, the previous five minutes). If so, and only if so, the action occurs.

Some of the sets of rules we show you may contain more than one rule. The word "OR" denotes two separate rules that trigger independently of one another. Note that there can be a subtle difference between rules.

IF **[It starts to rain]** THEN **[Turn the kitchen lights blue]**
–OR–
IF **[My cat goes outside]** THEN **[Turn off the sprinklers]**

The last keyword to take note of is "NOT". When the "NOT" keyword occurs, it is taken to mean that the event immediately following the keyword must **not** have taken place within the specified time window in order for the rule to fire.

Tutorial: State-State Only

[Shown if the temporality is state-state]

Each of the rules you see will be in the same trigger-action format as the following example:

IF **[It is currently raining]** THEN **[The kitchen lights should be blue]**

We refer to the entire diagram you see above as a **rule**. A rule combines one IF with one THEN. We call "it is currently raining" a **trigger** because when it is true, the rule will be triggered (will run). The trigger occurring causes the **action** specified by the rule to occur. In this case, the action is "the kitchen lights should be blue."

IMPORTANT: Every trigger you see in this study will be a state that is either true or false over a period of time, rather than just at an instant. In addition, many actions you come across in this study will also be states specifying how your devices and services should be acting. All states are indicated by a purple-colored box.

Some of the sets of rules we show you may contain more than one rule. The word "OR" denotes two separate rules that trigger independently of one another. As you saw above, action states are indicated using conditional language (e.g., "should be") because multiple independent rules might be trying to control the same device at the same time. The system knows which rule's action should take precedence through a priority system. **The rule with the higher priority (larger number) will be active**. Imagine the following set of rules:

IF **[My dog is outside]** THEN **[The kitchen lights should be off]** PRIORITY *[1]*
–OR–
IF **[It is currently raining]** THEN **[The kitchen lights should be blue]** PRIORITY *[10]*
–OR–
IF **[I am currently away from home]** THEN **[The kitchen lights should be yellow]** PRIORITY *[5]*

In this case, if you are both away from home and it is also raining, the lights will be blue because making the lights blue has a higher priority (10) than making the lights yellow (5), and the higher priority always takes precedence.

Some rules might combine two or more events into a single trigger by using the word "and." For example:

IF **[It is currently raining]** AND **[I am currently away from home]** THEN **[The kitchen lights should be red]**

Note that both events in the trigger, "it is currently raining" and "I am currently away from home," must be true at the same time for this rule to be active.

Finally, some rules may have actions that are **events** that effectively take place in an instant. Actions that are events will always be displayed in green boxes, rather than purple boxes. In such cases, the trigger may (or may not) have an additional condition (e.g., this rule has not fired in a specified amount of time).

IF **[It is currently raining]** AND **[This rule has not triggered in the last five minutes]** THEN **[Send me a text saying 'rain']**

In the rule above, if rain continues for an extended period of time, you will receive a text message every five minutes. **Note that if a rule with an event as an action does not specify a time period in the trigger, the rule will keep repeatedly triggering as fast as the system can go**. In other words, if the rule above did not include "this rule has not triggered in the last five minutes," you would receive a large number of text messages quickly.

There may appear states that indicate a time range, such as below. This is taken to mean that the state is true from the instant the clock strikes the time at the beginning of the range up until the instant that the clock strikes the time at the end of the range.

IF **[The time is between 8 AM and 9 AM]** THEN **[The kitchen lights should be blue]**

Some rules may have a "DEFAULT" option. This means that they will always be active when no other rule has priority. You will note that when there are multiple rules, the DEFAULT will always have the lowest priority.

DEFAULT: The lights in the living room are off PRIORITY *[0]*

The last keyword to take note of is "NOT". "NOT" is taken to mean that the state immediately following the keyword must **not** be true in order for the rule to fire.

Tutorial: Event-State Only

[Shown if the temporality is event-state]

Each of the rules you see will be in the same trigger-action format as the following example:

IF **[It starts to rain]** THEN **[Turn the kitchen lights blue]**

We call "it starts to rain" a **trigger** because when it occurs, the rule will be triggered (will run). The trigger occurring causes the **action** specified by the rule to occur. In this case, the action is "turn the kitchen lights blue." IMPORTANT: Every trigger you see in this study will start off with a single event that effectively takes place in an instant. In addition, every action you see in this study will also be an event that effectively starts in an instant, even though it may take some time for the event to complete (e.g., brewing coffee for you). **Events that effectively take place or start in an instant are always in green-colored boxes**. Some rules might combine two or more parts into a single trigger by using the word "while." For example:

IF **[It starts to rain]** WHILE **[I am currently away from home]** THEN **[Turn the kitchen lights yellow]**

Note that the first part of the trigger, "it starts to rain," is an event that effectively takes place in an instant and is therefore indicated by green-colored boxes. However, the second part of the trigger, "I am currently away from home," is a state that is either true or false over a period of time, rather than just at an instant. These long-term states are indicated by purple-colored boxes. Whenever the event (green) occurs, the system checks whether any states (purple) are also true. If, and only if, all of the states (purple) are true when the event (green) occurs, the action will occur. Note that having states as part of the trigger is optional. Each trigger must contain exactly one event, but it can also contain any number of state triggers. The event and first state trigger, if any, are separated by "while," while all subsequent state triggers are separated from each other by "and."

Some of the sets of rules we show you may contain more than one rule. The word "OR" denotes two separate rules that trigger independently of one another. Note that there can be a subtle difference between rules.

IF **[It starts to rain]** WHILE **[I am currently away from home]** THEN **[Turn the kitchen lights blue]**
–OR–
IF **[I leave the house]** WHILE **[It is currently raining]** THEN **[Turn the kitchen lights yellow]**

Note that, in the example above, if the rain starts after you have already left home, then the lights will turn blue at the moment the rain starts because the top rule triggers. If, however, the rain starts before you leave the house, the lights will turn yellow the moment you leave the house because the bottom rule triggers.

There may appear states that indicate a time range, such as below. This is taken to mean that the state is true from the instant the clock strikes the time at the beginning of the range up until the instant that the clock strikes the time at the end of the range.

IF **[It starts to rain]** WHILE **[The time is between 8 AM and 9 AM]** THEN **[Turn off the sprinklers]**

The last keyword to take note of is "NOT". When the "NOT" key word occurs, it is taken to mean that the state immediately following the key word must **not** be true in order for the rule to fire.

Post-Tutorial Questions

[These questions are shown to all participants after completion of the tutorial, regardless of temporal paradigm]

• In this study, each part of a trigger (the part following "IF"):
◯ Happens effectively in an instant at a particular moment in time
◯ Represents a value that is true or false over long periods of time
◯ Can be either of the above
◯ None of the above are true

• Multiple parts of a trigger can be combined using the following words: **(Check all that apply)**
□ And
□ With
□ And aferward
□ While

• Which of the following can be specified as part of a rule?
◯ Priority
◯ Duration of action
◯ Time window
◯ None of the above

Answers to Post-Tutorial Questions: Event-Event Only

[This answer is shown if the temporality is event-event and the participant answered the first question incorrectly]
You answered the first question, "In this study, each part of a trigger (the part following "IF"):", incorrectly. The answer should be, "Happens effectively in an instant at a particular moment in time".

[This answer is shown if the temporality is event-event and the participant answered the second question incorrectly]
You answered the second question, "Multiple parts of a trigger can be combined using the following words: (Check all that apply)", incorrectly. The answers should be, "And" and "And afterward".

[This answer is shown if the temporality is event-event and the participant answered the third question incorrectly]
You answered the third question, "Which of the following can be specified as part of a rule", incorrectly. The answer should be, "Time window".

Answers to Post-Tutorial Questions: State-State Only

[This answer is shown if the temporality is state-state and the participant answered the first question incorrectly]
You answered the first question, "In this study, each part of a trigger (the part following "IF"):", incorrectly. The answer should be, "Represents a value that is true or false over long periods of time".

[This answer is shown if the temporality is state-state and the participant answered the second question incorrectly]
You answered the second question, "Multiple parts of a trigger can be combined using the following words: (Check all that apply)", incorrectly. The answer should be, "And".

[This answer is shown if the temporality is state-state and the participant answered the third question incorrectly]
You answered the third question, "Which of the following can be specified as part of a rule", incorrectly. The answer should be, "Priority".

Answers to Post-Tutorial Questions: Event-State Only

[This answer is shown if the temporality is event-state and the participant answered the first question incorrectly]
You answered the first question, "In this study, each part of a trigger (the part following "IF"):", incorrectly. The answer should be, "Can be either of the above".

[This answer is shown if the temporality is event-state and the participant answered the second question incorrectly]
You answered the second question, "Multiple parts of a trigger can be combined using the following words: (Check all that apply)", incorrectly. The answer should be, "While".

[This answer is shown if the temporality is event-state and the participant answered the third question incorrectly]
You answered the third question, "Which of the following can be specified as part of a rule", incorrectly. The answer should be, "None of the above".

Start of Study Notifier

You have qualified for the study. You will now see a series of up to 25 different scenarios and their associated rules. For each scenario, you will have to answer questions about what happens as a result of the associated rules. If you wish to re-open the tutorial at any point, a link to re-open the tutorial will always be available at the top of each page.

Infinite Loop Scenario 1

Note: Assume that emails and text messages both take under ten seconds to send.
You want to remind yourself to read important documents by synchronizing a folder on your computer labeled "To Do Later" with emails containing attachments in your inbox. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[A file is placed in my "To Do Later" folder]** THEN **[Send me an email with the file attached]**
–OR–
IF **[I receive an email with an attachment]** THEN **[Download that attachment to my "To Do Later" folder]**

[Shown if event-event, non-buggy]
IF **[I receive an email with an attachment]** THEN **[Download that attachment to my "To Do Later" folder]**

[Shown if state-state, buggy]
IF **[I have an email in my inbox with an attachment]** THEN **[Download that attachment to my "To Do Later" folder]** PRIORITY *[4]*
–OR–
IF **[I have a file in my "To Do Later" folder]** THEN **[Send me an email with the file attached]** PRIORITY *[5]*

[Shown if state-state, non-buggy]
IF **[I have a file in my "To Do Later" folder]** AND **[No email in my inbox contains that file as an attachment]** THEN **[Send me an email with the file attached]** PRIORITY *[3]*
–OR–
IF **[I have an email in my inbox with an attachment]** AND **[No file in my "To Do Later" folder matches that attachment]** THEN **[Download that attachment to my "To Do Later" folder]** PRIORITY *[3]*

[Shown if event-state, buggy]
IF **[A file is placed in my "To Do Later" folder]** THEN **[Send me an email with the file attached]**
–OR–
IF **[I receive an email with an attachment]** THEN **[Download that attachment to my "To Do Later" folder]**

[Shown if event-state, non-buggy]
IF **[A file is placed in my "To Do Later" folder]** WHILE **[No email in my inbox contains that file as an attachment]** THEN **[Send me an email with the file attached]**
–OR–
IF **[I receive an email with an attachment]** WHILE **[No file in my "To Do Later" folder matches that attachment]** THEN **[Download that attachment to my "To Do Later" folder]**

• At 3:00 PM, you receive an email from your co-worker with a document file attached. Five minutes later, will there be more than one copy of the document file in your "To Do Later" folder on your computer?
◯ There will be more than one copy of the document in "To Do Later"
◯ There may or may not be more than one copy in "To Do Later"; the answer depends on other factors
◯ There will not be more than one copy of the document in "To Do Later"

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Infinite Loop Scenario 2

NOTE: Assume that your internet-connected device scanning an email or a text message does not change the item's "Read" vs. "Unread" status. Furthermore, assume that emails and texts both take under ten seconds to send.

You wish to better monitor communications from your boss on the weekend. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[I receive a text from anyone]** THEN **[Send me an email with the text message attached]**
–OR–
IF **[I receive an email from anyone]** THEN **[Send me a text with the email body attached]**

[Shown if event-event, non-buggy]
IF **[I receive a text from my boss]** THEN **[Send me an email with the text message attached]**
–OR–
IF **[I receive an email from my boss]** THEN **[Send me a text with the email body attached]**

[Shown if state-state, buggy]
IF **[I have an unread text from anyone]** THEN **[Send me an email with the text message attached]** PRIORITY *[1]*
–OR–
IF **[I have an unread email from anyone]** THEN **[Send me a text with the email body attached]** PRIORITY *[5]*

[Shown if state-state, non-buggy]
IF **[I have an unread text from my boss]** THEN **[Send me an email with the text message attached]** PRIORITY *[1]*
–OR–
IF **[I have an unread email from my boss]** THEN **[Send me a text with the email body attached]** PRIORITY *[5]*

[Shown if event-state, buggy]
IF **[I receive a text from anyone]** THEN **[Send me an email with the text message attached]**
–OR–
IF **[I receive an email from anyone]** THEN **[Send myself a text with the email body attached]**

[Shown if event-state, non-buggy]
IF **[I receive a text from my boss]** THEN **[Send me an email with the text message attached]**
–OR–
IF **[I receive an email from my boss]** THEN **[Send myself a text with the email body attached]**

• At the beginning of the scenario you have no emails in your inbox. At 2:00 PM you receive an email from your boss. Five minutes later, will you have more than one email in your inbox?
◯ There will be more than one email in my inbox
◯ There may or may not be more than one email in my inbox; the answer depends on other factors
◯ There will not be more than one email in my inbox

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Contradictory Action Scenario 1

NOTE: Assume that exactly 10 minutes after the windows open in your house, the inside temperature will be the same as the temperature outside of your house. Assume that exactly 10 minutes after your thermostat turns on, if the windows are closed, the temperature throughout the house will be the same as the temperature that the thermostat is set to.

You do not like your house to be too cold or too hot. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[The temperature inside the house reaches 60°]** THEN **[Close the windows and set the thermostat to 69°]**

–OR–
IF **[The temperature inside the house reaches 69°]** THEN **[Open the windows]**

[Shown if event-event, non-buggy]
IF **[The temperature inside the house reaches 60°]** THEN **[Close the windows and set the thermostat to 69°]**

[Shown if state-state, buggy]
IF **[The temperature inside the house is 60°]** THEN **[The windows should be closed and the thermostat set to 69°]** PRIORITY *[1]*
–OR–
IF **[If temperature inside the house is 69°]** THEN **[The windows should be open]** PRIORITY *[2]*

[Shown if state-state, non-buggy]
IF **[The temperature inside the house is 60°]** THEN **[The windows should be closed and the thermostat set to 69°]** PRIORITY *[1]*

[Shown if event-state, buggy]
IF **[The temperature inside the house reaches 60°]** THEN **[Close the windows and set the thermostat to 69°]**
–OR–
IF **[The temperature inside the house reaches 69°]** THEN **[Open the windows]**

[Shown if event-state, non-buggy]
IF **[The temperature inside the house reaches 60°]** THEN **[Close the windows and set the thermostat to 69°]**

• At 10:59 AM, it is 68 degrees inside of your house, and 60 degrees outside. You open the windows at 11:00 AM. The temperature outside remains constant for 21 minutes. At 11:21 AM, will the windows in your house be open?
◯ The windows will be open
◯ The windows may or may not be open; the answer depends on other factors
◯ The windows will not be open

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Contradictory Action Scenario 2

NOTE: Assume it takes 2.5 minutes for power generators to warm up after being turned on. During this time, they produce no power. Assume generators also take 2.5 minutes to shut off, and during this time they produce their full power capacity. Assume each generator produces 1 kW of power.

You have 10 back-up generators at your workplace. To keep up with electricity demand, you wish to turn on just enough additional generators to match demand, and to otherwise keep generators off to save energy. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[One minute elapses since the last time any rule has fired]** AND NOT **[The power output reaches 3 kW]** WITHIN **[4 mins]** THEN **[Turn on one more generator]**
–OR–
IF **[One minute elapses since the last time any rule has fired]** AND **[The power output reaches 5 kW]** WITHIN **[4 mins]** THEN **[Shut off one running generator]**
–OR–
IF **[The back-up system starts running]** THEN **[Turn on one generator]**

[Shown if event-event, non-buggy]
IF **[Three minutes elapse since the last time any rule has fired]** AND NOT **[The power output reaches 3 kW]** WITHIN **[4 mins]** THEN **[Turn on one more generator]**
–OR–
IF **[Three minutes elapse since the last time any rule has fired]** AND **[The power output reaches 5 kW]** WITHIN **[4 mins]** THEN **[Shut off one running generator]**
–OR–
IF **[The back-up system starts running]** THEN **[Turn on one generator]**

[Shown if state-state, buggy]

IF **[The power output is less than 3 kW]** AND **[This rule has not fired in the previous minute]** THEN **[Turn on one more generator]** PRIORITY *[4]*
–OR–
IF **[The power output is greater than or equal to 5 kW]** AND **[This rule has not fired in the previous minute]** THEN **[Turn off one running generator]** PRIORITY *[7]*

[Shown if state-state, non-buggy]
IF **[The power output is less than 3 kW]** AND **[This rule has not fired in the previous 3 minutes]** THEN **[Turn on one more generator]** PRIORITY *[4]*
–OR–
IF **[The power output is greater than or equal to 5 kW]** AND **[This rule has not fired in the previous 3 minutes]** THEN **[Shut off one running generator]** PRIORITY *[7]*

[Shown if event-state, buggy]
IF **[One minute elapses since the last time any rule has fired]** WHILE **[The power output is less than 3 kW]** THEN **[Turn on one more generator]**
–OR–
IF **[One minute elapses since the last time any rule has fired]** WHILE **[The power output is greater than or equal to 5 kW]** THEN **[Shut off one running generator]**
–OR–
IF **[The back-up system starts running]** THEN **[Turn on one generator]**

IF **[Three minutes elapse since the last time any rule has fired]** WHILE **[The power output is less than 3 kW]** THEN **[Turn on one more generator]**
–OR–
IF **[Three minutes elapse since the last time any rule has fired]** WHILE **[The power output is greater than or equal to 5 kW]** THEN **[Shut off one running generator]**
–OR–
IF **[The back-up system starts running]** THEN **[Turn on one generator]**

• All generators are off at the start of the scenario. At 8:30 AM, the back-up system starts running. By 8:40 AM, will the power output of the plant have ever exceeded 3 kW since the start of the scenario?
◯ The power output will have exceeded 3 kW
◯ The power output may or may not have exceeded 3 kW; the answer depends on other factors
◯ The power output will not have exceeded 3 kW

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Repeated Trigger (State) Scenario 1

[All of the below are only shown if state-state]
You love GreatPizza, and when there is a sale, you wish to have one of their pizzas for dinner. So, you write the rule(s) below.

[Shown if buggy]
IF **[There is a sale on GreatPizza's pizza]** THEN **[Order one pizza from GreatPizza]**

[Shown if non-buggy]
IF **[There is a sale on GreatPizza's pizza]** AND **[This device has not ordered pizza within the last 24 hours]** THEN **[Order one pizza from GreatPizza]**

• You have not yet ordered from GreatPizza today. At 6:00 PM, a sale on GreatPizza's pizza is announced. At 8:00 PM, the sale ends. At 8:01 PM, will your device have ordered you exactly one pizza from GreatPizza?
◯ Exactly one pizza will have been ordered
◯ The number of pizzas ordered cannot be determined; the answer depends on other factors
◯ No pizzas will have been ordered
◯ More than one pizza will have been ordered

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Repeated Trigger (State) Scenario 2

[All of the below are only shown if state-state]
You wish to receive if a text if your motion detector is tripped when you are away. So, you write the rule(s) below.

[Shown if buggy]
IF **[My motion sensor is being tripped]** THEN **[Send me a text]**

[Shown if non-buggy]
IF **[My motion sensor is being tripped]** AND **[The motion sensor has not sent a text in the last 10 minutes]** THEN **[Send me a text]**

• You leave the house at 8 AM. At 10 AM, your cat wanders in front of the motion sensor for a full minute, keeping it in a tripped state. At 10:05 AM, will you have received exactly one text from your internet-connected motion sensor?
◯ I will have received exactly one text from my motion sensor
◯ The number of texts I will have received from my motion sensor cannot be determined; the answer depends on other factors
◯ I will not have received any texts from my motion sensor
◯ I will have received more than one text from my motion sensor

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Repeated Trigger (Event) Scenario 1

You love GreatPizza, and when there is a sale, you wish to have one of their pizzas for dinner. So, you write the rule(s) below.

[Shown if event-event and buggy]
IF **[GreatPizza tweets about a sale]** THEN **[Order one pizza from GreatPizza]**

[Shown if event-event and non-buggy]
IF NOT **[This rule fires]** AND AFTERWARD **[GreatPizza tweets about a sale]** WITHIN **[1 hr]** THEN **[Order one pizza from GreatPizza]**

[Shown if event-state and buggy]
IF **[GreatPizza tweets about a sale]** THEN **[Order one pizza from GreatPizza]**

[Shown if event-state and non-buggy]
IF **[GreatPizza tweets about a sale]** WHILE NOT **[This rule has triggered within the last hour]** THEN **[Order one pizza from GreatPizza]**

• You have not yet ordered from GreatPizza today. At 6:00 PM, the GreatPizza twitter account sends out a tweet announcing a sale. Every minute for the next 5 minutes, they tweet the same message. At 8:07 PM, will your internet-connected device have ordered you exactly one pizza from GreatPizza?
◯ Exactly one pizza will have been ordered
◯ The number of pizzas ordered cannot be determined; the answer depends on other factors
◯ No pizzas will have been ordered
◯ More than one pizza will have been ordered

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Repeated Trigger (Event) Scenario 2

You wish to receive if a text if the motion detector in your attic is tripped. So, you write the rule(s) below.

[Shown if event-event and buggy]
IF **[My attic motion sensor is tripped]** THEN **[Send me a text]**

[Shown if event-event and non-buggy]
IF **[My attic motion sensor is tripped]** AND NOT **[This rule triggers]** WITHIN **[10 min]** THEN **[Send me a text]**

[Shown if event-state and buggy]
IF **[My attic motion sensor is tripped]** THEN **[Send me a text]**

[Shown if event-state and non-buggy]
IF **[My attic motion sensor is tripped]** WHILE NOT **[This rule has triggered within the last 10 minutes]** THEN **[Send me a text]**

• You leave the house at 8 AM. At 10 AM, your cat wanders back and forth in front of the motion sensor for five minutes, tripping it multiple times. At 10:09 AM, will you have received exactly one text from your internet-connected motion sensor?
◯ I will have received exactly one text from my motion sensor
◯ The number of texts I will have received from my motion sensor cannot be determined; the answer depends on other factors
◯ I will not have received any texts from my motion sensor
◯ I will have received more than one text from my motion sensor

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Nondeterministic Timing Scenario 1

NOTE: Assume that a text message's initial status is "unread" when it is received.

You wish to automatically open text messages on your tablet computer when you are on a phone call, but automatically open them on your phone if you are not on a phone call. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[I accept a phone call]** AND AFTERWARD **[I receive a text]** WITHIN **[1 hr]** THEN **[Display the text message on my tablet computer]**

[Shown if event-event, non-buggy]
IF **[I accept a phone call]** AND **[I receive a text]** WITHIN **[1 hr]** THEN **[Display the text message on my tablet computer]**

[Shown if state-state, buggy]
IF **[I am on a phone call]** AND **[I have an unread text message]** THEN **[Display the text message on my tablet computer]**

[Shown if state-state, non-buggy]
IF **[I am on a phone call]** AND **[I have an unread text message]** THEN **[Mark the text message as read and display it on my tablet computer]** PRIORITY *[6]*
–OR–
IF **[A text message is open on my phone]** AND **[The phone is ringing]** THEN **[Mark the text message as read and display it on my tablet computer]** PRIORITY *[5]*

[Shown if event-state, buggy]
IF **[I receive a text message]** WHILE **[I am on a phone call]** THEN **[Display the text message on my tablet computer]**

[Shown if event-state, non-buggy]
IF **[I receive a text message]** WHILE **[I am on a phone call]** THEN **[Display the text message on my tablet computer]**
–OR–
IF **[I accept a phone call]** WHILE **[A text message is open on my phone]** THEN **[Display the text message on my tablet computer]**

At the beginning of the scenario, you have no unread text messages. At 7:21 PM, you receive a text message from your friend at the exact instant that you accept a phone call from your mother. You accept the phone call and begin speaking to your mother. At 7:22 PM, will the text message have displayed on your tablet computer?

• At the beginning of the scenario, you have no unread text messages. At 7:21 PM, you receive a text message from your friend at the exact instant that you accept a phone call from your mother. You accept the phone call and begin speaking to your mother. At 7:22 PM, will the text message have displayed on your tablet computer?
◯ The text message will have displayed on my tablet computer
◯ The text message may or may not have displayed on my tablet computer; the answer depends on other factors

◯ The text message will not have displayed on my tablet computer

• At 10:59 AM, it is 68 degrees inside of your house, and 60 degrees outside. You open the windows at 11:00 AM. The temperature outside remains constant for 21 minutes. At 11:21 AM, will the windows in your house be open?
◯ The windows will be open
◯ The windows may or may not be open; the answer depends on other factors
◯ The windows will not be open

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Nondeterministic Timing Scenario 2

You want to congratulate yourself each time you make it to work on time. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[I arrive at work]** AND AFTERWARD **[The clock strikes 9 AM]** WITHIN **[1 hr]** THEN **[Send me a text that says "Congrats!"]**

[Shown if event-event, non-buggy]
IF **[The clock strikes 8:01 AM]** AND **[I arrive at work]** WITHIN **[1 hr]** THEN **[Send me a text that says "Congrats!"]**

[Shown if state-state, buggy]
IF **[I am at work]** AND **[The time is between 8:00 AM and 9:00 AM]** THEN **[The time is between 8:00 AM and 9:00 AM]**

[Shown if state-state, non-buggy]
IF **[I am at work]** AND **[The time is between 8:00 AM and 9:01 AM]** THEN **[Send me a text that says "Congrats!"]**

[Shown if event-state, buggy]
IF **[The clock strikes 9 AM]** WHILE **[I am at work]** THEN **[Send me a text that says "Congrats!"]**

[Shown if event-state, non-buggy]
IF **[I arrive at work]** WHILE **[The time is between 8 AM and 9:01 AM]** THEN **[Send me a text that says "Congrats!"]**

• You walk through the doors at work at the instant the clock strikes 9 AM. By 9:05 AM, will you have received a congratulatory text?
◯ I will have received a congratulatory text
◯ I may or may not have received a congratulatory text; the answer depends on other factors
◯ I will not have received a congratulatory text

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Extended Action Scenario 1

[All of the below are only shown for state-state]
NOTE: Assume it takes 1 hour to run a chemical reaction, and 10 reactions can be run at the same time.
You wish to program the robots at your chemical production factory to run chemical reactions while electricity is cheaper. So, you write the rule(s) below.

[Shown for buggy]
IF **[The price of electricity is less than 12 cents/kilowatt-hour]** AND NOT **[A chemical reaction has finished in the past hour]** THEN **[Start running one chemical reaction]**

[Shown for non-buggy]
IF **[The price of electricity is less than 12 cents/kilowatt-hour]** AND NOT **[A chemical reaction is currently running]** THEN **[Start running one chemical reaction]**

• At 9 PM, the price of electricity drops to 10 cents/kilowatt-hour. At 9:45 PM the price rises to 15 cents/kilowatt-hour. By midnight, will the robots have run exactly one chemical reaction?

◯ The robots will have run exactly one chemical reaction
◯ The number of chemical reactions the robots will have run cannot be determined; the answer depends on other factors
◯ The robots will not have run any chemical reactions
◯ The robots will have run more than one chemical reaction

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Extended Action Scenario 2

[All of the below are only shown for state-state]

Scenario 2: NOTE: Assume that coffee takes 10 minutes to brew and your pot can hold 12 cups of coffee.

You want your internet-connected coffee maker to start automatically brewing coffee for you in the mornings when you are tired. So, you write the rule(s) below.

[Shown for buggy]

IF **[I have slept less than 8 hours]** AND **[I am awake]** AND **[The time is between 7 AM and 7:05 AM]** AND **[Coffee has not finished brewing in the last 10 minutes]** THEN **[Start brewing one cup of coffee]**

[Shown for non-buggy]

IF **[I have slept less than 8 hours]** AND **[I am awake]** AND **[The time is between 7 AM and 7:05 AM]** AND **[Coffee is not currently brewing]** THEN **[Start brewing one cup of coffee]**

• You fall asleep at 2:00 AM, and wake up at 7:00 AM. You get up and walk into the kitchen at 7:30 AM. At 7:31 AM, will exactly one cup of coffee have been brewed?
◯ Exactly one cup of coffee will have been brewed
◯ The number of cups of coffee that will have been brewed cannot be determined; the answer depends on other factors
◯ No cups of coffee will have been brewed
◯ More than one cup of coffee will have been brewed

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Missing Reversal Scenario 1

You want to save electricity, and ensure that the lights are turned off before you go to bed for the evening. So, you write the rule(s) below.

[Shown if event-event, buggy]

IF **[I enter the living room]** THEN **[Turn on the living room lights]**

[Shown if event-event, non-buggy]

IF **[I enter the living room]** THEN **[Turn on the living room lights]**
– OR –
IF **[I leave the living room]** THEN **[Turn off the living room lights]**

[Shown if state-state, buggy]

IF **[I am in the living room]** THEN **[The lights in the living room should be on]**

[Shown if state-state, non-buggy]

DEFAULT: **[The lights in the living room should be off]** *[0]* – OR –
IF **[I am in the living room]** THEN **[The lights in the living room should be on]** *[5]*

[Shown if event-state, buggy]

IF **[I enter the living room]** THEN **[Turn on the living room lights]**

[Shown if event-state, non-buggy]

IF **[I enter the living room]** THEN **[Turn on the living room lights]**

– OR –
IF **[I leave the living room]** THEN **[Turn off the living room lights]**

• At 7 PM, you are the only person in the living room. You watch TV for half an hour, then you leave the room, go to your bedroom, and go to bed. At that point, will the lights in the living room be turned off?
◯ The lights will be turned off
◯ The lights may or may not be turned off; the answer depends on other factors
◯ The lights will **not** be turned off

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Missing Reversal Scenario 2

When you are out of the house, you like to circulate fresh air through your house as long as the weather is nice, but when it begins to rain you want to close the windows to ensure rain does not get inside. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[I leave the house]** AND **[It begins to rain]** WITHIN **[12 hrs]** THEN **[Close the windows]**

[Shown if event-event, non-buggy]
IF **[I leave the house]** AND **[It begins to rain]** WITHIN **[12 hrs]** THEN **[Close the windows]**
– OR –
IF **[I leave the house]** AND **[It stops raining]** WITHIN **[12 hrs]** THEN **[Open the windows]**

[Shown if state-state, buggy]
IF **[It is raining]** AND **[I am out of the house]** THEN **[The windows should be closed]**

[Shown if state-state, non-buggy]
DEFAULT: **[The windows should be open]** *[0]* – OR –
IF **[It is raining]** AND **[I am out of the house]** THEN **[The windows should be closed]** *[1]*

[Shown if event-state, buggy]
IF **[It begins to rain]** WHILE **[I am out of the house]** THEN **[Close the windows]**

[Shown if event-state, non-buggy]
IF **[It begins to rain]** WHILE **[I am out of the house]** THEN **[Close the windows]**
– OR –
IF **[It stops raining]** WHILE **[I am out of the house]** THEN **[Open the windows]**

• The windows are open at the beginning of this scenario. You leave the house at 7:30 AM, and do not return home until 8:30 PM. It begins to rain at 8:00 AM. It stops raining by 10:00 AM, and is then sunny until 8:00 PM. At 7:59 PM, will your windows be open?
◯ The windows will be open
◯ The windows may or may not be open; the answer depends on other factors
◯ The windows will **not** be open

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Secure Default Bias Scenario 1

You wish to change the color of the lights in your garden when there is a weather alert, but you want them to be a normal white light for your neighbor to come by and water your plants at 7:00 pm. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[A weather alert is issued]** THEN **[Change my garden lights to blue]**
–OR–
IF **[The clock strikes 7:00 PM]** THEN **[Change my garden lights to white]**

[Shown if event-event, non-buggy]
IF **[A weather alert is issued]** THEN **[Change my garden lights to blue]**
–OR–
IF **[The clock strikes 7:00 PM]** THEN **[Change my garden lights to white]**
–OR–
IF **[The neighbor leaves the garden]** THEN **[Change my garden lights to blue]**

[Shown if state-state, buggy]
IF **[A weather alert is active]** THEN **[My garden lights should be blue]** PRIORITY *[3]*
–OR–
IF **[The time is between 7:00 PM and 8:00 PM]** THEN **[My garden lights should be white]** PRIORITY *[4]*

[Shown if state-state, non-buggy]
IF **[A weather alert is active]** THEN **[My garden lights should be blue]** PRIORITY *[4]*
–OR–
IF **[The time is between 7:00 PM and 7:30 PM]** THEN **[My garden lights should be white]** PRIORITY *[3]*

[Shown if event-state, buggy]
IF **[A weather alert is issued]** THEN **[Change my garden lights to blue]**
–OR–
IF **[The clock strikes 7:00 PM]** THEN **[Change my garden lights to white]**

[Shown if event-state, non-buggy]
IF **[A weather alert is issued]** THEN **[Change my garden lights to blue]**
–OR–
IF **[The clock strikes 7:00 PM]** THEN **[Change my garden lights to white]**
–OR–
IF **[My neighbor leaves the garden]** WHILE **[A weather alert is active]** THEN **[Change my garden lights to blue]**

• At 6:50 PM, a weather alert is issued, and remains active until 8:00 PM. At 7:45 PM, will your garden lights be blue?
◯ The lights will be blue
◯ The lights may or may not be blue; the answer depends on other factors
◯ The lights will not be blue

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Secure Default Bias Scenario 2

You wish to protect your house from criminals by locking the doors when there is a criminal alert, but you want to leave the door unlocked for your neighbor to come by and take your dog, Fido, on a walk at 7:00 PM. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[A criminal alert is issued]** THEN **[Lock the door]**
–OR–
IF **[The clock strikes 7:00 PM]** THEN **[Unlock the door]**

[Shown if event-event, non-buggy]
IF **[A criminal alert is issued]** THEN **[Lock the door]**
–OR–
IF **[The clock strikes 7:00 PM]** THEN **[Unlock the door]**
–OR–
IF **[Fido enters the house]** THEN **[Lock the door]**

[Shown if state-state, buggy]
IF **[A criminal alert is active]** THEN **[The door should be locked]** PRIORITY *[3]*
–OR–
IF **[The time is between 7:00 PM and 8:00 PM]** THEN **[The door should be unlocked]** PRIORITY *[4]*

[Shown if state-state, non-buggy]
IF **[A criminal alert is active]** THEN **[The door should be locked]** PRIORITY *[4]*
–OR–
IF **[The time is between 7:00 PM and 7:30 PM]** THEN **[The door should be unlocked]** PRIORITY *[3]*

[Shown if event-state, buggy]
IF **[A criminal alert is issued]** THEN **[Lock the door]**
–OR–
IF **[The clock strikes 7:00 PM]** THEN **[Unlock the door]**

[Shown if event-state, non-buggy]
IF **[A criminal alert is issued]** THEN **[Lock the door]**
–OR–
IF **[The clock strikes 7:00 PM]** THEN **[Unlock the door]**
–OR–
IF **[Fido enters the house]** WHILE **[A criminal alert is active]** THEN **[Lock the door]**

• At 6:50 PM, a criminal alert is issued. The alert remains active until 8:00 PM. At 7:45 PM, will your doors be locked?
◯ The doors will be locked
◯ The doors may or may not be locked; the answer depends on other factors
◯ The doors will not be locked

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Time Window Scenario 1

[Shown if event-event]
You are sending some of your scientific data to an offsite supercomputer for processing, and if your thermometer sends updated data to your lab computer while it is processing, you want to receive an email notification. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[I send data to the supercomputer]** AND **[I receive additional thermometer data]** WITHIN **[4 hrs]** THEN **[Send me an email notification]**

[Shown if event-event, non-buggy]
IF **[I send data to the supercomputer]** AND **[I receive additional thermometer data]** WITHIN **[2 hrs]** THEN **[Send me an email notification]**

• You send the data to the supercomputer at 10 AM, and the data processes for the next 2 hours. At 1 PM, your thermometer sends updated data to your lab computer. At 2 PM, will you have received an email notification from your internet-connected device?
◯ I will have received an email notification
◯ I may or may not have received an email notification; the answer depends on other factors
◯ I will **not** have received an email notification

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Time Window Scenario 2

[Shown if event-event]
You cannot hear the doorbell when you are in the bathroom, so you wish to receive a call to let you know when someone is at the door when you are in the bathroom. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[I enter the bathroom]** AND **[The doorbell rings]** WITHIN **[20 mins]** THEN **[Call my cell phone]**

[Shown if event-event, non-buggy]
IF **[I enter the bathroom]** AND **[The doorbell rings]** WITHIN **[5 mins]** THEN **[Call my cell phone]**

• You enter the bathroom at 8 PM. You stay in the bathroom for 10 minutes, and then you leave. At 8:15 PM, your doorbell rings. At 8:16 PM, will your cell phone have been called by your internet-connected device?
◯ My cell phone will have been called
◯ My cell phone may or may not have been called; the answer depends on other factors
◯ My cell phone will **not** have been called

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Conflict Resolution Scenario 1

[All of the below are only shown if state-state]
You like to have red light inside when there is a rainbow outside your window, but when it is raining, you prefer to have blue light. So, you write the rule(s) below.

[Shown if buggy]
IF **[It is raining]** THEN **[The lights should be blue]** PRIORITY *[3]*
–OR–
IF **[There is a rainbow outside]** THEN **[The lights should be red]** PRIORITY *[3]*

[Shown if non-buggy]
IF **[It is raining]** THEN **[The lights should be blue]** PRIORITY *[4]*
–OR–
IF **[There is a rainbow outside]** THEN **[The lights should be red]** PRIORITY *[2]*

• At 2:00 PM, it begins raining. It continues raining for the next 4 hours. At 3:00 PM, while it is still raining, a rainbow appears in the sky. At 3:01 PM, will your lights be blue?
◯ The lights will be blue
◯ The lights may or may not be blue; the answer depends on other factors
◯ The lights will not be blue

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Conflict Resolution Scenario 2

[All of the below are only shown if state-state]
When your living room is too crowded (has 10 or more people) you want the lights to turn red. So, you write the rule(s) below.

[Shown if buggy]
IF **[One or more people are in the living room]** THEN **[The lights should be blue]** PRIORITY *[3]*
–OR–
IF **[Ten or more people are in the living room]** THEN **[The lights should be red]** PRIORITY *[3]*

[Shown if non-buggy]
IF **[One or more people are in the living room]** THEN **[The lights should be blue]** PRIORITY *[4]*
–OR–
IF **[Ten or more people are in the living room]** THEN **[The lights should be red]** PRIORITY *[3]*

• Nine people are sitting in the living room at 4:05 PM. At 4:10 PM, a tenth person enters the living room and sits down. At 4:11 PM, will the lights be blue?
◯ The lights will be blue
◯ The lights may or may not be blue; the answer depends on other factors
◯ The lights will not be blue

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Flipped Event-State Scenario 1

You do not want your dog Fido playing outside in the rain, since he will track mud back indoors. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[Fido goes outside]** AND AFTERWARD **[It starts raining]** WITHIN **[1 hr]** THEN **[Call Fido inside]**

[Shown if event-event, non-buggy]
IF **[Fido goes outside]** AND **[It starts raining]** WITHIN **[1 hr]** THEN **[Call Fido inside]**

[Shown if event-state, buggy]
IF **[It starts raining]** WHILE **[Fido is outside]** THEN **[Call Fido inside]**

[Shown if event-state, non-buggy]
IF **[It starts raining]** WHILE **[Fido is outside]** THEN **[Call Fido inside]**
–OR–
IF **[Fido goes outside]** WHILE **[It is raining]** THEN **[Call Fido inside]**

• At 2:00 PM, it begins to rain, and continues raining. At 2:30 PM, Fido goes outside. At 2:31 PM, will Fido have been called inside?
◯ Fido will have been called inside
◯ Fido may or may not have been called inside; the answer depends on other factors
◯ Fido will not have been called inside

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Flipped Event-State Scenario 2

NOTE: Assume it takes 1 minute for your car's bluetooth system to connect to any bluetooth device.

You like to listen to music from your phone in the car, and so you want to make it easier for your phone to connect to your car's bluetooth function. So, you write the rule(s) below.

[Shown if event-event, buggy]
IF **[I turn on my phone's bluetooth]** AND AFTERWARD **[I start the car]** WITHIN **[15 min]** THEN **[Connect my car's bluetooth system to my phone]**

[Shown if event-event, non-buggy]
IF **[I turn on my phone's bluetooth]** AND **[I start the car]** WITHIN **[15 min]** THEN **[Connect my car's bluetooth system to my phone]**

[Shown if event-state, buggy]
IF **[I start the car]** WHILE **[My phone's bluetooth is turned on]** THEN **[Connect my car's bluetooth system to my phone]**

[Shown if event-state, non-buggy]
IF **[I start the car]** WHILE **[My phone's bluetooth is turned on]** THEN **[Connect my car's bluetooth system to my phone]**
–OR–
IF **[I turn on my phone's bluetooth]** WHILE **[My car is on]** THEN **[Connect my car's bluetooth system to my phone]**

• At 5:10 PM, you enter your car and place your phone in the cupholder. While the time is still 5:10 PM, you turn on your car. At 5:11 PM, you turn on your phone's bluetooth capability. At 5:15 PM, will your car's bluetooth system have connected to your phone?
◯ My car's bluetooth system will have connected to my phone
◯ My car's bluetooth system may or may not have connected to my phone; the answer depends on other factors
◯ My car's bluetooth system will not have been connected to my phone

• How confident are you in your answer to the previous question?
◯ Extremely confident ◯ Moderately confident ◯ Somewhat confident ◯ Slightly confident ◯ Not at all confident

• Why?

Demographics

We will finish the survey with a handful of questions about your demographics and experience (if any) with computer science.

• How old are you?

• With what gender do you identify?

◯ Male ◯ Female ◯ Non-binary / other ◯ I prefer not to answer

Try your best to answer the following three logic questions, which we have included for the purpose of calibrating participants' answers.

• A bat and a ball cost $1.10 in total. The bat costs $1.00 more than the ball. How much does the ball cost? (Give your answer in cents; e.g., type 2 if your answer is 2 cents.)

• If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets? (Give your answer in minutes; e.g., type 2 if your answer is 2 minutes.)

• In a lake, there is a patch of lily pads. Every day, the patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake? (Give your answer in days; e.g., type 2 if your answer is 2 days.)

• Please select the highest level of education you have completed:

◯ Less than high school ◯ High school graduate ◯ Some college; no degree ◯ 2 year college degree ◯ 4 year college degree ◯ Master's degree, professional degree, or doctorate

• Are you majoring in, hold a degree in, or have held a job in any of the following fields: computer science; computer engineering; information technology; or a related field?

◯ Yes ◯ No ◯ I prefer not to answer

• Have you ever completed a class or completed a class-length online tutorial about computer programming?

◯ Yes ◯ No ◯ Prefer not to answer

[This next question is displayed if the user answers the previous question in the affirmative]

• What computer programming languages have you used?

• Are you familiar with the website IFTTT ("If this, then that")

◯ Yes ◯ No ◯ I'm not sure

[This next question is displayed if the user answers the previous question in the affirmative]

• Have you previously used the website IFTTT ("If this, then that") ◯ Yes ◯ No ◯ I'm not sure

• Do you own a smart phone, such as an iPhone or Android?

◯ Yes ◯ No ◯ I'm not sure

• Do you, or any other member of your household, own any internet-connected home devices, including (but not limited to) a Nest Thermostat, Philips Hue lights, Samsung SmartThings, Roomba vacuum cleaner, Amazon Echo, or Google Home?

◯ Yes ◯ No ◯ I'm not sure

[This next question is displayed if the user answers the previous question in the affirmative]

• What internet-connected home devices do you or other members of your household own?