CLAIMS

What is claimed is:

1. A computer-implemented method comprising:

obtaining, by a configured computing system, a decision data structure generated from data about previous modification actions of multiple types that are performed on configuration settings affecting use of hardware components on mobile devices and that are associated with subsequent changes in device operations of the mobile devices, wherein the mobile devices have a plurality of device attributes and the modification actions have a plurality of action attributes, and wherein the decision data structure includes information about measured effects for a subset of the device and action attributes that are selected based on combinations of those device and action attributes being associated with measured effects of an indicated type in the subsequent changes; and

using, by the configured computing system, the decision data structure to control ongoing operations for an additional mobile device, including:

determining, by the configured computing system, and for each of multiple modification actions to possibly perform, one of the combinations of device and action attributes in the decision data structure that matches attributes of the additional mobile device and the modification action, and using information about the measured effects for the determined combination to predict an effect of performing the modification action on the additional mobile device;

selecting, by the configured computing system, one of the multiple modification actions to perform based at least in part on the predicted effect of performing the selected one modification action on the additional mobile device; and

initiating, by the configured computing system, performance of the selected one modification action on the additional mobile device to modify one or more configuration settings that affect use of hardware components on the additional mobile device.

2. The computer-implemented method of claim 1 wherein the measured effects for the subset of the device and action attributes are based on

performance of batteries powering the mobile devices, wherein the predicted effect of performing the selected one modification action on the additional mobile device involves increasing a length of time that one or more batteries are available to power the additional mobile device, and wherein the initiating of the performance of the selected one modification action on the additional mobile device includes reducing use of one or more hardware components on the additional mobile device that are associated with battery usage.

3. The computer-implemented method of claim 2 wherein the reducing of the use of one or more hardware components on the additional mobile device includes modifying one or more configuration settings on the additional mobile device to reduce use of a display on the additional mobile device.

4. The computer-implemented method of claim 2 wherein the reducing of the use of one or more hardware components on the additional mobile device includes modifying one or more configuration settings on one or more other devices that are associated with managing electronic communications sent to and/or from the additional mobile device to reduce use of a network interface on the additional mobile device.

5. The computer-implemented method of claim 1 wherein the measured effects for the subset of the device and action attributes are based on errors in network communications involving the mobile devices, wherein the predicted effect of performing the selected one modification action on the additional mobile device involves reducing errors of one or more types for network communications involving the additional mobile device, and wherein the initiating of the performance of the selected one modification action on the additional mobile device includes increasing a memory buffer size on the additional mobile device that is associated with streaming data to the additional mobile device.

6. The computer-implemented method of claim 1 wherein the measured effects for the subset of the device and action attributes are based on at least one of processor or memory performance on the mobile devices, wherein the

predicted effect of performing the selected one modification action on the additional mobile device involves improving the at least one of processor or memory performance on the additional mobile device, and wherein the initiating of the performance of the selected one modification action on the additional mobile device includes reducing use of virtualization on the additional mobile device.

7. The computer-implemented method of claim 1 wherein the configured computing system is the additional mobile device, and wherein the using of the decision data structure includes executing an automated performance manager system on the additional mobile device to perform the controlling of the ongoing operations for the additional mobile device.

8. The computer-implemented method of claim 1 further comprising:

obtaining additional decision data structures that each includes information about a type of measured effect for a subset of device and action attributes that are selected for use in that decision data structure, and wherein the type of measured effect for each of the additional decision data structures is different from that for the obtained decision data structure and from other of the additional decision data structures; and

determining, by the configured computing system, and for each of the additional decision data structures, a predicted effect of the type for the additional decision data structure for performing each of the multiple modification actions on the additional mobile device;

and wherein the selecting of the one modification action further includes blending the determined predicted effects from each of the additional decision data structures for the one modification action with the predicted effect from the decision data structure for the one modification action.

9. The computer-implemented method of claim 8 wherein the determining of the predicted effect for each of the additional decision data structures for performing each of the multiple modification actions on the additional mobile device includes identifying one of multiple nodes in the

additional decision data structure that is associated with a combination of device and action attributes in the decision data structure that matches attributes of the additional mobile device and that modification action, and wherein the blending of the determined predicted effects from each of the additional decision data structures for the one modification action with the predicted effect from the decision data structure for the one modification action includes weighting the determined predicted effect from each additional decision data structure based at least in part on how similar the device and modification attributes for the identified node in that additional decision data structure for the one modification action are to an intersection of device and modification attributes of all nodes.

10. The computer-implemented method of claim 1 wherein the using of the decision data structure to control ongoing operations for the additional mobile device further includes receiving, by the configured computing system, a request for a modification action to be performed substantially immediately, and wherein the determining and the using of the information and the selecting and the initiating are performed in response to the received request.

11. The computer-implemented method of claim 1 wherein the additional mobile device is at least one of a smartphone, a portable gaming device, a tablet computer or a laptop computer, and wherein the method further comprises notifying, by at least one of the configured computing system or the additional mobile device, and after the performance of the selected one modification action on the additional mobile device, a user of the additional mobile device of the performance of the selected one modification action on the additional mobile device.

12. The computer-implemented method of claim 1 wherein the additional mobile device is at least one of a smartphone, a portable gaming device, a tablet computer or a laptop computer, and wherein the method further comprises notifying, by at least one of the configured computing system or the additional mobile device, a user of the additional mobile device of the selected one modification action, and wherein the performance of the selected one

modification action on the additional mobile device is further based at least in part on a response of the user to the notifying.

13. The computer-implemented method of claim 1 wherein the selecting of the one modification action is further based in part on additional information specific to the additional mobile device to customize the selecting to the additional mobile device or specific to a user of the additional mobile device to customize the selecting to the user.

14. The computer-implemented method of claim 1 wherein some of the combinations of device and action attributes with information included in the decision data structure have action attributes that further correspond to actions involving modifying content being provided via programs executing on the mobile devices, wherein one or more of the multiple modification actions include modifying content being provided by at least one program executing on the additional mobile device, and wherein the method further comprises selecting and performing at least one of the one or more modification actions to cause content being provided by at least one program executing on the additional mobile device to be modified.

15. The computer-implemented method of claim 1 wherein some of the combinations of device and action attributes with information included in the decision data structure have action attributes that further correspond to actions involving providing choices to increase use of a service by the mobile devices or to retain use of a service by the mobile devices, wherein one or more of the multiple modification actions include providing one or more choices to increase or retain use of the service by the additional mobile device, and wherein the method further comprises selecting and performing at least one of the one or more modification actions to cause the providing of the one or more choices to increase or retain use of the service by the additional mobile device.

16. The computer-implemented method of claim 1 wherein the determined one combination of device and action attributes has an associated

node in the decision data structure that has a target distribution and a control distribution, wherein the target distribution identifies the measured effects for devices with the device attributes of the determined one combination that receive modification actions with the action attributes of the determined one combination, wherein the control distribution identifies the measured effects for other devices with the device attributes of the determined one combination that do not receive modification actions with the action attributes of the determined one combination, and wherein predicting the effect of performing the modification action on the additional mobile device includes determining a difference in identified measured effects for the target distribution and identified measured effects for the control distribution.

17. A non-transitory computer-readable medium having stored contents that cause one or more computing systems to perform automated operations including at least:

obtaining, by a configured computing system, a decision structure generated from data about previous modification actions of multiple types that are performed on configuration settings affecting use of hardware components on computing devices and that are associated with subsequent changes in device operations of the computing devices, wherein the computing devices and the modification actions have a plurality of device and action attributes, and wherein the decision structure includes information about measured effects for a subset of the device and action attributes that are selected based on combinations of those device and action attributes being associated with measured effects of an indicated type in the subsequent changes; and

using, by the configured computing system, the decision structure to control ongoing operations for an additional computing device, including:

determining, by the configured computing system, and for each of multiple modification actions to possibly perform, a combination of device and action attributes in the decision structure that matches attributes of the additional computing device and the modification action, and using information about the measured effects for the determined combination to predict an effect of performing the modification action on the additional computing device;

selecting, by the configured computing system, one of the multiple modification actions based at least in part on the predicted effect of performing the selected one modification action on the additional computing device; and

initiating, by the configured computing system, performance of the selected one modification action on the additional computing device to modify one or more configuration settings that affect use of hardware components on the additional computing device.

18. The non-transitory computer-readable medium of claim 17 wherein the additional computing device is a mobile device, wherein the decision structure is a decision tree data structure, and wherein the stored contents include software instructions that, when executed, program the one or more computing systems to perform the automated operations.

19. A system comprising:

one or more hardware processors of one or more computing systems; and

one or more memories with stored instructions that, when executed, cause the system to perform automated operations including at least:

obtaining decision information generated from data about previous modification actions of multiple types that are performed on configuration settings affecting use of hardware components on computing devices and that are associated with subsequent changes in device operations of the computing devices, wherein the computing devices and the modification actions have a plurality of device and action attributes, and wherein the decision structure includes information about measured effects for a subset of the device and action attributes that are selected based on combinations of those device and action attributes being associated with measured effects of an indicated type in the subsequent changes; and

using the obtained decision information to control ongoing operations for an additional computing device, including:

determining, for each of multiple modification actions to possibly perform, a combination of device and action attributes in the obtained decision information that matches attributes of the additional computing device and the

modification action, and using information about the measured effects for the determined combination to predict an effect of performing the modification action on the additional computing device;

selecting one of the multiple modification actions based at least in part on the predicted effect of performing the selected one modification action on the additional computing device; and

initiating performance of the selected one modification action on the additional computing device to modify one or more configuration settings that affect use of hardware components on the additional computing device.

20. The system of claim 19 wherein the additional computing device is a mobile device, wherein the obtained decision information is encoded in a decision tree data structure, and wherein the stored instructions include software instructions that, when executed, program the one or more computing systems to perform the automated operations.