Claims

1. An utility grid command filter system comprising:

a memory configured to store a plurality of device command rules; and

a command filter module stored on the memory and executable by a processor to:

receive a plurality of commands, wherein each of the plurality of commands is received from a respective origination device, and wherein each of the plurality of commands is configured to provide a command for a respective device electrically coupled to a utility grid;

retrieve at least one device command rule from the plurality of device command rules;

retrieve utility grid connectivity data corresponding to current operating conditions of the utility grid;

retrieve utility grid historical data corresponding to operation of a device respective to the at least one command;

determine at least one predicted utility grid effect from authorization of the at least one command based on the utility grid historical data and the utility grid connectivity data;

determine when at least one command of the plurality of commands is authorized for execution by the respective device based on the at least one device command rule and the predicted utility grid effect; and

transmit the at least one command to be received by the respective device when the at least one command is determined to be authorized for execution by the respective device.

2. The utility grid command filter system of Claim 1, wherein the command filter module is further executable to generate a rejection message configured to be received by the respective origination device when the at least one command is determined to be unauthorized for execution by the respective device, wherein the rejection message is indicative of the at least one command being unauthorized for execution by the respective device.

3. The utility grid command filter system of Claim 1 or 2, wherein the command filter module is further executable to:

~~retrieve utility grid historical data corresponding to operation of a device respective to the at least one command, and~~

determine when at least one command of the plurality of commands is authorized for execution by the device based on the utility grid historical data.

4. The utility grid command filter system of Claim 3, wherein the command filter module is further executable to:

~~retrieve utility grid connectivity data corresponding to current operating conditions of the utility grid; and~~

determine when at least one command of the plurality of commands is authorized for execution by the device based on the utility grid connectivity data.

~~5. The utility grid command filter system of Claim 4, wherein the command filter module is further executable to:~~

~~determine at least one predicted utility grid effect from authorization of the at least one command based on the utility grid historical data and the utility grid connectivity data; and~~

~~determine when at least one command of the plurality of commands is authorized for execution by the device based on the at least one predicted effect.~~

~~6~~5. The utility grid command filter system of any of the preceding ~~C~~claims ~~5~~1, wherein the at least one device command rule is a minimum utility grid disturbance threshold, where the command filter module is further executable to determine when the at least one command of the plurality of commands is authorized for execution by the device when the predicted effect is less than the minimum utility grid disturbance threshold.

~~7~~6. The utility grid command filter system of any of the preceding ~~C~~claims ~~1~~, wherein the at least one device command rule comprises limiting device connection to a predetermined number of devices within a predetermined amount of time.

~~8~~7. The utility grid command filter system of any of the preceding ~~C~~claims ~~1~~, wherein the at least one device command rule comprises limiting restart of a device to a predetermined number of times within a predetermined amount of time.

~~9~~8. A utility grid comprising:

a plurality of electrically-coupled devices; and

a command filter system configured to:

receive a plurality of commands, wherein each of the plurality of commands is received from a respective origination device, and wherein each of the plurality of commands is configured to provide a command to a respective device of the plurality of electrically-coupled devices;

retrieve at least one device command rule from a plurality of device command rules;

retrieve utility grid connectivity data corresponding to current operating conditions of the utility grid;

retrieve utility grid historical data corresponding to operation of a device respective to the at least one command;

determine at least one predicted utility grid effect from authorization of the at least one command based on the utility grid historical data and the utility grid connectivity data;

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determine when at least one command of the plurality of commands is authorized for execution by the respective device based on the at least one device command rule and the predicted utility grid effect; and

transmit the at least one command to be received by the respective device when the at least one command is determined to be authorized for execution by the respective device; and

a communication network configured to relay the at least one command from the command filter system to the respective device.

~~10~~9. The utility grid of Claim ~~9~~ 8 further comprising:

an event bus configured to execute the command filter system;

wherein the plurality of devices comprises a first device having a first predetermined function within the utility grid and a second device having a second predetermined function within the utility grid, wherein the second predetermined function is different than the first predetermined function;

wherein the at least one command comprises a first command and a second command, wherein the first command corresponds to the first device and the second command corresponds to the second device;

wherein the communication network comprises a first communication sub-network and a second communication sub-network;

wherein the command filter system is configured to:

determine when the first command is authorized for execution by the first device based on the at least one device command rule; and

determine when the second command is authorized for execution by the respective device based on the at least one device command rule;

wherein the first communication sub-network is configured to relay the first device command to the first device when the first command is authorized for execution; and

wherein the second communication sub-network is configured to relay the second command to the second device when the second command is authorized for execution.

~~11~~10. The utility grid of Claim ~~9~~8, wherein the plurality of devices comprises a first device having a first predetermined function within the utility grid and a second device having a second predetermined function within the utility grid, wherein the second predetermined function is different than the first predetermined function;

wherein, the at least one command comprises a first command and a second command, wherein the first command corresponds to the first device and the second command corresponds to the second device;

wherein the command filter system is configured to:

determine when the first command is authorized for execution by the first device based on the at least one device command rule; and

determine when the second command is authorized for execution by the respective device based on the at least one device command rule; and

wherein the communication network comprises a communication network bus, wherein the command filter system is configured to be executed on the communication network bus;

wherein the communication network bus is configured to relay the first device command to the first device when the first command is authorized for execution; and

wherein the communication network bus is configured to relay the second command to the second device when the second command is authorized for execution.

~~12~~11. The utility grid of Claim ~~9~~8 further comprising:

an event bus configured to execute the command filter system;

wherein the plurality of devices comprises a first device having a first predetermined function within the utility grid and a second device having a second predetermined function within the utility grid, wherein the second predetermined function is different than the first predetermined function;

wherein, the at least one command comprises a first command and a second command, wherein the first command corresponds to the first device and the second command corresponds to the second device;

wherein the command filter system is configured to:

determine when the first command is authorized for execution by the first device based on the at least one device command rule; and

determine when the second command is authorized for execution by the respective device based on the at least one device command rule; and

wherein the communication network comprises a communication bus configured to:

receive the first device command to the first device from the event bus when the first command is authorized for execution;

receive the second command to the second device from the event bus when the second command is authorized for execution; and

relay the received first command to the first device and the received second command to the second device.

~~13~~12. The utility grid of Claim ~~9~~8 further comprising:

a first event bus and second event bus, wherein the command filter system comprises a first command filter system and second command filter system, where the first command filter system is configured to be executed on the first event bus and the second command filter system is configured to be executed on the second event bus;

wherein the plurality of devices comprises a first device having a first predetermined function within the utility grid and a second device having a second

predetermined function within the utility grid, wherein the second predetermined function is different than the first predetermined function;

wherein, the at least one command comprises a first command and a second command, wherein the first command corresponds to the first device and the second command corresponds to the second device;

wherein the first command filter system is configured to determine when the first command is authorized for execution by the first device based on the at least one device command rule;

wherein the second command filter system is configured to determine when the second command is authorized for execution by the respective device based on the at least one device command rule;

wherein the communication network comprises a first communication sub-network and a second communication sub-network, wherein the first communication sub-network is configured to:

receive the first device command from the first command filter system when the first command is authorized for execution; and

relay the received first device command to the first device; and

wherein the second communication sub-network is configured to:

receive the second device command from the second command filter system when the second command is authorized for execution; and

relay the received second device command to the second device.

~~14~~13. A computer-readable medium comprising a plurality of instructions executable by a processor, the computer-readable medium comprising:

instructions to direct the processor to receive a plurality of device commands, where each device command is configured to be executed by a respective device of a plurality of devices interconnected to a utility grid;

instructions to direct the processor to retrieve a set of command rules;

instructions to direct the processor to retrieve utility grid connectivity data corresponding to current operating conditions of the utility grid;

instructions to direct the processor to retrieve utility grid historical data corresponding to operation of a device respective to the at least one command;

instructions to direct the processor to determine at least one predicted utility grid effect from authorization of the at least one command based on the utility grid historical data and the utility grid connectivity data;

instructions to direct the processor to apply the set of command rules and the predicted utility grid effect to the plurality of device commands to determine when the plurality of device commands are authorized for execution by the respective device;

instructions to direct the processor to transmit each of the plurality of device commands for execution by the respective device when the plurality of device commands comply with the set of command rules and do not result in an adverse effect on the utility grid; and

instructions to prevent each of the plurality of device commands from being executed by the respective device when the plurality of device commands fail to comply with at least one command rule of the set of command rules and that are predicted to result in an adverse effect to the utility grid based on the predicted utility grid effect.

~~15~~14. The computer-readable medium of Claim ~~14~~13, further comprising:

instructions to transmit a first portion of the plurality of device commands for execution by the respective device, wherein the portion of the plurality of device commands comply with the set of command rules; and

instructions to prevent a second portion of the plurality of device commands for execution by the respective device, wherein the second portion of the plurality of device commands fail to comply with the set of command rules.

~~16~~15. The computer-readable medium of Claim ~~14~~13, further comprising:

instructions to transmit a first portion of the plurality of device commands for execution by the respective device when the first portion of the plurality of device commands are less than a predetermined command number threshold.

~~17. The computer-readable medium of Claim 14, further comprising:~~

~~instructions to predict an effect on the utility grid due to authorization of the plurality of commands; and~~

~~instructions to transmit each of the plurality of device commands for execution by the respective device based on the predicted effect.~~

~~18~~16. The computer-readable medium of Claim ~~14~~13, further comprising instructions to receive the plurality of device commands from one or more graphical user interfaces configured to receive manually-input commands.

~~19~~17. The computer-readable medium of Claim ~~14~~13, wherein the instructions to receive a plurality of device commands comprise instructions to receive the plurality of device commands, wherein at least one of the plurality of device commands is configured to be executed by a smart meter, customer premise device, switching device, or compensator device.