CLAIMS

What is claimed is:

1. A method to allocate resources for wireless communications, comprising:

grouping downlink control channels from multiple subframes;

ordering the downlink control channels across downlink subframes having a first control channel element located in a first symbol map and associated with reserved resources for an uplink channel; and

employing a symbol first mapping or a mixed-symbol/subframe first mapping to efficiently allocate the resources.

2. The method of claim 1, the control channel element (CCE) is located across downlink (DL) subframes where a first CCE is located in a first orthogonal frequency division multiplex (OFDM) symbol map to a band-edge of the reserved resources for uplink (UL) dynamic acknowledgement/negative-acknowledgement (ACK/NACK).

3. The method of claim 1, the downlink control channel is associated with a physical downlink control channel (PDCCH).

4. The method of claim 2, further comprising ordering downlink control channels having a first CCE in a second OFDM symbol.

5. The method of claim 4, further comprising ordering downlink control channels having a first CCE in a third OFDM symbol.

6. The method of claim 5, further comprising ordering downlink control channels having a first CCE in a fourth OFDM symbol.

7. The method of claim 1, further comprising scheduling unused resources for Physical uplink shared channel (PUSCH) transmissions.

8. The method of claim 1, further comprising ordering remaining downlink control channels not associated with a first CCE in a first downlink subframe.

9. The method of claim 8, further comprising ordering remaining downlink control channels not associated with the first CCE or the first downlink subframe in a second downlink subframe.

10. The method of claim 9, further comprising ordering remaining downlink control channels not associated with the first CCE or the first downlink subframe or the second downlink subframe in a third subframe.

11. The method of claim 8, further comprising scheduling unused resources for Physical uplink shared channel (PUSCH) transmissions.

12. The method of claim 1, further comprising evenly distributing data control channels across multiple subframes.

13. The method of claim 12, further comprising processing a symmetric number of downlink and uplink resources.

14. The method of claim 1, further comprising processing the downlink channels in accordance with time division duplex or frequency division duplex systems or half duplex frequency division systems.

15. A communications apparatus, comprising:

a memory that retains instructions for aggregating control channels from multiple subframes, reordering the control channels across subframes having a first control channel element located in a first symbol map and associated with reserved resources for an uplink channel, and processing a symbol first mapping or a mixed-symbol/subframe first mapping to allocate the resources; and

a processor that executes the instructions.

16. The apparatus of claim 15, the control channel element (CCE) is located across downlink (DL) subframes where a first CCE is located in a first orthogonal frequency division multiplex (OFDM) symbol map to a band-edge of the reserved resources for uplink (UL) dynamic acknowledgement/negative-acknowledgement (ACK/NACK).

17. The apparatus of claim 16, further comprising downlink control channels having a first CCE in a second OFDM symbol.

18. The apparatus of claim 17, further comprising a scheduler to process unused resources for Physical uplink shared channel (PUSCH) transmissions.

19. A communications apparatus, comprising:

means for processing multiple control channels from one or more subframes;

means for sequencing the control channels across downlink subframes having a first control channel element located in a first symbol map and associated with reserved resources for an uplink channel; and

means for generating a symbol first mapping or a mixed-symbol/subframe first mapping to process the resources.

20. A computer-readable medium, comprising:

processing multiple control channels from one or more subframes;

reordering the control channels across downlink subframes having a first control channel element located in a first symbol map associated with reserved resources; and

transmitting a symbol first mapping or a mixed-symbol/subframe first mapping to allocate the resources.

21. A processor that executes the following instructions:

monitoring multiple control channels from a plurality of subframes;

spreading the control channels across downlink subframes having a first control channel element located in a first symbol map associated with reserved resources; and

transmitting a symbol first mapping or a mixed-symbol/subframe first mapping to distribute the resources.

22. A method to process resources for wireless communications, comprising:

receiving downlink control channels from multiple subframes;

processing the downlink control channels across downlink subframes having a first control channel element located in a first symbol map and associated with reserved resources for an uplink channel; and

processing a symbol first mapping or a mixed-symbol/subframe first mapping to efficiently allocate the resources.

23. The method of claim 22, the control channel element (CCE) is located across downlink (DL) subframes where a first CCE is located in a first orthogonal frequency division multiplex (OFDM) symbol map to a band-edge of the reserved resources for uplink (UL) dynamic acknowledgement/negative-acknowledgement (ACK/NACK).

24. The method of claim 23, further comprising scheduling unused resources for Physical uplink shared channel (PUSCH) transmissions.

25. A communications apparatus, comprising:

a memory that retains instructions for receiving control channels from multiple subframes, processing the control channels across subframes having a first control channel element located in a first symbol map and associated with reserved resources for an uplink channel, and processing a symbol first mapping or a mixed-symbol/subframe first mapping to allocate the resources; and

a processor that executes the instructions.

26. A communications apparatus, comprising:

means for processing multiple control channels from one or more subframes;

means for receiving the control channels from downlink subframes having a first control channel element located in a first symbol map and associated with reserved resources for an uplink channel; and

means for processing a symbol first mapping or a mixed-symbol/subframe first mapping to process the resources.

27. A computer-readable medium, comprising:

processing multiple control channels from one or more subframes;

receiving the control channels across downlink subframes having a first control channel element located in a first symbol map associated with reserved resources; and

processing a symbol first mapping or a mixed-symbol/subframe first mapping to allocate the resources.

28. A processor that executes the following instructions:

monitoring multiple control channels from a plurality of subframes;

receiving the control channels across downlink subframes having a first control channel element located in a first symbol map associated with reserved resources; and

processing a symbol first mapping or a mixed-symbol/subframe first mapping to distribute the resources.

CLAIMS

1. A method to allocate resources for wireless communications, comprising:

grouping downlink control channels from multiple subframes;

mapping the downlink control channels to control channel elements (CCEs), wherein the mapping comprises ordering downlink control channels of the grouped downlink control channels in an effort to locate first CCEs of multiple downlink control channels to locations that implicitly map to a first set of resources reserved for uplink (UL) dynamic acknowledgement/negative-acknowledgment (ACK/NACK) such that a second set of the resources reserved for UL dynamic ACK/NACK can be used by physical uplink shared channel (PUSCH) transmission, wherein the mapping comprises:

ordering a first one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the first one or more downlink control channels to locations in a first subframe that implicitly map to the first set of resources; and

ordering a second one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the second one or more downlink control channels to locations in a second subframe that implicitly map to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE in the first subframe for mapping to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE or the first subframe in the second subframe for mapping to the first set of resources; and

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE, the first subframe, or the second subframe in a third downlink subframe for mapping to the first set of resources; and

transmitting the downlink control channels in accordance with the mapping.

2. The method of claim 1, wherein the downlink control channels are associated with physical downlink control channels (PDCCHs).

3. A communications apparatus, comprising:

a memory that retains instructions for:

grouping downlink control channels from multiple subframes;

mapping the downlink control channels to control channel elements (CCEs), wherein the mapping comprises ordering downlink control channels of the grouped downlink control channels in an effort to locate first CCEs of multiple downlink control channels to locations that implicitly map to a first set of recourses reserved for uplink (UL) dynamic acknowledgment/negative-acknowledgement (ACK/NACK) such that a second set of the resources reserved for UL dynamic ACK/NACK can be used by physical uplink shared channel (PUSCH) transmission, wherein the instructions for mapping comprise:

ordering a first one or more downlink control channels, of the grouped downlink control

channels, in an effort to locate first CCEs of the first one or more downlink control channels to locations in a first subframe that implicitly map to the first set of resources; and

ordering a second one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the second one or more downlink control channels to locations in a second subframe that implicitly map to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE in the first subframe for mapping to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE or the first subframe in the second subframe for mapping to the first set of resources; and

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE, the first subframe, or the second subframe in a third downlink subframe for mapping to the first set of resources; and

transmitting the downlink control channels in accordance with the mapping; and

a processor that executes the instructions.

4. A communications apparatus, comprising:

means for grouping downlink control channels from multiple subframes;

means for mapping the downlink control channels to control channel elements (CCEs), wherein the mapping comprises ordering downlink control channels of the grouped downlink control channels in an effort to locate first CCEs of multiple downlink control channels to locations that implicitly map to a first set of resources reserved for uplink (UL) dynamic acknowledgement/negative-acknowledgment (ACK/NACK) such that a second set of the resources reserved for UL dynamic ACK/NACK can be used by physical uplink shared channel (PUSCH) transmission, wherein the means for mapping comprises:

means for ordering a first one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the first one or more downlink control channels to locations in a first subframe that implicitly map to the first set of resources; and

means for ordering a second one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the second one or more downlink control channels to locations in a second subframe that implicitly map to the first set of resources;

means for ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE in the first subframe for mapping to the first set of resources;

means for ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE or the first subframe in the second subframe for mapping to the first set of resources; and

means for ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE, the first subframe, or the second subframe in a third downlink subframe for mapping to the first set of resources; and

means for transmitting the downlink control channels in accordance with the mapping.

5. A non-transitory computer-readable medium having instructions stored thereon, the instructions comprising code for causing at least one computer to:

group downlink control channels from multiple subframes;

map the downlink control channels to control channel elements (CCEs), wherein the mapping comprises ordering downlink control channels of the grouped downlink control channels in an effort to locate first CCEs of multiple downlink control channels to locations that implicitly map to a first set of resources reserved for uplink (UL) dynamic acknowledgement/negative-acknowledgment (ACK/NACK) such that a second set of the resources reserved for UL dynamic ACK/NACK can be used by physical uplink shared channel (PUSCH) transmission, wherein the mapping comprises:

ordering a first one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the first one or more downlink control channels to locations in a first subframe that implicitly map to the first set of resources; and

ordering a second one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the second one or more downlink control channels to locations in a second subframe that implicitly map to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE in the first subframe for mapping to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE or the first subframe in the second subframe for mapping to the first set of resources; and

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE, the first subframe, or the second subframe in a third downlink subframe for mapping to the first set of resources; and

transmit the downlink control channels in accordance with the mapping.

6. A method to allocate resources for wireless communications, comprising:

grouping downlink control channels from multiple subframes;

mapping the downlink control channels to control channel elements (CCEs), wherein the mapping comprises ordering downlink control channels of the grouped downlink control channels in an effort to locate first CCEs of multiple downlink control channels to locations that implicitly map to a first set of resources reserved for uplink (UL) dynamic acknowledgement/negative-acknowledgment (ACK/NACK) such that a second set of the resources reserved for UL dynamic ACK/NACK can be used by physical uplink shared channel (PUSCH) transmission, wherein the mapping comprises:

ordering a first one or more downlink control channels, in an effort to locate first CCEs of the first one or more downlink control channels to locations in a first subframe that implicitly map to the first set of resources; and

ordering a second one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the second one or more downlink control channels to locations in a second subframe that implicitly map to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE in the first subframe for mapping to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE or the first subframe, in the second subframe for mapping to the first set of resources; and

transmitting the downlink control channels in accordance with the mapping.

7. The method of claim 6, the downlink control channels are associated with a physical downlink control channels (PDCCHs).

8. A communications apparatus, comprising:

a memory that retains instructions for:

grouping downlink control channels from multiple subframes;

mapping the downlink control channels to control channel elements (CCEs), wherein the mapping comprises ordering downlink control channels of the grouped downlink control channels in an effort to locate first CCEs of multiple downlink control channels to locations that implicitly map to a first set of recourses reserved for uplink (UL) dynamic acknowledgment/negative-acknowledgement (ACK/NACK) such that a second set of the resources reserved for UL dynamic ACK/NACK can be used by physical uplink shared channel (PUSCH) transmission, wherein the instructions for mapping comprise:

ordering a first one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the first one or more downlink control channels to locations in a first subframe that implicitly map to the first set of resources; and

ordering a second one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the second one or more downlink control channels to locations in a second subframe that implicitly map to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE in the first subframe for mapping to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE or the first subframe, in the second subframe for mapping to the first set of resources; and

transmitting the downlink control channels in accordance with the mapping; and

a processor that executes the instructions.

9. A communications apparatus, comprising:

means for grouping downlink control channels from multiple subframes;

means for mapping the downlink control channels to first control channel elements (CCEs), wherein the mapping comprises ordering downlink control channels of the grouped downlink control channels in an effort to locate first CCEs of multiple downlink control channels to locations that implicitly map to a first set of resources reserved for uplink (UL) dynamic acknowledgement/negative-acknowledgment (ACK/NACK) such that a second set of the resources reserved for UL dynamic ACK/NACK can be used by physical uplink shared channel (PUSCH) transmission, wherein the means for mapping comprises:

means for ordering a first one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the first one or more downlink control channels to locations in a first subframe that implicitly map to the first set of resources; and

means for ordering a second one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the second one or more downlink control channels to locations in a second subframe that implicitly map to the first set of resources;

means for ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE in the first subframe for mapping to the first set of resources;

means for ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE or the first subframe, in the second subframe for mapping to the first set of resources; and

means for transmitting the downlink control channels in accordance with the mapping.

10. A non-transitory computer-readable medium having instructions stored thereon, the instructions comprising code for causing at least one computer to:

group downlink control channels from multiple subframes;

map the downlink control channels across to control channel elements (CCEs), wherein the mapping comprises ordering downlink control channels of the grouped downlink control channels in an effort to locate first CCEs of multiple downlink control channels to locations that implicitly map to a first set of resources reserved for uplink (UL) dynamic acknowledgement/negative-acknowledgment (ACK/NACK) such that a second set of the resources reserved for UL dynamic ACK/NACK can be used by physical uplink shared channel (PUSCH) transmission;

wherein the mapping comprises:

ordering a first one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the first one or more downlink control channels to locations in a first subframe that implicitly map to the first set of resources; and

ordering a second one or more downlink control channels, of the grouped downlink control channels, in an effort to locate first CCEs of the second one or more downlink control channels to locations in a second subframe that implicitly map to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE in the first subframe for mapping to the first set of resources;

ordering downlink control channels, of the grouped downlink control channels, not associated with the first CCE or the first subframe, in the second subframe for mapping to the first set of resources; and

transmit the downlink control channels in accordance with the mapping.