

CLAIMS

What is claimed is:

1. A method for managing channel bandwidth of one or more downlink signals, the method comprising:
 - receiving the one or more downlink signals from one or more antenna feeds, the one or more downlink signals having a first bandwidth;
 - in a first one or more processing blocks in one or more processors,
 - performing a first channelizer operation on a first portion of the one or more downlink signals that creates a first plurality of channels, each of the first plurality of channels having a bandwidth smaller than the first bandwidth;
 - in a second one or more processing blocks in the one or more processors in parallel with the first one or more processing blocks,
 - performing a second channelizer operation on a second portion of the one or more downlink signals that creates a second plurality of channels, each of the second plurality of channels having a bandwidth smaller than the first bandwidth; and
 - in a third one or more processing blocks in the one or more processors,
 - performing a combiner operation that combines a subset of the first plurality of channels and a subset of the second plurality of channels into a combined channel, the combined channels having a second bandwidth smaller than the first bandwidth, and
 - outputting the combined channel to a network.
2. The method of claim 1, wherein the first one or more processing blocks comprises a first one or more central processing unit (CPU) cores and the second one or more processing blocks comprises a second one or more CPU cores.
3. The method of claims 1 or 2, wherein the one or more processors comprises a plurality of processors, wherein in the first one or more processing blocks are comprised in a first processor of the plurality and the second one or more processing blocks are comprised in a second processor of the plurality of processors.
4. The method of claims 1 or 2, wherein the one or more processors comprises a single processor comprising the first one or more processing blocks and the second one or more processing blocks.

5. The method of any one of claims 1-4, wherein at least one of the third one or more processing blocks is comprised as part of one or more of (i) the one or more first processing blocks and (ii) the one or more second processing blocks.

6. The method of any one of claims 1-4, wherein the third one or more processing blocks are separate from the first one or more processing blocks and the second one or more processing blocks.

7. The method of any one of claims 1-6, wherein the first channelizer operation comprises a first plurality of functions including:

- ingesting samples from an input channel, the samples received as first data packets included in the first portion of the one or more downlink signals;
- applying a multiple path filter on the samples;
- executing a multiple point circular buffer on the filtered samples; and
- separating the samples into multiple channels based applying a multiple point Inverse Fast Fourier Transform to the samples.

8. The method of claim 7, wherein the first one or more processing blocks comprises a first plurality of processing blocks, wherein performing the first channelizer operation comprises distributing the first plurality of functions amongst the first plurality of processing blocks and performing the distributed first plurality of functions in parallel.

9. The method of claim 6, wherein the second channelizer operation comprises a second plurality of functions including:

- ingesting samples from an input channel, the samples received as second data packets included in the second portion of the one or more downlink signals;
- applying a multiple path filter on the samples;
- executing a multiple point circular buffer on the filtered samples; and
- separating the samples into multiple channels based applying a multiple point Inverse Fast Fourier Transform to the samples.

10. The method of claim 9, wherein the second one or more processing blocks comprises a second plurality of processing blocks, wherein performing the second channelizer operation comprises distributing the second plurality of functions amongst the second plurality of processing blocks and performing the distributed second plurality of functions in parallel.

11. The method of claim 8, wherein one or more of the second plurality of functions are performed in the second one or more processing blocks in parallel with one or more of the first plurality of functions performed in the first one or more processing blocks.

12. The method of any one of claims 1-9, wherein the combiner operation comprises combining spectral bandwidth from a plurality of input channels into the combined channel, the plurality of input channels comprising the subset of the first plurality of channels and the subset of the second plurality of channels.

13. The method of any one of claims 1-10, wherein the combiner operation comprises a third plurality of functions including:

ingesting samples from the subset of the first plurality of channels and the subset of the second plurality of channels as a plurality of input channels, the samples received as data packets included in the subset of the first plurality of channels and the subset of the second plurality of channels;

applying a multiple point Inverse Fast Fourier Transform to the samples on each of the multiple channels;

executing a multiple point circular buffer for each of the multiple channels based on the application of the multiple point Inverse Fast Fourier Transform on the samples; and

combining the samples into the combined channel based on applying a multiple path filter and a summer.

14. The method of claim 13, wherein the third one or more processing blocks comprises a third plurality of processing blocks, wherein performing the combiner operation comprises distributing the third plurality of functions amongst the third plurality of processing blocks and performing the distributed third plurality of functions in parallel.

15. The method of claim 11, wherein the third one or more processing blocks comprises a third plurality of processing blocks, wherein at least two of the third plurality of functions are performed by the separate processing blocks of the third plurality of processing blocks in parallel.

16. The method of claim 13, further comprising, in a fourth one or more processing blocks in the one or more processors in parallel with the third one or more processing blocks, performing a second combiner operation on another subset of the first plurality of channels and another the subset of the second plurality of channels.

17. The method of claim 1, further comprising dividing, at one or more processors, the digital bit stream into a plurality of data packets, each of the data packets of the plurality of data packets including an overlap of data from an adjacent packet.

18. The method of claim 11, wherein the adjacent packets overlap in time by one percent of the length of the packets.

19. The method of claim 11, wherein the plurality of data packets have varying lengths.

20. The method of any one of claims 1-19, wherein the one or more processors are one or more general-purpose central processing units (CPU).

21. The method of any one of claim 1-21, wherein the one or more processors employ single instructions, multiple data (SIMD) techniques to achieve high throughput.

22. A method for managing channel bandwidth of one or more downlink signals, the method comprising:

receiving the one or more downlink signals from one or more antenna feeds, the one or more downlink signals having a first bandwidth;

in a first one or more processing blocks in one or more processors,

performing a first channelizer operation on a first portion of the one or more downlink signals that creates a first plurality of channels, each of the first plurality of channels having a bandwidth smaller than the first bandwidth;

in a second one or more processing blocks in the one or more processors in parallel with the first one or more processing blocks,

performing a second channelizer operation on a second portion of the one or more downlink signals that creates a second plurality of channels, each of the second plurality of channels having a bandwidth smaller than the first bandwidth; and

outputting the first and second plurality of channels to a network.

23. The method of claim 22, wherein the first one or more processing blocks comprises a first one or more central processing unit (CPU) cores and the second one or more processing blocks comprises a second one or more CPU cores.

24. The method of claims 22 or 23, wherein the one or more processors comprises a plurality of processors, wherein in the first one or more processing blocks are

comprised in a first processor of the plurality and the second one or more processing blocks are comprised in a second processor of the plurality of processors.

25. The method of claims 22 or 23, wherein the one or more processors comprises a single processor comprising the first one or more processing blocks and the second one or more processing blocks.

26. The method of any one of claims 22-5, wherein the first channelizer operation comprises a first plurality of functions including:

- ingesting samples from an input channel, the samples received as first data packets included in the first portion of the one or more downlink signals;
- applying a multiple path filter on the samples;
- executing a multiple point circular buffer on the filtered samples; and
- separating the samples into multiple channels based applying a multiple point Inverse Fast Fourier Transform to the samples.

27. The method of claim 26, wherein the first one or more processing blocks comprises a first plurality of processing blocks, wherein performing the first channelizer operation comprises distributing the first plurality of functions amongst the first plurality of processing blocks and performing the distributed first plurality of functions in parallel.

28. The method of claim 26, wherein the second channelizer operation comprises a second plurality of functions including:

- ingesting samples from an input channel, the samples received as second data packets included in the second portion of the one or more downlink signals;
- applying a multiple path filter on the samples;
- executing a multiple point circular buffer on the filtered samples; and
- separating the samples into multiple channels based applying a multiple point Inverse Fast Fourier Transform to the samples.

29. The method of claim 28, wherein the second one or more processing blocks comprises a second plurality of processing blocks, wherein performing the second channelizer operation comprises distributing the second plurality of functions amongst the second plurality of processing blocks and performing the distributed second plurality of functions in parallel.

30. The method of claim 29, wherein one or more of the second plurality of functions are performed in the second one or more processing blocks in parallel with one or more of the first plurality of functions performed in the first one or more processing blocks.

31. The method of claim 22-30, further comprising dividing, at one or more processors, the digital bit stream into a plurality of data packets, each of the data packets of the plurality of data packets including an overlap of data from an adjacent packet.

32. The method of claim 31, wherein the adjacent packets overlap in time by one percent of the length of the packets.

33. The method of claims 31 or 32, wherein the plurality of data packets have varying lengths.

34. The method of any one of claims 22-32, wherein the one or more processors are one or more general-purpose central processing units (CPU).

35. The method of any one of claim 22-33, wherein the one or more processors employ single instructions, multiple data (SIMD) techniques to achieve high throughput.

36. A method for managing channel bandwidth of one or more downlink signals, the method comprising:

receiving input signals of the one or more downlink signals on a plurality of input channels, each input channel having a spectral bandwidth;

in a plurality of processing blocks in one or more processors, performing a combiner operation on the input channels that combines the spectral bandwidth of a selected subset of the plurality of input channels into a combined channel, the plurality of processing blocks operating in parallel, and

outputting the combined channel to a network.

37. The method of claim 36, wherein the plurality of processing blocks comprises a plurality of central processing unit (CPU) cores.

38. The method of claims 36 or 37, wherein the one or more processors comprises a plurality of processors, wherein in at least a first processing block of the plurality of processing blocks is comprised in a first processor of the plurality and a second processing

block of the plurality of processing blocks is comprised in a second processor of the plurality of processors.

39. The method of claims 36 or 37, wherein the one or more processors comprises a single processor.

40. The method of any one of claims 36-39, wherein the combiner operation comprises a plurality of functions including:

ingesting samples from the selected subset of the input channels, the samples received as data packets included in the subset of the input channels;

applying a multiple point Inverse Fast Fourier Transform to the samples on each of the multiple channels;

executing a multiple point circular buffer for each of the multiple channels based on the application of the multiple point Inverse Fast Fourier Transform on the samples; and

combining the samples into the combined channel based on applying a multiple path filter and a summer.

41. The method of claim 36, wherein performing the combiner operation comprises distributing the plurality of functions amongst the plurality of processing blocks and performing the distributed plurality of functions in parallel.

42. The method of claim 36, wherein at least two of the plurality of functions are performed by the separate processing blocks of the plurality of processing blocks in parallel.

43. The method of any one of claims 36-42, wherein the plurality of processing blocks comprises a first one or more processing blocks and a second one or more processing blocks, wherein:

in the first one or more processing blocks, performing a first combiner operation performing on a first subset of input signals corresponding to a first subset of the plurality of input channels, and

in the second one or more processing blocks in parallel with the first one or more processing blocks, performing a second combiner operation on a second subset of input signals corresponding to a second subset of the plurality of input channels,

wherein the first and second combiner options combines the spectral bandwidth of the first and second subset of the plurality of input channels into the combined channel.

44. The method of any one of claims 36-43, further comprising dividing, at one or more processors, the digital bit stream into a plurality of data packets, each of the data packets of the plurality of data packets including an overlap of data from an adjacent packet.

45. The method of any one of claims 36-44, wherein the adjacent packets overlap in time by one percent of the length of the packets.

46. The method of any one of claims 36-45, wherein the plurality of data packets have varying lengths.

47. The method of any one of claims 36-46, wherein the one or more processors are one or more general-purpose central processing units (CPU).

48. The method of any one of claim 36-47, wherein the one or more processors employ single instructions, multiple data (SIMD) techniques to achieve high throughput.

49. A system managing channel bandwidth one or more downlink signals, the system comprising:

one or more antennas configured to receive the plurality of downlink signals; and
one or more processors communicatively coupled to the plurality of antennas, the one or more processors having a plurality of processing blocks and operable to perform the method of any one of claims 1-48.