WHAT IS CLAIMED IS:

1. A computer-implemented method for performing a time-triggered distribution of messages from a region of networked machines to multiple destinations, the method comprising:

running a software-based synchronization process to synchronize each of a plurality of gateways with a reference clock, wherein each gateway is a machine on a perimeter of the region of networked machines and is connected to transmit messages to multiple destinations;

the gateways receiving messages from within the region of networked machines for distribution to multiple destinations outside the region of networked machines according to a distribution schedule based on absolute time relative to the reference clock; and

the gateways performing the distribution of the received messages, wherein each gateway determines absolute time based on that gateway's synchronization with the reference clock.

2. The computer-implemented method of claim 1, wherein the distribution schedule causes simultaneous distribution of the received messages from each of the gateways.

3. The computer-implemented method of claim 1, the gateways each receiving instructions from a coordinator device including the distribution schedule.

4. The computer-implemented method of claim 1, the gateways buffering the received messages until a transmission time indicated by the distribution schedule is reached.

5. The computer-implemented method of claim 4, wherein the received messages are buffered so that the distribution of the received messages may be performed in order without missing any messages which arrived before their distribution deadline.

6. The computer-implemented method of claim 1, the gateways applying additional offsets to the distribution schedule based on known jitter between the gateways and their destinations.

7. The computer-implemented method of claim 1, wherein the gateways are synchronized to within an order of nanoseconds of the reference clock.

8. The computer-implemented method of claim 1, wherein the gateways are guaranteed to be synchronized to within a known time deviation from the reference clock.

9. The computer-implemented method of claim 1, wherein synchronizing the gateways comprises, for at least one of the gateways:

correcting a local clock of the gateway to match the reference clock, whereby the distribution schedule references a time relative to the reference clock for distribution.

10. The computer-implemented method of claim 1, wherein the software-based synchronization process comprises:

exchanging probes between pairs of machines, wherein the machines exchanging probes include the gateways;

for different pairs of machines, estimating an offset between the pair of machines based on the transit times of probes exchanged between the pair of machines; wherein the transit time is based on a transmit timestamp from the machine transmitting the probe and a receive timestamp from the machine receiving the probe, and one of the machines produces timestamps based on the reference clock;

for different loops of at least three machines, calculating a loop offset error, which is defined as the sum of the estimated offsets between pairs of machines around the loop; and

adjusting estimated absolute offsets of the machines based on the loop offset errors, wherein the absolute offset of a machine is defined relative to the reference clock.

11. The computer-implemented method of claim 10, wherein estimating the offset between the pair of machines is based on the transit times of coded probes, wherein coded probes are pairs of probes transmitted from one of the machines in the pair to the other of the machines in the pair, the transmit timestamps of the pair of probes are within a predetermined time interval of each other, and the transit times of the pair of probes are also within a predetermined deviation of each other.

12. The computer-implemented method of claim 10, wherein the software-based synchronization process further comprises:

for different pairs of machines, estimating a clock drift between the pair of machines based on the transit times of probes exchanged between the pair of machines; and

estimating absolute drifts of the machines based on the estimated clock drifts between pairs of machines, wherein the absolute drift of a machine is defined relative to the reference clock.

13. The computer-implemented method of claim 12, wherein the software-based synchronization process further comprises:

adjusting a frequency of a local clock for at least one of the gateways to match the reference clock.

14. A computer-implemented method for performing a time-ordered operation on messages transmitted from multiple sources, the method comprising:

for each of two or more regions of networked machines:

running a software-based synchronization process to synchronize each of a plurality of gateways with a reference clock specific to that region, wherein each gateway is a machine on a perimeter of that region of networked machines and connected to transmit messages to multiple destinations;

receiving messages that are addressed to one or more of the multiple destinations and are to exit that region through one or more of the gateways according to a distribution schedule based on absolute time relative to that reference clock; and

performing the distribution of the received messages by the one or more gateways according to the the distribution schedule, wherein each gateway determines absolute time based on that gateway's synchronization with the reference clock.

15. The computer-implemented method of claim 14, wherein all of the regions use the same reference clock.

16. The computer-implemented method of claim 14, wherein at least two of the regions use different reference clocks.

17. The computer-implemented method of claim 16, wherein the different reference clocks result in different distribution schedules for each of the at least two of the regions.

18. The computer-implemented method of claim 14, wherein the perimeter for one of the regions lies entirely inside the perimeter of another of the regions.

19. The computer-implemented method of claim 14, wherein the perimeter for one of the regions lies partially inside the perimeter of another of the regions.

20. The computer-implemented method of claim 14, wherein the distribution occurs after the received messages are buffered at each of the gateways.