for sharing the data transmit time that permits each transceiver of the network to transmit data during a specific time chunk or slot. The TDMA frame architecture divides data transmission time into discrete data "frames". Frames are further subdivided into "slots".

[**0073**] In the preferred embodiment, the TDMA frame definition **58** comprises a master slot **60**, a command slot **62**, and a plurality of data slots **64***a* through **64***n*. The master slot **60** contains a synchronizing beacon or "master sync". More preferably, the "master sync" is the same code as the "master sync code" as described earlier for clock synchronization unit **40**. The command slot **62** contains protocol messages exchanged between the transceiver devices of the network. Generally, each of the data slots **64***a* through **64***n* provides data transmission time for a corresponding slave device **14***a* through **14***n* of the network **10**. Preferably, each data slot assigned is structured and configured to have a variable bit width and is dynamically assigned by the master device. In an alternative arrangement, the slave devices **14***a* through **14***n* request the use of one or more of the data slots **64***a* through **64***n* for data transmission. In either arrangement, the master may also be assigned one or more slots to transmit data to slave devices. If random access devices are connected to the network, these devices may be assigned a common random access time slot by the master. These devices will communicate using a CSMA-CD or similar protocol within the allocated time slot.

[**0074**] As noted above, the transceiver device **22** includes a framing control function **38**. The framing control function **38** carries out the operation of generating and maintaining the time frame information. In the master device **12** the framing control function **38** delineates each new frame by Start-Of-Frame (SOF) symbols. The SOF symbols are unique symbols, which do not appear anywhere else within the frame and mark the start of each frame. In the preferred embodiment, the SOF symbols serve as the "master sync" and as the "master sync code" for the network and are transmitted in the master slot **60** of frame **58**. These SOF symbols are used by the framing control function **38** in each of the slave devices **14***a* through **14***n* on the network to ascertain the beginning of each frame **58** from the incoming data stream. For example, in one illustrative embodiment, the invention utilizes a 10-bit SOF "master sync" code of "0111111110".

[**0075**] Various encoding schemes known in the art may be used to guarantee that the SOF code will not appear anywhere else in the data sequence of the frame. For example, a common encoding scheme is 4B/5B encoding, where a 4-bit values is encoded as a 5-bit value. Several criteria or "rules" specified in a 4B/5B code table, such as "each encoded 5-bit value may contain no more than three ones or three zeros" and "each encoded 5-bit value may not end with three ones or three zeros", ensure that a pulse stream will not have a string of six or more ones or zeros. Other techniques known in the art may also be used including, for example, bit stuffing or zero stuffing.

[**0076**] The master transceiver **12** carries out the operation of managing network data communication via the exchange of "protocol messages" in the command slot **62** of frame **58**. The master transceiver **12** carries out the operation of authenticating slave transceivers **14***a* through **14***n*, assigning and withdrawing data time slots **64***a* through **64***n* for the slave transceivers **14***a* through **14***n*, and controlling power of the slave transceivers **14***a* through **14***n*.

[**0077**] Master transceiver **12** authenticates or registers each slave transceiver by ascertaining the "state" of each of the slave transceivers of the network **10**. Each transceiver operates as a finite-state machine having at least three states: offline, online, and engaged. When a transceiver is in the offline state, the transceiver is considered "unregistered" and is not available for communication with the other devices on the network **10**. Each slave transceiver must first be "registered" with master transceiver **12** before the slave transceiver is assigned or allocated a data slot within the TDMA frame **58**. Once a transceiver is registered with the master transceiver **12**, the device is considered "online".

[**0078**] A slave transceiver that is in the "online" state is ready to send data or ready to receive data from the other devices on the network **10**. Additionally, an "online" transceiver is one which is not currently transmitting or receiving "non-protocol" data. Non-protocol data is data other than that used for authenticating the "state" of the transceiver devices.

[**0079**] A transceiver is "engaged" when the transceiver is currently transmitting and/or receiving "non-protocol" data. Each slave device maintains and tracks its state by storing its state information internally, usually in random access memory (RAM). The state of each slave device is further maintained and tracked by the master device **12** by storing the states of the slaves in a master table (not shown) stored in RAM.

[**0080**] In operation, the master transceiver **12** periodically broadcasts an ALOHA packet in the command slot **62** to ascertain or otherwise detect "unregistered" slave devices and to receive command requests from the slave transceivers of then network. More generally, an ALOHA broadcast is an invitation to slave transceivers to send their pending protocol messages. This arrangement is known as "slotted ALOHA" because all protocol messages including the ALOHA broadcast are sent during a predetermined time slot. In the preferred embodiment, the ALOHA broadcast is transmitted at a predetermined interval. Responsive to this ALOHA packet and in the next immediate TDMA frame, an "unregistered" slave device **14***n* transmits a signal in command slot **62** identifying itself as slave device **14***n* and acknowledging the master device with a registration or "discovery" (DISC) request indicating additional information, such as the bandwidth capabilities of the device. When the registration request is received by the master transceiver **12**, the master table records in the master table that device **14***n* is "online". The master transceiver **12** also transmits a confirmation in command slot **62** to the slave device **14***n* that the state of slave device **14***n* has changed to "online".

[**0081**] When the slave device **14***n* receives the confirmation command from the master device **12**, the slave device **14***n* then changes its internal state to "online". If more than one slave transceiver replies with an acknowledgement to an ALOHA broadcast in the same frame, a packet collision may occur because both transceivers are attempting to occupy the same command slot **62** within the frame **58**. When a collision is detected in response to an ALOHA broadcast, the master transceiver **12** transmits another ALOHA message directed to a subset of the slave devices based on a binary-search style scheme, a random delay scheme or other similar searching means known in the art.