The Structure of Slotted ALOHA DAMA MAC

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Introduction

In this document, a proposed numerical assignment of the SALOHADAMA MAC is provided. The intention is to allow simulations to be carried out using this MAC. The key point of this MAC is that it can be configured to any setting independent of the station settings. Since the stations are slaved to the central controller, the controller can be programmed to best suit the typical traffic patterns in the network. In this document, a typical numerical example is given, so that the configuration settings of the well-known Novel environment can be demonstrated.

MAC Configuration Vectors

In SALOHADAMA, a typical network configuration file is shown below:

Network:

Network home code table identifier {1 to 32}:
Registration password {64 bits}:
Transmit Power control {Manual / automatic}:
Redundancy standby mode {Enable/disable}:
Backbone Comm {Enable/disable}:

Operation:

Slot Size: {number of octets}
Minimum Frame size: {number of slots} <minimum access delay calculated and displayed here>
Maximum Frame size: {number of slots} <minimum access delay calculated and displayed here>
Frame length optimization: {enable/disable}
Frame length bias: {1-10, low traffic=1, high traffic=10}

Registration:

Aloha slot:

Station address size: {64 bits?}
Instruction size: {16 bits}

Broadcast message: {Filename}
Broadcast frequency: { number of frames}

Configuration Vectors

One of the most important advantages of this MAC is that vendors can upgrade the IEEE802.11 stations, without physically servicing the stations individually. The stations are fully slaved to the central controller, and each member of the network will automatically follows the MAC distribution commands. In addition, the controller can also be remotely controlled by software downloading of the configuration vectors. A similar concept of the PC bios boot-rom is applied here.

Network Vectors:

Network home code table identifier is one of the Gold Codes in the spreading code table. Assuming there are 32 Gold Codes, then the controller shall be assigned one of the 32 codes.

Registration password will the leading word used in the ALOHA access. This is for network identification purposes.

Since the centralized control allows the best optimization of code division orthogonality with power control, the stations will be able to automatically adjust its power by referencing to the controller transmission power level. The user has the option to disable this function.

Redundancy standby control will allow a controller to begin or cease operation when a similarly assigned controller is in existence. This is a very convenient way of deploying uncoordinated redundancy where network integrity and transmission security are of the utmost importance. In industrial environment, the loss of communication, can sometime cause human fatality.

A controller communication with a backbone can be inhibited even if a backbone is present. When the backbone is absent, EBSA operation will not be attempted.

Operation

The slot size is set for the basic traffic requirement. Since the SALOHADAMA has a basic software configurable platform, there can also be an adaptive slot size assignment option added.

The minimum frame size is an assigned number of slots in a frame, where the optimization action of the network controller will not go below. In this way, occasional long files will not be disadvantaged excessively.

The maximum frame size is an assignment to ensure a maximum access delay time is maintained. This is to ensure occasional short packets will not violate its delay time.

Since the controller has full knowledge of the traffic within its control, it is very easy to adopt an adaptive frame length assignment strategy to optimize network efficiency. When the traffic is light, the frame length is adjusted short. Efficiency drops because of overhead to data ratio gets larger but there are enough capacity for the traffic to move at full bit rate. Access time is at a minimum and will approach the performance of a distributed network. When the traffic is heavy, the frame length is adjusted long. Efficiency goes up, full traffic capacity is utilized. Access time will be longer. However for a distributed network, the network will cease to function under the same load.

The optimization of the frame length can also be made to bias towards a short packet traffic or a long file transfer environment.

Registration

Aloha slot access is accomplished by an access word ==> Password+Sender Address+Receiver Address+Instruction.

Broadcast message is transmitted by the controller by assigning itself a demand assignment slot, and transmits to all station. There can be two categories of broadcast messages. One is intended to human users. The other is binary executable file that the station configuration can be changed. In this way, a station entering into a new network, can quickly acquire the characteristics of the network. As one may imagine that if any configuration changes are needed in the future, the worst that can happen to a network provider or a vendor is to retro-fit the thousands of station cards. In a distributed network, download able file strategy can also be used but the risk of network anarchy is extremely high.

SALOHDAMA

The SALOHADAMA MAC has been introduced in the past. Here is a simple timing frame designation diagram. The separation of the ALOHA slot and the Broadcast slot is intentional. This is to allow slower processor to process slot/aperture assignments and other administrative functions.

Typical Configuration for Novel traffic Environment:

The network traffic is purely Novel traffic of minimum packet size =64 octets and maximum packet size = 576 octets.

Network:

Network home code table identifier: 5
Registration password :2A43F5
Transmit Power control :Auto
Redundancy standby mode : Disable
Backbone Comm : Enabled

Operation:

Slot Size: 64
Minimum Frame size: 128
Maximum Frame size: 1024
Frame length optimization: Enabled
Frame length bias: 1

Expected Access Delay: < >mSec
Expected Access Delay: < >mSec

Registration:

Aloha slot:

Station address size: 64
Instruction size: 16

Broadcast message: IEEE802.11.doc
Broadcast frequency: 50