

IEEE 802.11 MAC Chip

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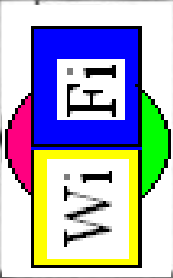
Presented by:

Agnish Jain

Hemant Parate

M.E. Microelectroincs II

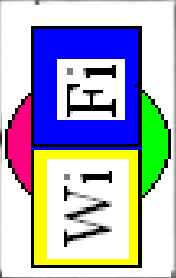




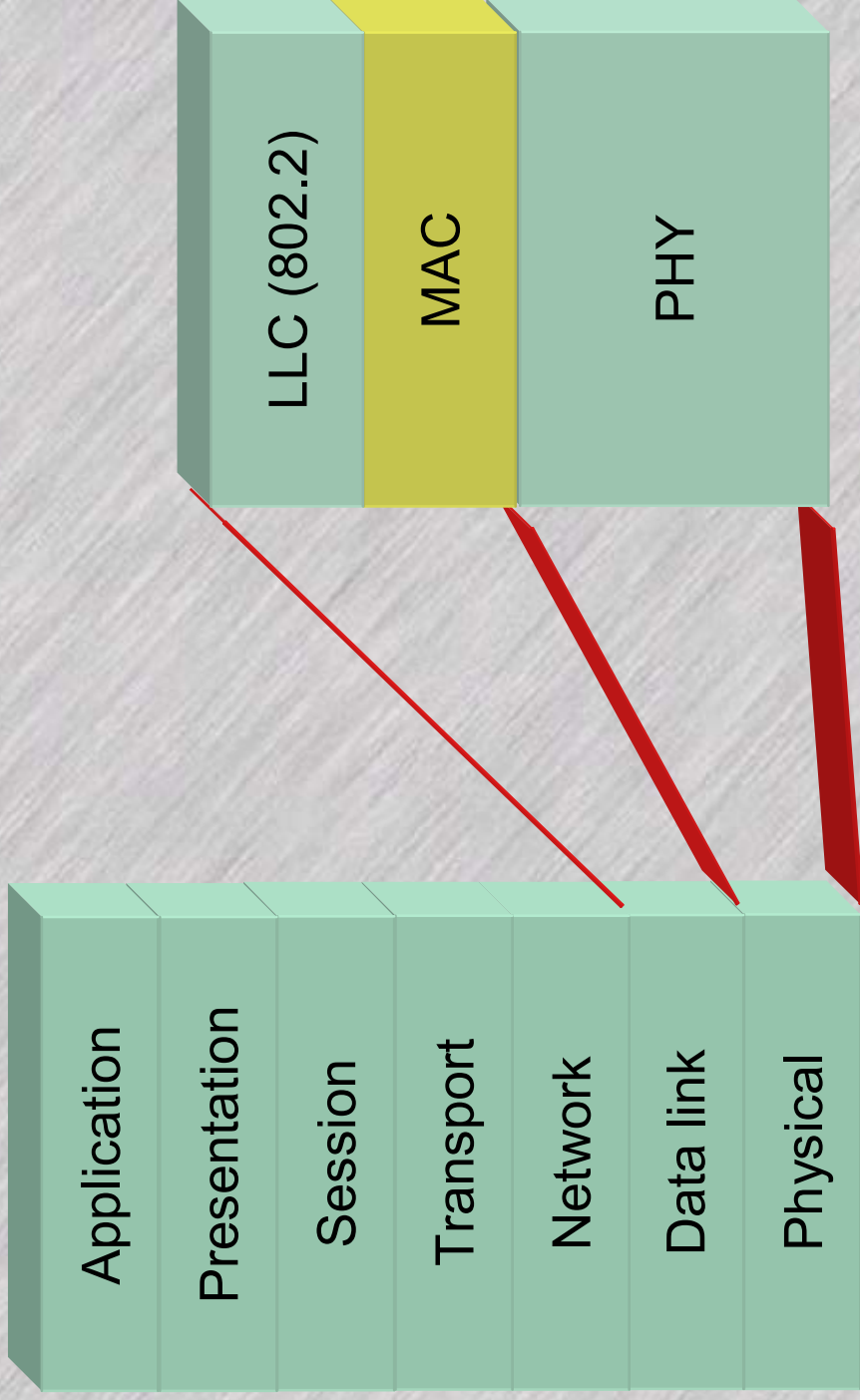
Presentation Overview

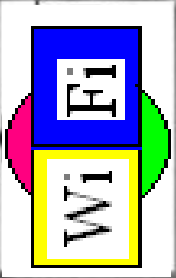
- 📡 Design Aspects of IEEE 802.11 MAC.
- 📡 Technical specifications
- 📡 Partitioning the architecture
 - 📡 Hardware (FPGA)
 - 📡 Software (HOST)
- 📡 Block Diagram of Implementation
- 📡 Interface of MAC with
 - 📡 Host
 - 📡 RF chipset(PHY)



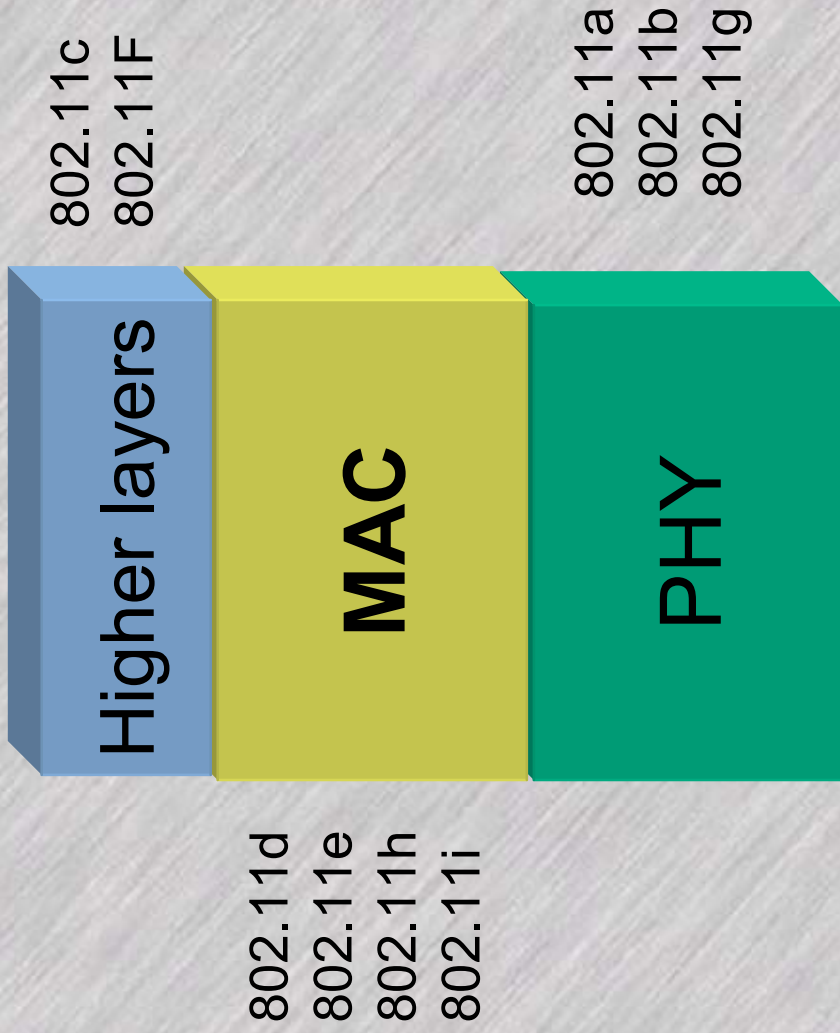


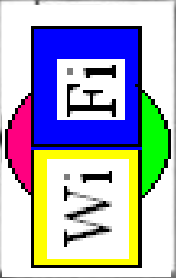
802.11 Logical Architecture





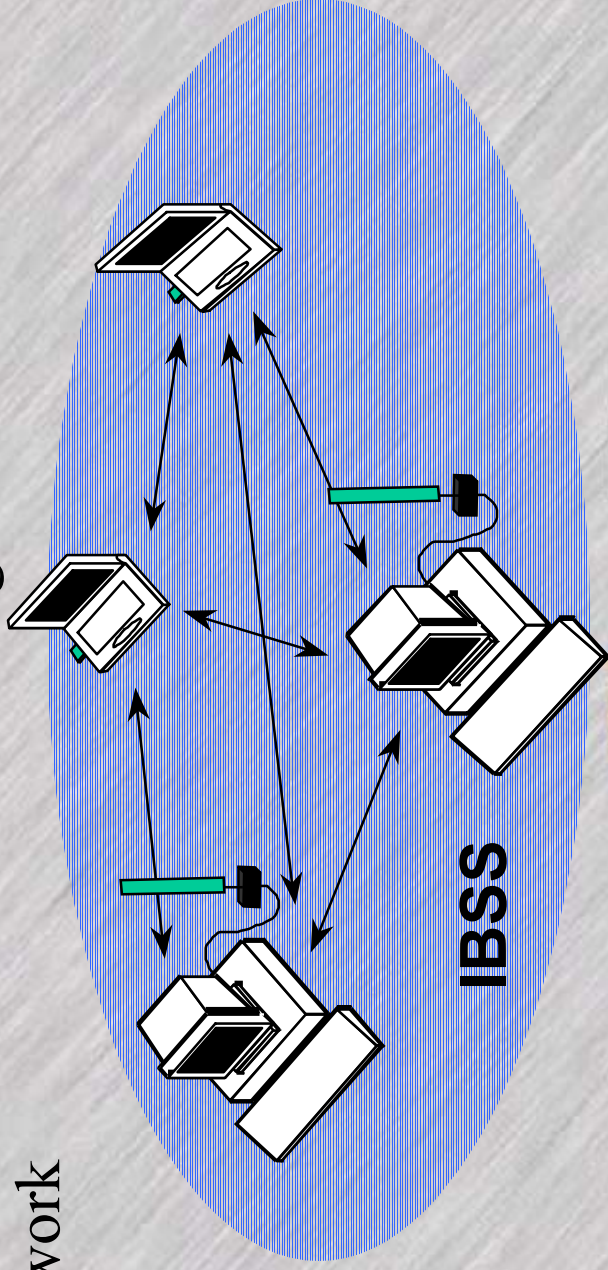
802.11 sublayers

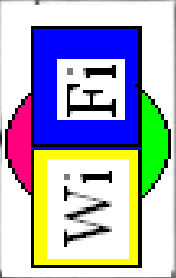




Independent BSS (IBSS)

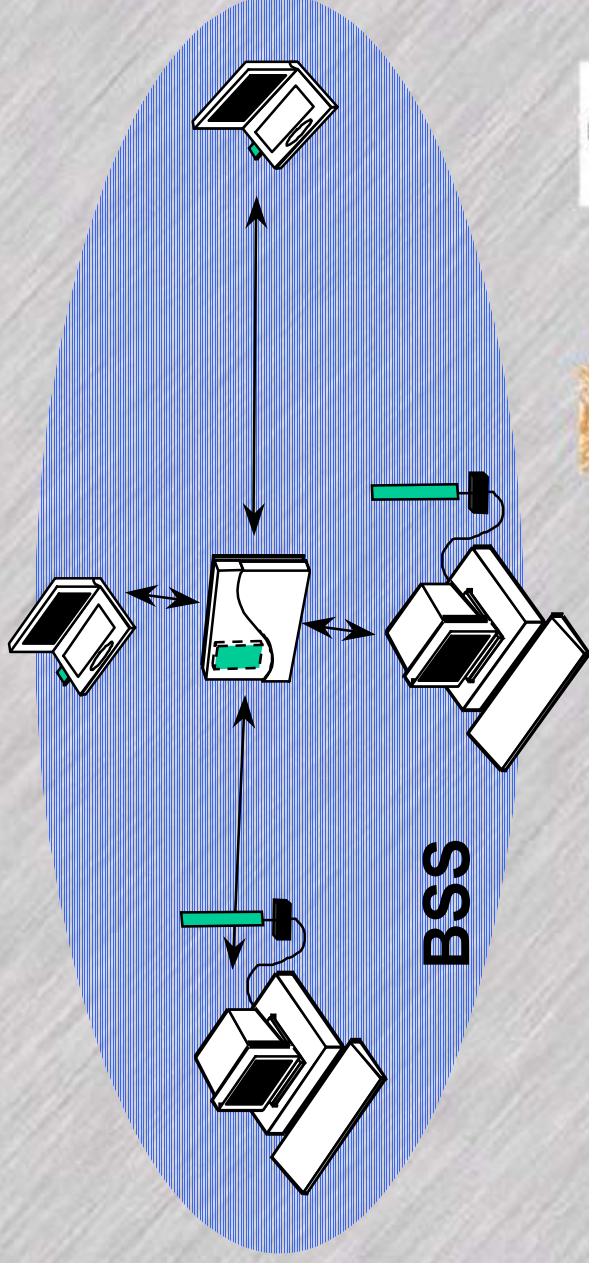
- No access to a Distribution System is available
- **Without** an AP
- At least 2 stations,
- One of the stations in the IBSS can be configured to “initiate” the network

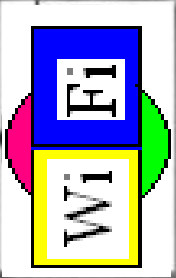




Infrastructure BSS

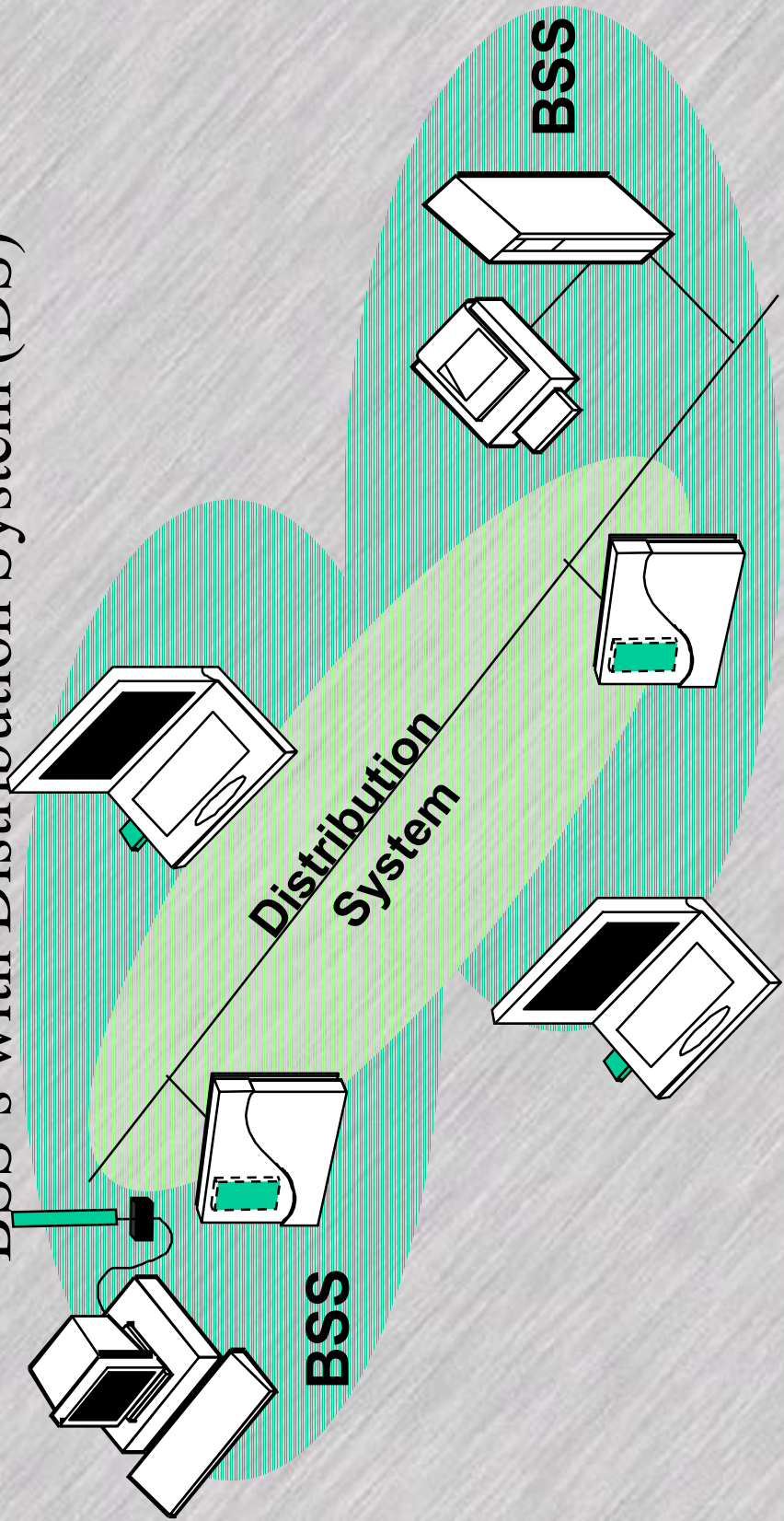
- BSS with AP
- Because of AP bandwidth decreases by 2.
- AP buffers traffic of mobile in low power mode

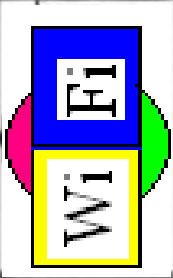




Extended Service Set (ESS)

BSS's with Distribution System (DS)

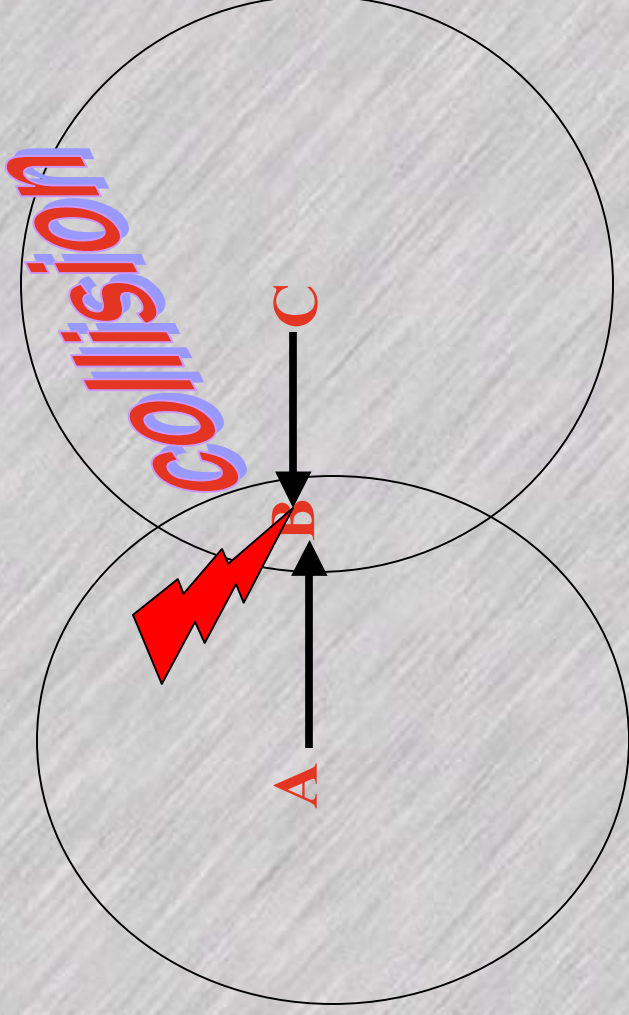


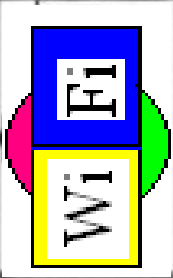


Dealing with Media

- Minimal Frame Exchange
- Two Frames-
 - Frame transmitted
 - ACK
 - No ACK- retransmission

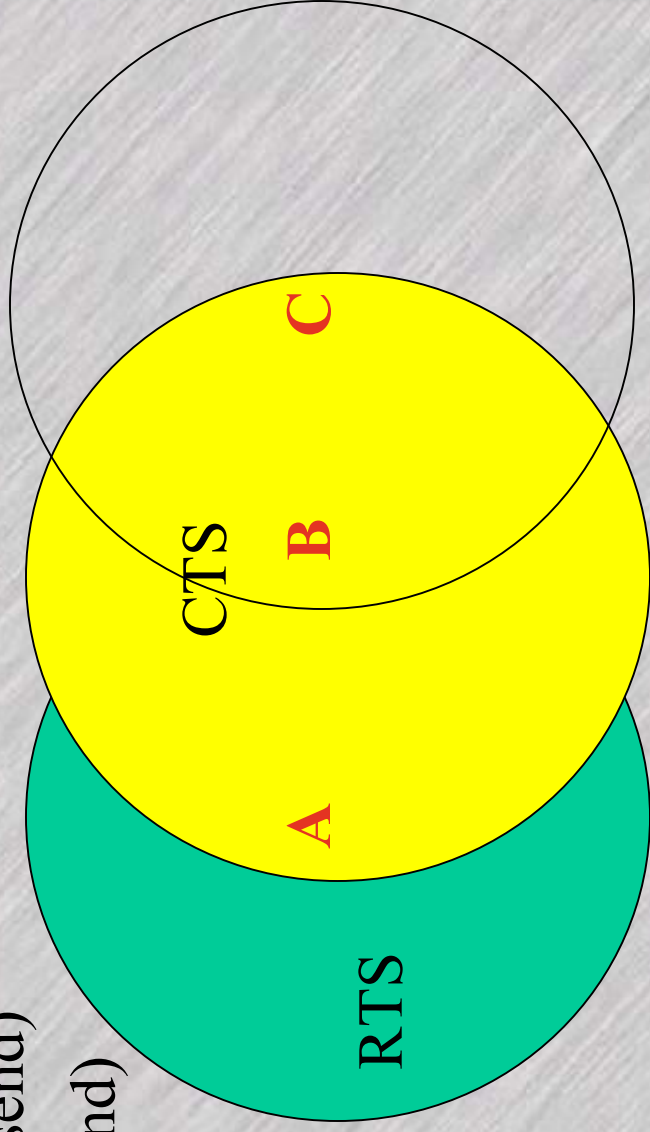
Hidden Node Problem

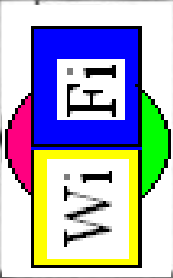




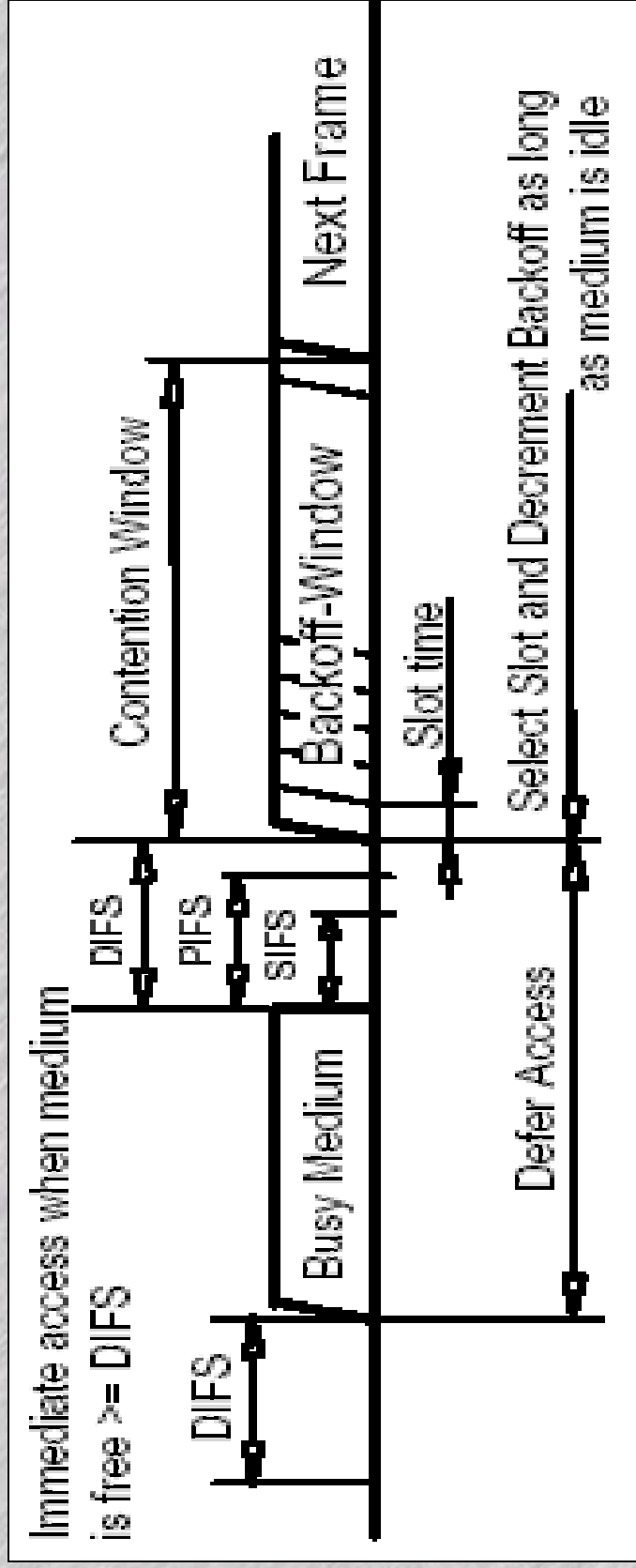
Dealing with Media

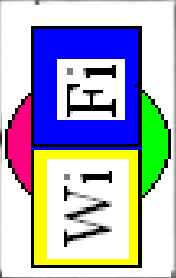
- Four Way Exchange
 - To eliminate Hidden node problem
 - RTS(request to send)
 - CTS(Clear to send)





Back-off Algorithm





802.11 services

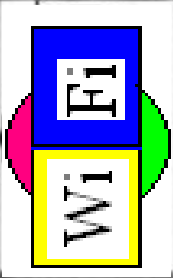
Station Services

- ✓ Authentication
- ✓ De-Authentication
- ✓ Privacy
- ✓ Delivery of Data

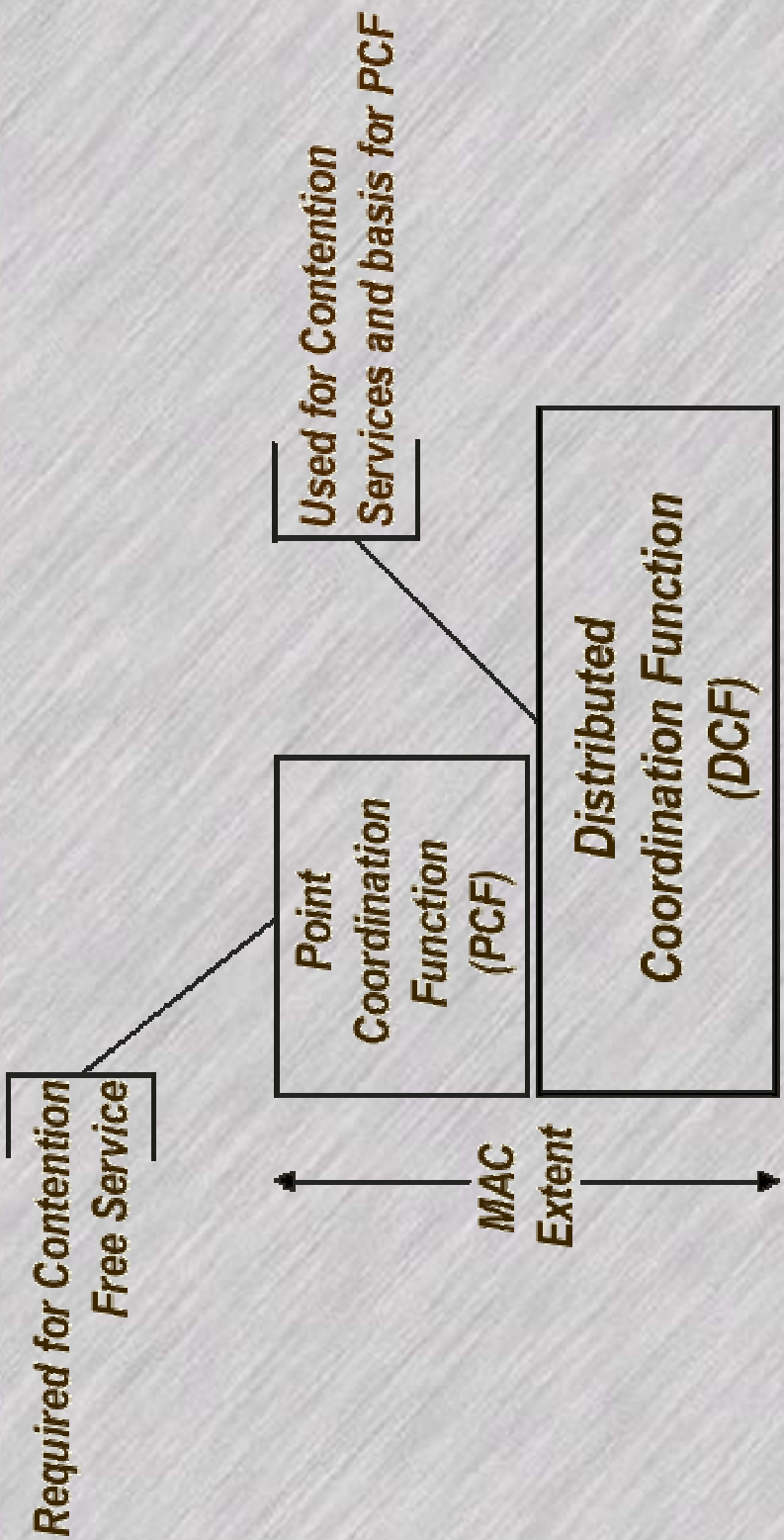
Distribution Services

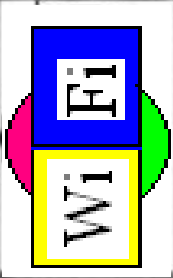
- ✓ Association
- ✓ Disassociation
- ✓ Re-association
- ✓ Distribution
- ✓ Integration





MAC Sub Layer Architecture



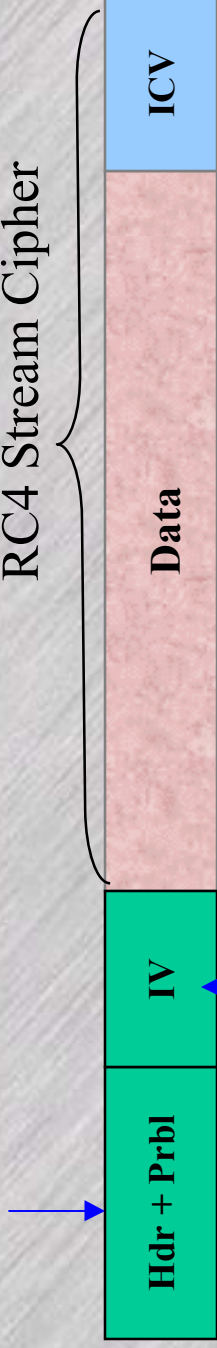


Wired Equivalent Privacy (WEP)

- WEP is the security protocol
- encryption via the RC4 algorithm.
- Primary function is to safeguard against eavesdropping.

Header and Preamble

Encrypted under Key + IV using the RC4 Stream Cipher

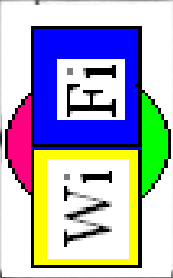


24 bit Initialization Vector

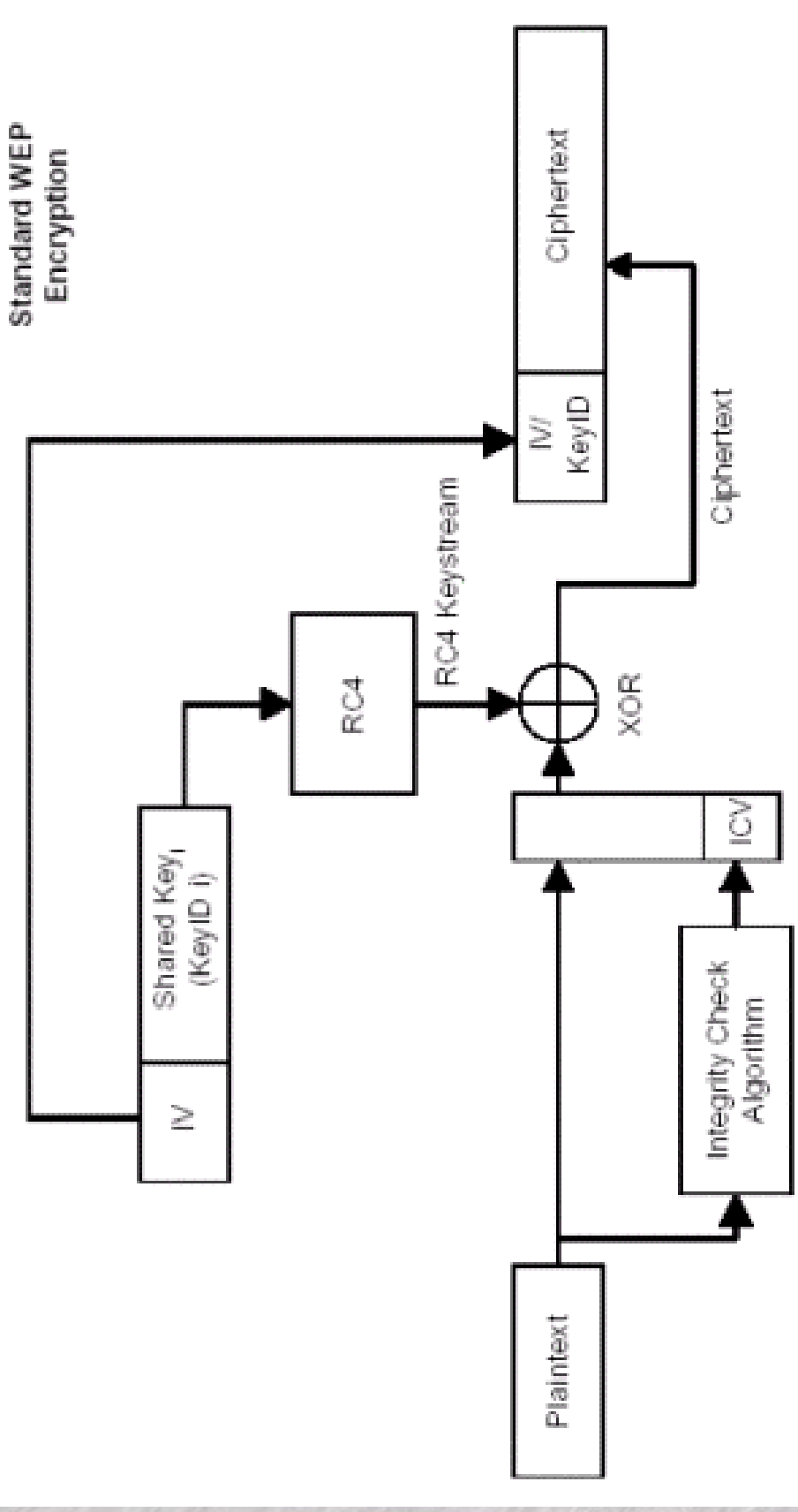
Encrypted WEP Packet

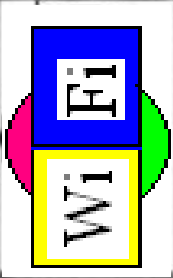
29-Nov-03





RC4 Implemented in WEP

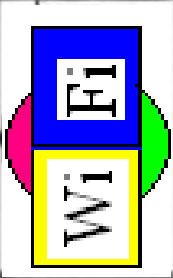




Technical Specifications

- Fully compliant to IEEE 802.11 Standard 1999
- Timing Synchronization algorithms
- Compatible with IEEE 802.11 a/b/g, PHY (BB)
- Complete system featuring dedicated hardware and software
- Both IBSS (Ad-hoc networks) or Infrastructure network support
- Power Management & Control
- WEP encryption
- Interface to allows simple bridging to a range of host interfaces

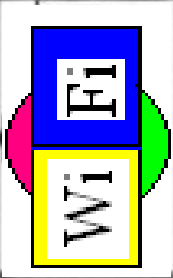




Technical Specifications

- Verilog HDL source code
 - Synthesis and test scripts
 - Test vectors & test benches
 - Simulation and synthesis reports, user and reference manuals
- Design documentation that includes
 - Hardware architecture Document
 - Programming guide
 - Design document
- Fully synthesizable and optimized for low gate count
- Considerations for easy ASIC integration

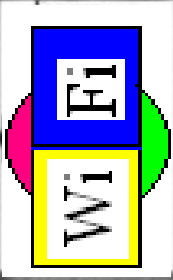




Hardware Partition

- Timer Synchronization Function
- Dedicated Counters for Interframe Spacing
- Random/ Exponential Back off Algo. + NAV Counter.
- Virtual (+ PHY) carrier Sensing Module
- CRC and Checksum generator Polynomial and division

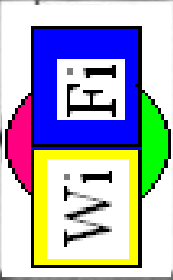




Hardware Partition

- WEP Encryption and Decryption Module.
- Frame transmitter/ receiving module to the PHY
- Control and Management Frames (Partly in S/w)
- Baseband Information & Power Management
- Tx & Rx State Machine, FIFO, registers, DPRAM

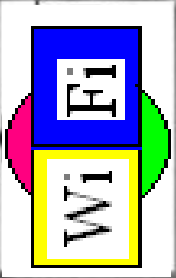




Software Partition

- Header Generator Module
- Data transmitter/ receiving module to LLC
- RTS threshold, Frame threshold and Sequence Control generator.
- Address Field Module
- Distribution System Services (DSS) Support

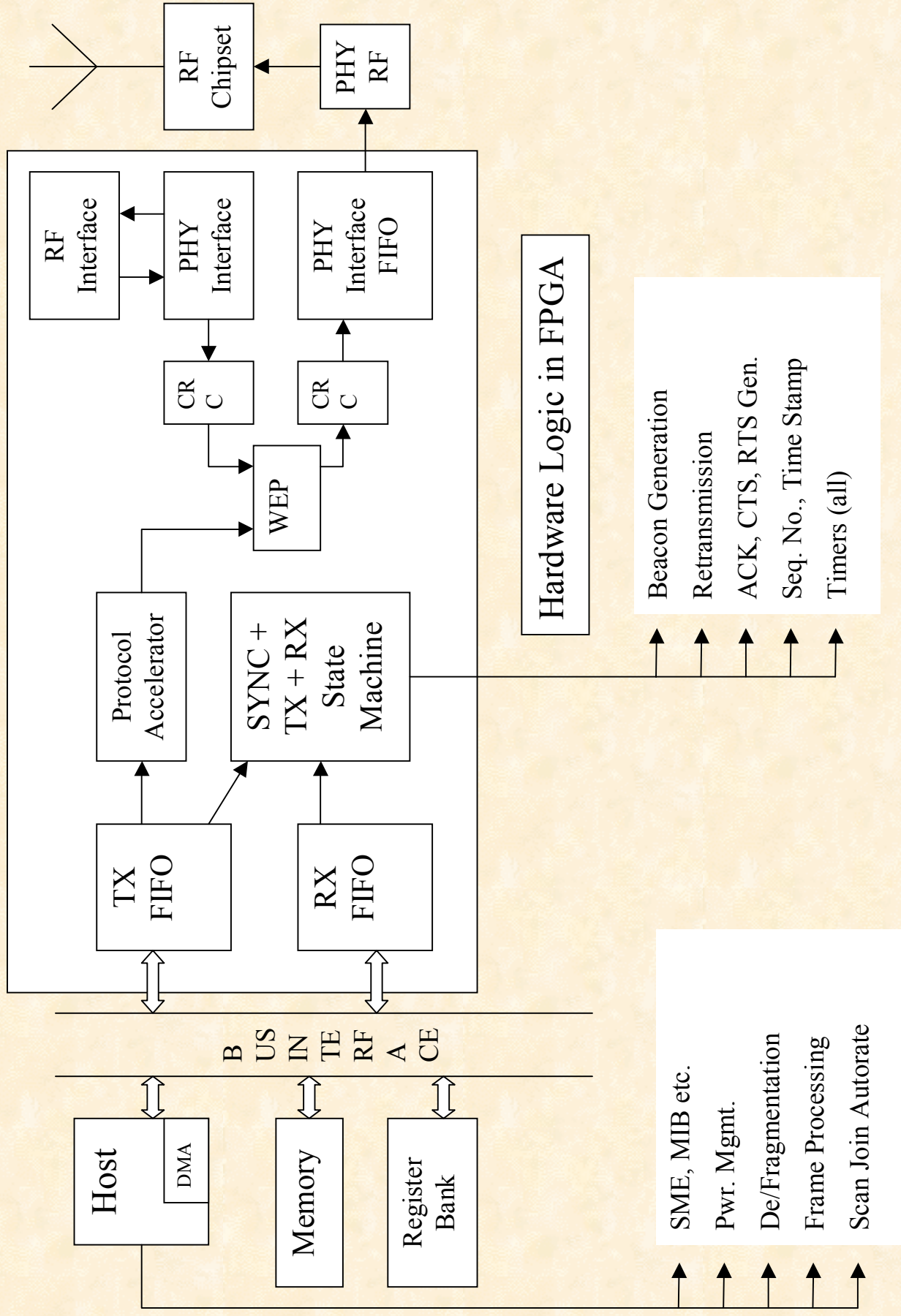




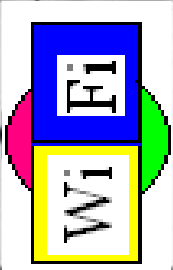
Interface Architecture

- HOST to MAC
 1. AMBA or
 2. PCMCIA
 - MAC to PHY
- MII Bus Interface





29-Nov-2004 **Block Diagram of Implementation of 802.11 MAC**



IEEE 802.11 MAC Chip

TEASER

