HIPERLAN MAC Overview For IEEE 802

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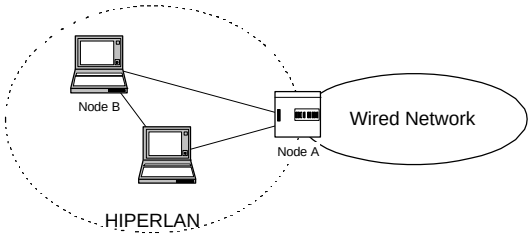
MAC Service Definition

- Service definition is based on ISO 15 802-1
  - To a higher layer the HIPERLAN MAC service interface looks very much like an “ordinary” MAC layer
  - IEEE 48 bit addresses
  - Quality of Service (QoS)
    - User Priority (0 or 1)
    - MAC SDU Lifetime (in milli-seconds)

HIPERLAN Architecture

- All nodes are equal
  - Peer-to-peer communication
  - No central controller, or “hub”
- A node may bridge to a wired network
  - Acts as an “access point”
  - It does not have any other “special” functions just because it is a bridge



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Distributed MAC Architecture

- Unlike 802.11 there is no centralised PCF
  - HIPERLAN only has a few channels available and so different systems may have to share the same channel “fairly”
  - QoS can be supported in non-centralised manner
- Can bridge to a wired network
  - Bridges learn the location of MAC entities and copy data from input to output port if appropriate
  - HIPERLAN MAC layer and wired MAC layer can bridge data between themselves
    - HIPERLAN can be used for broadband radio access to an infrastructure network
  - This Access Point (AP) has no other special functions
- All functions are distributed
  - For example: Channel Access Control, Power Saving, Generating lookup confirm PDUs

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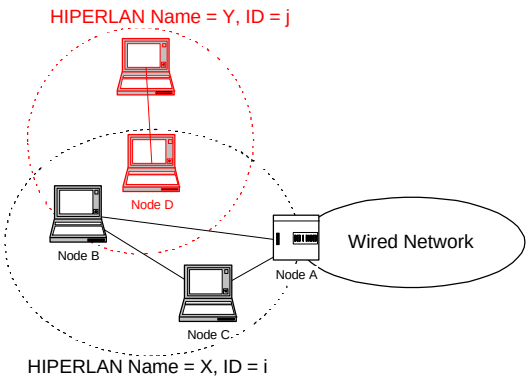
HIPERLAN Differentiation



- Two HIPERLANs may occupy the same channel and location
  - Differentiation is by HIPERLAN identifier (and name)

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Differentiation

- HIPERLAN differentiation
  - How to differentiate logical groups of nodes (HIPERLANs) ?
  - A string, the HIPERLAN name
  - A number, the HIPERLAN identifier
    - Name to identifier mapping should not clash
  - Similar to the 802.11 concept of a Basic Service Set (BSS) or an Extended Service Set (ESS)
  - You belong to a HIPERLAN if you have the same name and identifier
- HIPERLAN discovery
  - Joining node sends Lookup PDU
  - One of the established nodes sends a Confirm PDU including the HIPERLAN name and identifier
  - Similar to 802.11 probe and probe response

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MAC Service Provision

- Queue of packets is NOT necessarily a FIFO
- Packet selected for transmission based on priority
- Priority determined by
  - Residual lifetime
  - User priority
  - Expected number of radio hops
- Highest priority packets jump to the front of the queue!
  - Shorter lifetime means higher priority means less queuing time
  - Therefore, QoS can be supported for a mixture of applications
- Channel Access Control (CAC)
  - Accepts MAC packets for transmission, with priority as a parameter
  - (CAC covered by another presentation)

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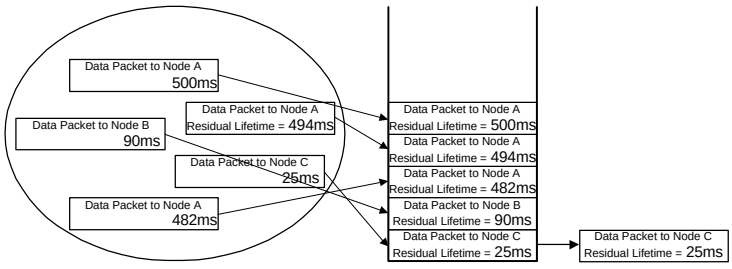
MAC Service Provision



- Mapping MAC QoS to MAC priority
  - 1. Generate priority
  - 2. Order by priority
  - 3. Select head of queue for CAC

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MAC Layer Error Control and Filtering

- Error Control
  - Packet is discarded once a good acknowledgement (ACK) is received
    - Multicast and broadcast packets are not acknowledged
  - OR when lifetime expires
- Receive Filtering
  - Duplicates may occur in radio networks
    - Because of missing ACK
    - Broadcast may be relayed by more than one node
  - Receiver filters on destination address
  - Receiver also checks source sequence number for duplicates

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Security

- Implementation of security features is optional
- Security is based on encryption with a secret key
  - A node may have 3 keys
  - The key index is sent “in the clear”
  - User data is encrypted
- Encryption algorithm is specified
  - There is only one algorithm
- Key distribution mechanism is not specified

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Power Saving

- Implementation of power saving features is optional
- Power Saving Node (p-saver)
  - Advertises when it will wake to receive individual (point-to-point) data
  - The advertised pattern is the Individual Pattern (IP)
  - IP includes regular wake and sleep phases
- Power Supporting Node (p-supporter)
  - Delays transmission to p-saver until the next wake phase
  - Advertises when it will send group (point-to-multipoint) data
  - The advertised pattern is the Group Pattern (GP)
  - GP includes regular wake and sleep phases that p-savers can follow
  - P-supporter ensures that group data is sent during wake phase of the GP

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Management Information Base

- Power saving / supporting capability
- Current radio channel
- Observed load
- RSSI
- HIPERLAN name and identifier
- Heard HIPERLANs
- (Note that this list is not exhaustive)

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Local Topology Maintenance

- Sending and Receiving Hellos
  - Nodes announce their presence with regular “Hello” PDUs
  - Mutual existence is derived from sending and receiving Hello PDUs
  - Nodes who determine “mutual existence” become Neighbours
- Decoding Hellos
  - Hello PDUs include information about Neighbours
  - Decoding a received Hello PDU gives information about my neighbour’s neighbours
    - “Two Hop” topology

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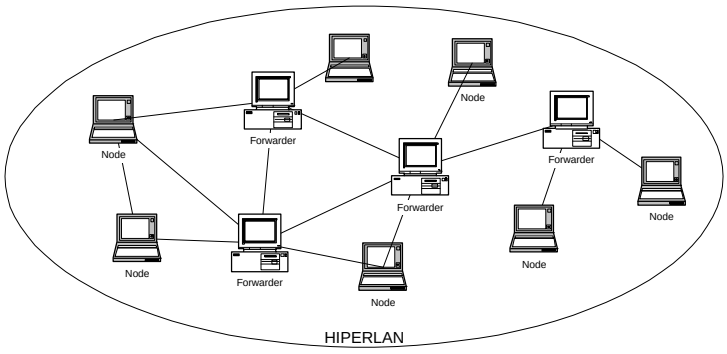
Multiple Radio Hop Network



- HIPERLAN extends beyond one radio hop
  - Range extended using “forwarder” nodes

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Forwarding

- Implementation of forwarding features is optional
- Forwarders
  - A HIPERLAN may extend over a range greater than one radio hop
  - Data may be relayed over multiple radio hops via forwarders
- Topology Maintenance
  - Topology is maintained over the whole HIPERLAN
  - Multipoint relays are forwarding nodes chosen to ensure multicast coverage of 2 hops with the minimum number of transmissions
- Routing
  - Each node computes the best next hop on the route to the destination
  - The use of a routing table is similar to IP routing, but the genreation of the routing table is done automatically by the HIPERLAN protocol

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HIPERLAN and 802.11 MAC Comparison

	HIPERLAN 1 MAC	**IEEE 802.11 MAC**
Ad-hoc network	Yes	Yes
Access Point **bridge to wired network**	Yes	Yes
Power Saving	Yes	Yes
Encryption	Yes	Yes
Authentication	No	Yes
Association	No	Yes
Quality of Service	Yes	Not standardized
Multiple radio hop network	Yes	Yes (wireless Distribution System)
Roaming	Outside standard	Outside standard (Inter Access Point Protocol)

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