15.6 Do Bluetooth devices and household microwave ovens interfere with each other? Explain.

Answer:

Bluetooth, which works in ISM band, typically hops faster (220 micro seconds) and employs shorter packets as compared to other systems operating in same frequency band. It limits the impact of microwave ovens and other sources of indoor disturbances on Bluetooth enabled devices by using fast frequency hopping technique.

15.8 In a hypothetical wireless system , five adjacent frequency bands (f1, f2, f3, f4, f5) are allowed for frequency-hopping sequences. Enumerate how many different hopping sequences a re possible and prove their correctness.

Answer:

If Bluetooth devices are connected to mobile units then the device may move out of the range of a particular master in the piconet, resulting in breaking of master-slave communication. If the master moves out of the range then it will result in the complete failure of the piconet.

15.10 A conference organizer decided to have eight separate groups of panels- A, B, C, D , E , F, G, and H-to make decisions on eight parallel tracks for a professional meeting. To facilitate communication between six members of each group, a piconet is formed using Bluetooth-enabled laptops. The following hopping sequence is followed by a piconet of each group.

Group	Allocated frequency hopping sequence							
A	f_1	f_5	f_9	f_{13}	f_{17}	f_{21}	f_{25}	f_{29}
B	f_2	f_6	f_{10}	f_{14}	f_{18}	f_{22}	f_{26}	f_{30}
C	f_3	f_7	f_{11}	f_{15}	f_{19}	f_{23}	f_{27}	f_{31}
D	f_4	f_8	f_{12}	f_{16}	f_{20}	f_{24}	f_{28}	f_{32}
E	f_{13}	f_{17}	f_{21}	f_{25}	f_{29}	f_1	f_5	f_9
F	f_{14}	f_{18}	f_{22}	f_{26}	f_{30}	f_2	f_6	f_{10}
G	f_{15}	f_{19}	f_{23}	f_{27}	f_{31}	f_3	f_7	f_{11}
H	f_{16}	f_{20}	f_{24}	f_{28}	f_{32}	f_4	f_8	f_{12}

If there is a collision, quantity the fraction of time during which such an interference may be present.

Answer:

If the group operates in parallel then there may be 100% collision.

15.14 What are the advantages and disadvantages of using Bluetooth-based devices as a sensor network? Explain your answer from a possible feasibility point of view.

Answer:

For a small set up, we can make use of Bluetooth based devices as a sensor network. For example in home if a fire is generated at a point and if the Bluetooth slave is able to sense it, then it can always communicate it to the master for emergency action. But in general inter and intra piconet communication, configuration and reconfiguration of scatternet, and inter piconet routing for sensor networks becomes a critical issue in using Bluetooth devices for sensor networks.

15.18 What is the rationale behind using different slot sizes in Bluetooth? Explain clearly.

Answer:

It is the channel quality. If channel quality is good, using multiply slots packets can provide higher throughput. On the other hand, in a noisy environment or if multiply piconets co-exist in the same area, system may have much more interference. If channel quality is not good, packets may easily get corrupted and retransmission of a large packet causes added retransmission delays. The small slots size can reduce the retransmission ratio and can get a better overall efficiency.