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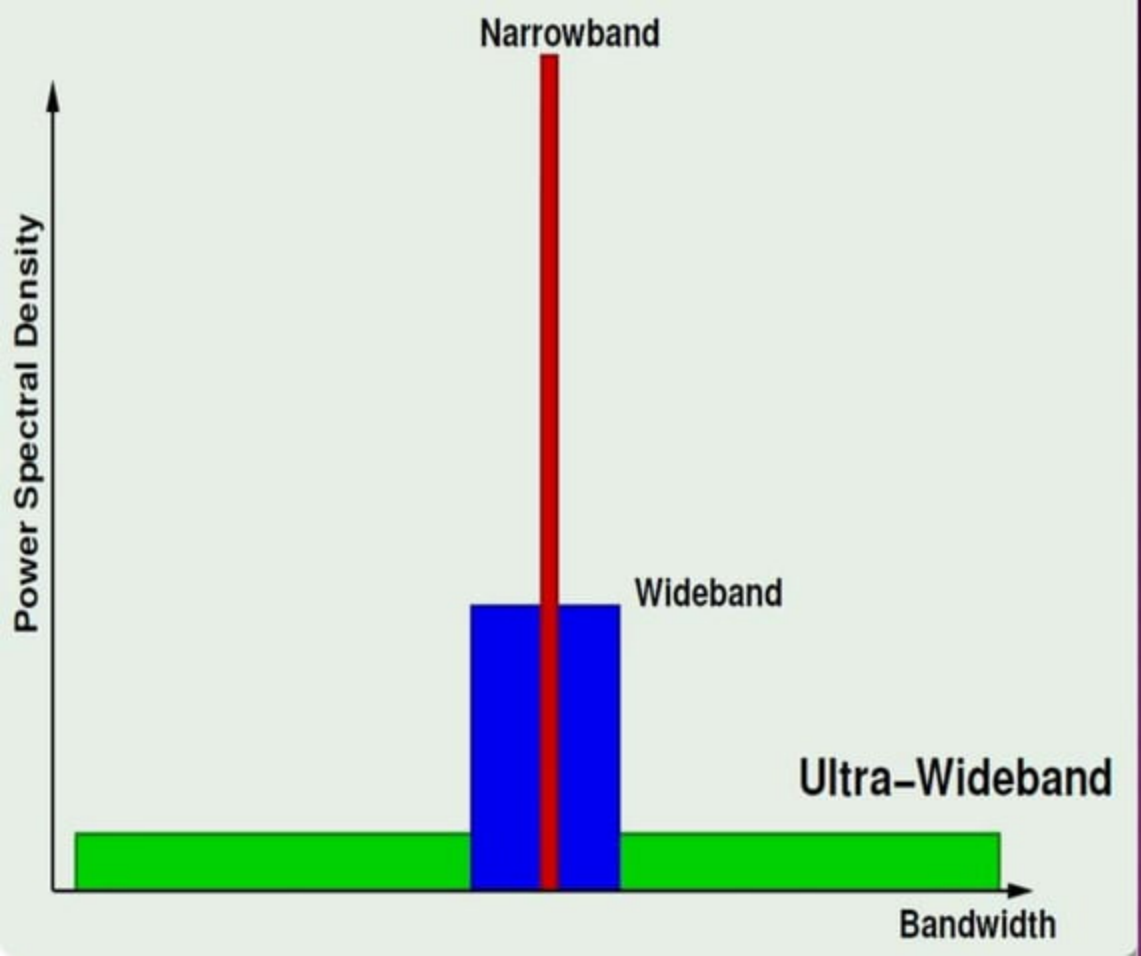
WHAT IS UWB?

- Wireless technology for transmitting digital data at very high rates, using very low power.
- UWB is ideally suited for short-range and high-speed data transmissions for WPAN applications.


Narrowband
Power Spectral Density
Wideband
Ultra-Wideband
Bandwidth

PRINCIPLES OF UWB:-

Time Domain

- Extremely short pulses
- Very low duty cycle

Frequency Domain

- Ultra wide spectrum
- Low power spectral density

ADVANTAGES OF UWB

Spectrum reuse	• 3.1-10.6 GHz, coexist with other users
High data rate in short range	• 500 Mbps at 10 feet
Multipath immunity	• Path delay >> pulse width
Low power	• Baseband modulation (no carrier)
Low cost	• Almost “all digital”, simple analog module

APPLICATIONS OF UWB

Communications

- Wireless Personal Area Network
- Military communications

Radar

- Ground penetrating radar
- Through-wall radar
- Buried victim rescue

Intelligence Sensors

- Telemetry
- Intelligent airbag, driving and parking aids
- Intelligent transport system

APPLICATION IN WPAN

- Due to the wide bandwidth and high time resolution UWB signals are much more robust to interferences and multipath fading.
- The large channel capacity and wide bandwidth offer wireless transmission of real-time high quality multimedia files.

CONTINUED.....

- The extremely small transmit power and the very short communication distances result in a large number of other advantages for WPAN applications.

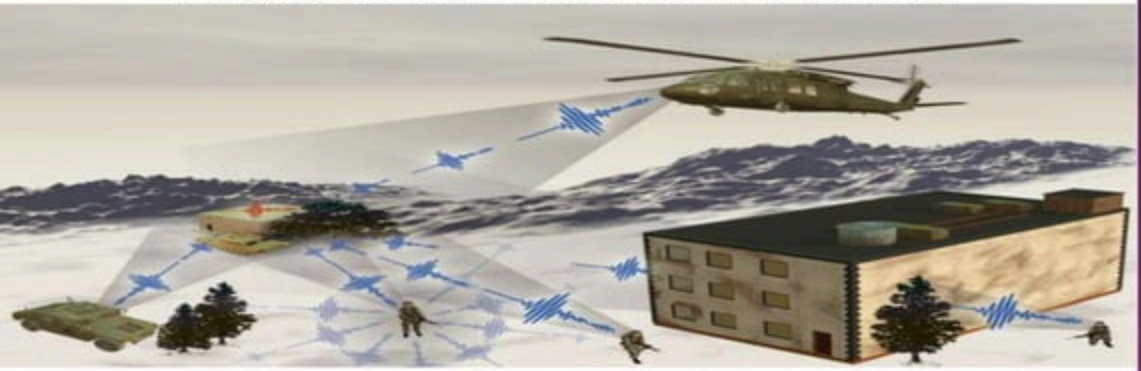
- Since UWB signals are operating below the noise floor, they provide better security, lower RF health hazards, and lower interference to other systems

APPLICATION IN :-

- Ground penetrating radar (GPR):-
- Because of Accurate timing information and ultra wide bandwidth it is widely applicable for the detection of unknown objects under the ground.
- The UWB GPR is used to draw a map of gas pipelines buried under ground by connecting GPS system to the GPR
- UWB GPR have been intensively investigated for mine detection.

APPLICATION IN :-

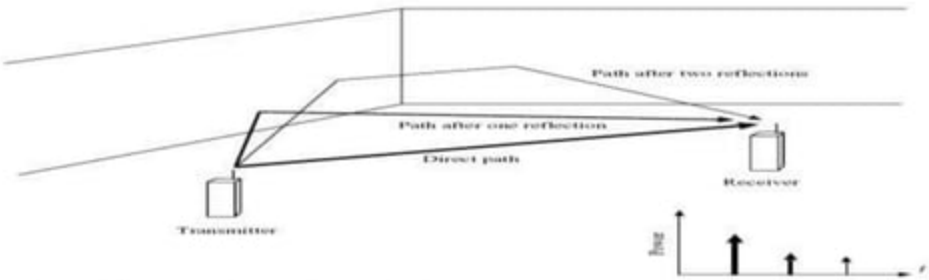
- Military Communication :-
- Attractive for manned and unmanned military vehicles
  - Issues associated with cable weight, space, and costs.
  - Substantial cost associated with installing and modifying cabling embedded within the platform .



- Trade-off: extra ammunition or fuel.

UWB CHARACTERISTICS

- Extremely low transmission energy
- Extremely difficult to intercept
- Multipath immunity to fading



- Follows Shannon's channel capacity theorem

- C:- Maximum channel capacity
- B:- Bandwidth(Hz)
- S/N:- Signal to Noise power Ratio(Watts)

$$C = B \log\left(1 + \frac{S}{N}\right)$$

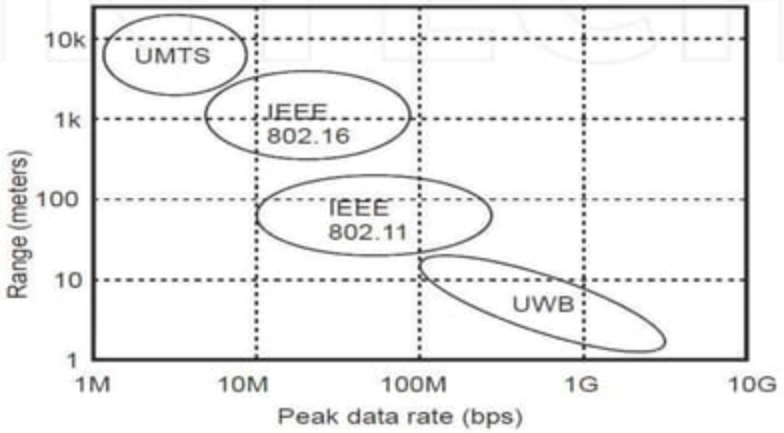
COMPARISION WITH OTHER TECHNOLOGIES

- Extremely low transmission energy
- Extremely difficult to intercept
- Multipath immunity to fading
- Follows Shannon's channel capacity theorem

CONTINUED....

Classification	Communication range	Examples	Current major applications
WWAN	> 10 km	GSM, UMTS	Mobile Internet access
WMAN	<10 km	IEEE 802.16	Broadband Internet access
WLAN	< 100 m	IEEE 802.11a/b/g/n	Internet access, file sharing
WPAN	< 10 m	IEEE 802.15 TG1	File sharing, headset
WBAN	<1 m	IEEE 802.15 TG6	Body senor network

Table 1. Basic characteristics of wireless networks



FUTURE SCOPE

WIRELESS USB

- The next step for USB technology is wireless USB.
- WUSB will be high speed wireless interconnect technology to take advantage of UWB

- With WUSB, a user can bring a hard disk in proximity to a PC, laptop and, once authentication and authorization are complete, files can be transferred onto the PC.

CHALLENGES

- Interference with other licensed bands
- Tradeoffs with noise
- Low power operation

CONCLUSION

- Well suited for high speed, short range WPAN.
- Supports multimedia data rates, and offers inherent data security.
- There's a possibility that UWB will become the "next best" technology for all types of wireless networks, including wireless LANs.