



Application Note

Reference: NA_001

Version: 1.1

*Wireless Network Topology &
Measurement Mode*



Wireless Sensor Network Topology

Zigbee

**Mesh network, Cluster-Tree, Star, Point-To-Point
Application: Securised & AD-HOC wireless sensor
network(WSN), static & ultra-low power
measurement**

IEEE 802.15.4

**Star, Point-To-Point Network
Application: Dynamic Measurement (strain gauge,
acceleration)**

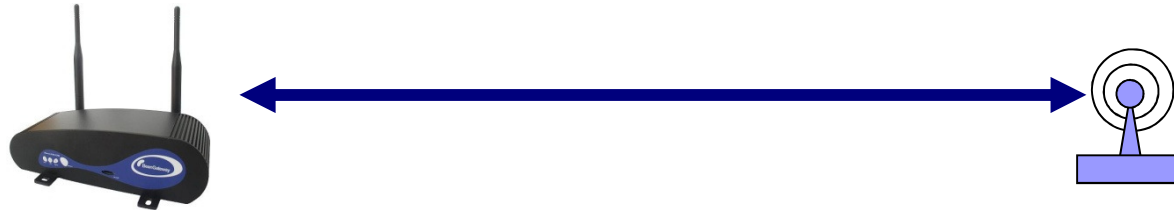


Wireless Point-to-Point Network

Two nodes:

1 Wireless Coordinator

1 Wireless sensor Node

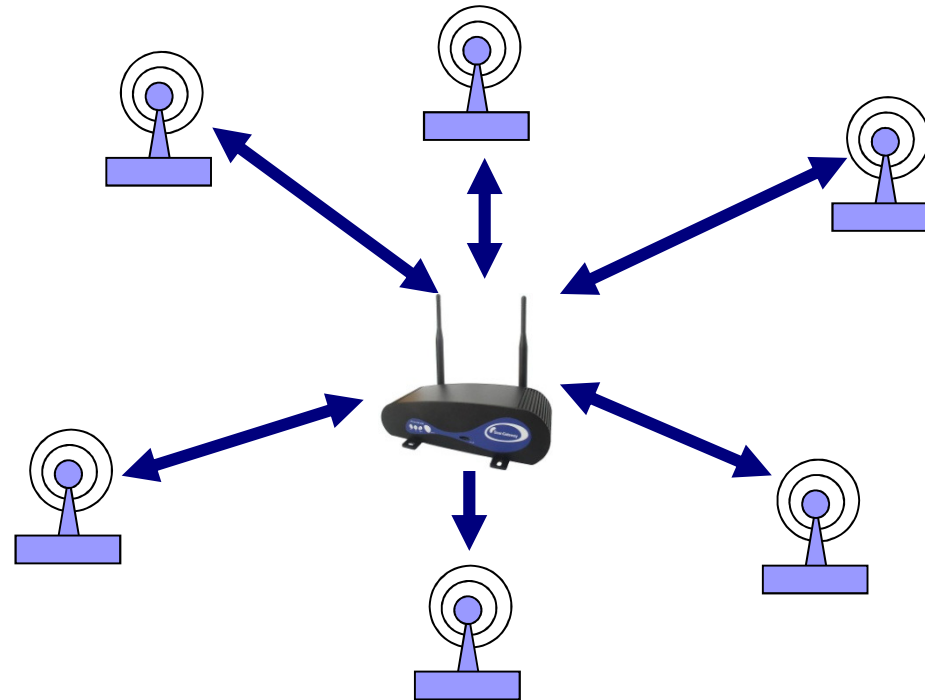




Wireless Star Network

**1 wireless
coordinator**

**Several nodes:
« End Device »**



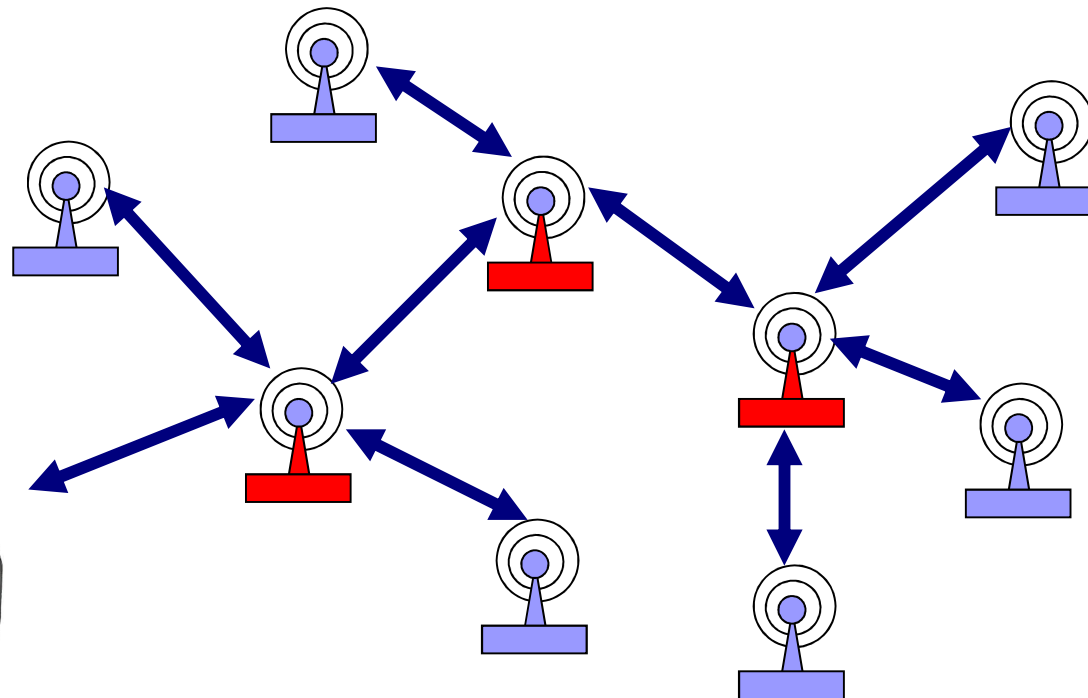


Wireless Cluster-Tree Network

1 wireless coordinator

Several nodes:
« End Device » +
« Router »

Only one wireless « Path »



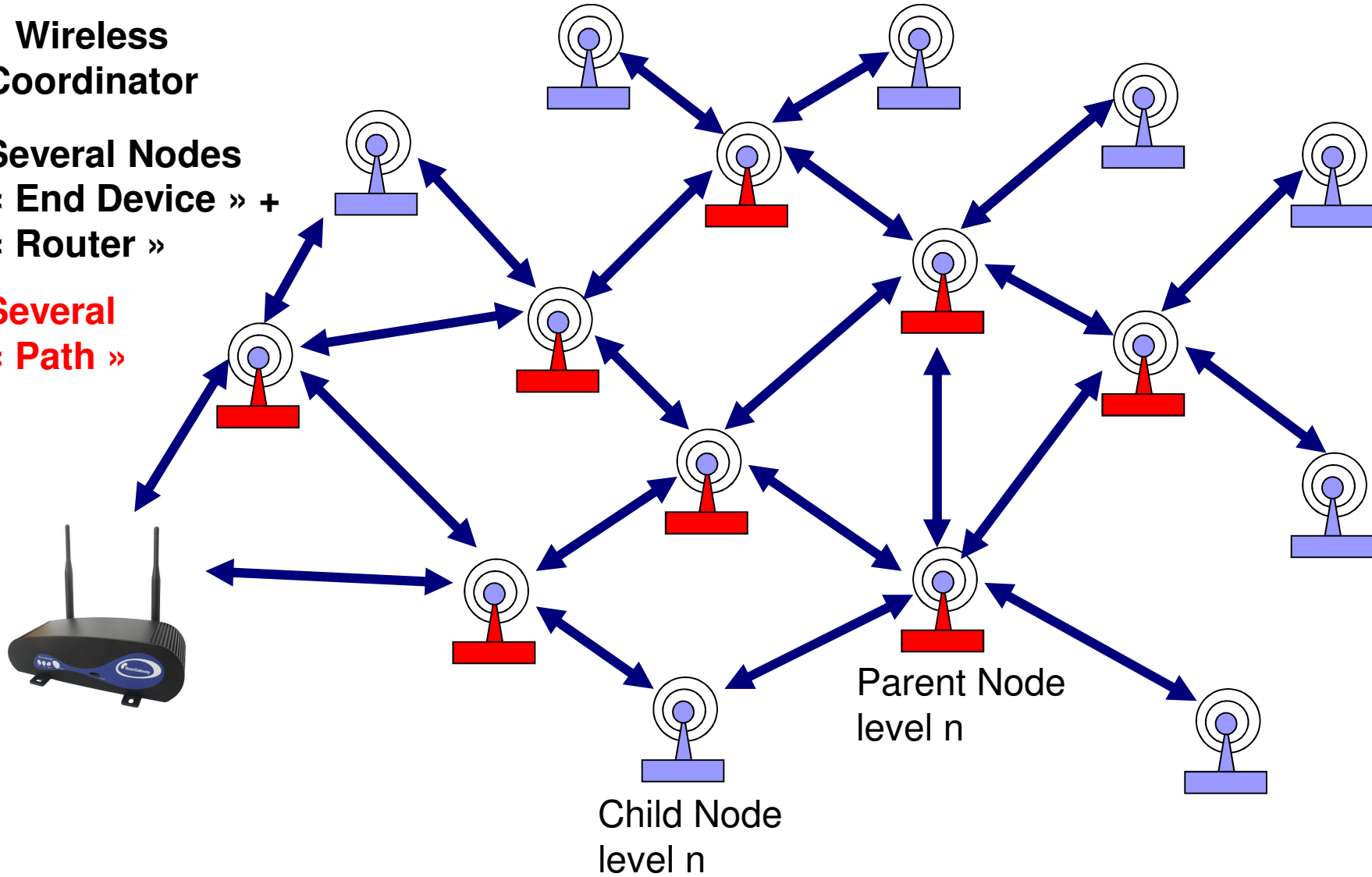


Wireless Mesh network (Mesh)

1 Wireless Coordinator

Several Nodes
« End Device » +
« Router »

Several
« Path »



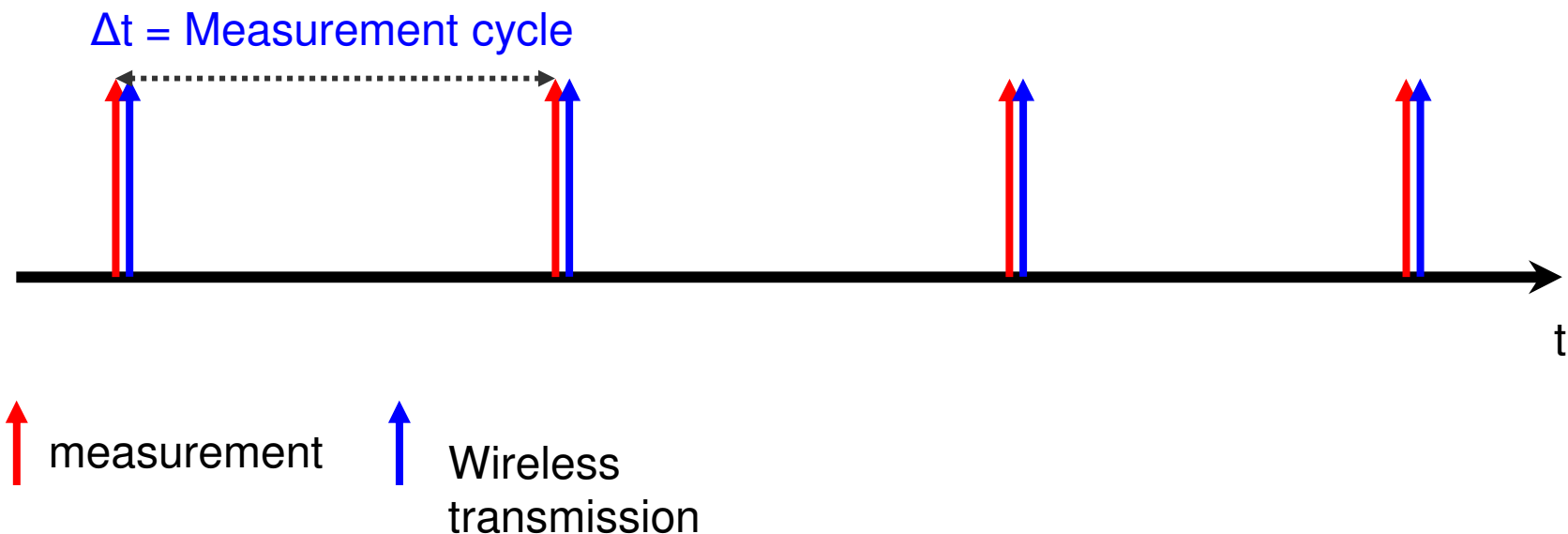


BeanAir

Beacon Mode

(available on Zigbee® & IEEE 802.15.4 stack)

After each measurement, the value is immediately transmitted by radio to the BeanGateway. The transmission frequency can be configured from 1s to 365 days.

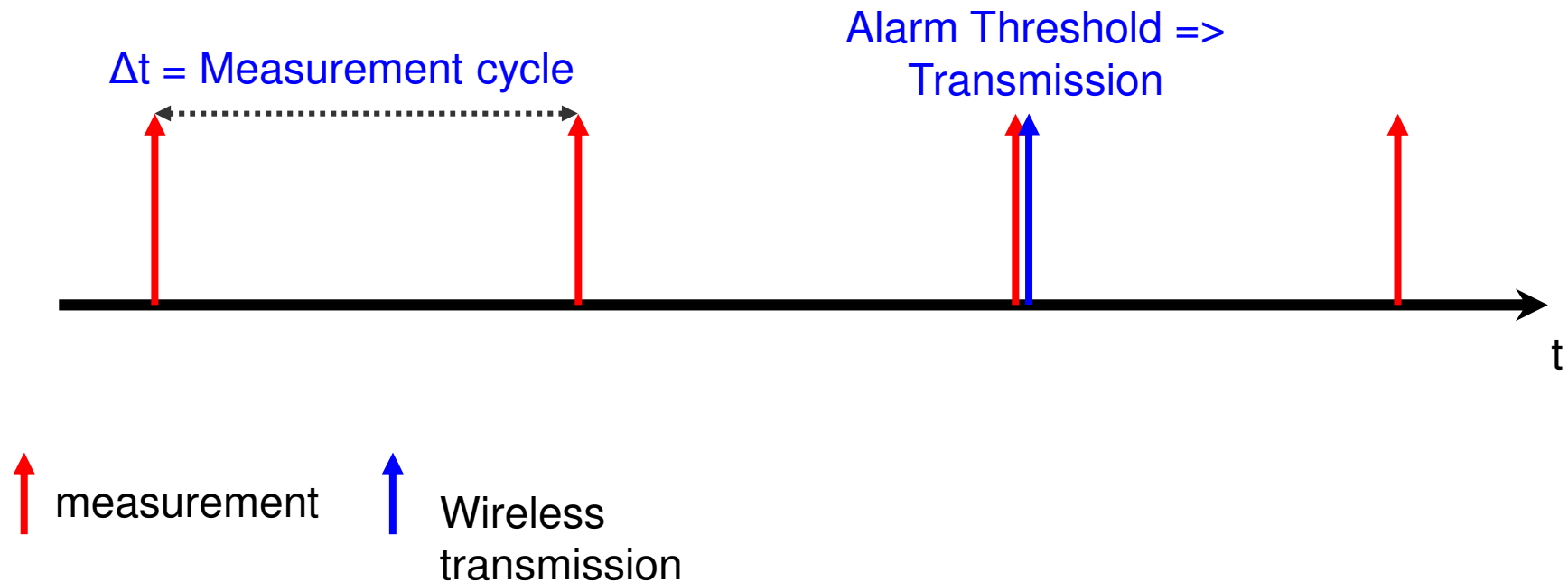


Between each RF transmission, the BeanDevice will operate in idle mode with a Ultra-Low Power Consumption.



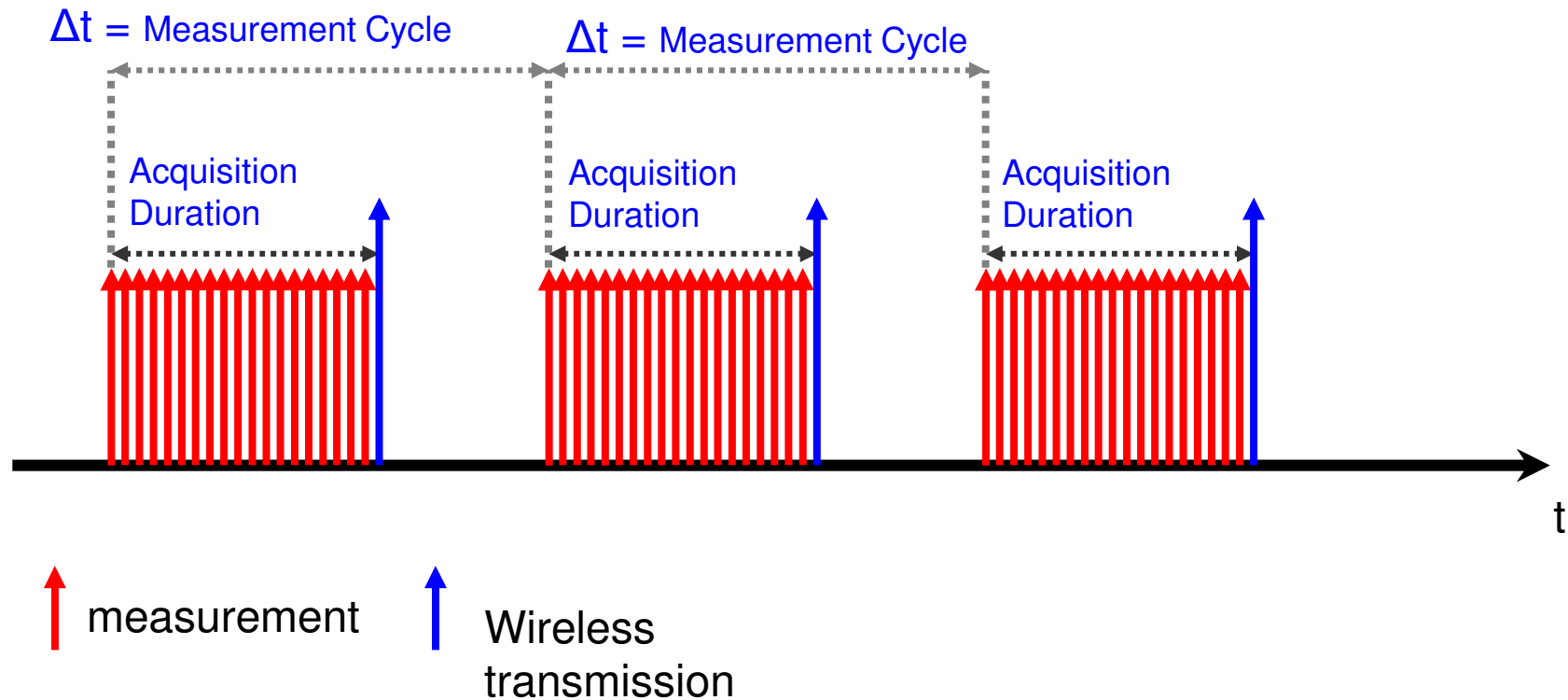
Alarm Mode (available on Zigbee® & IEEE 802.15.4 network)

The measured value is transmitted by radio whenever an alarm threshold (fixed by the user) is detected (4 alarm threshold levels High/Low).



Disponible sur le réseau Zigbee

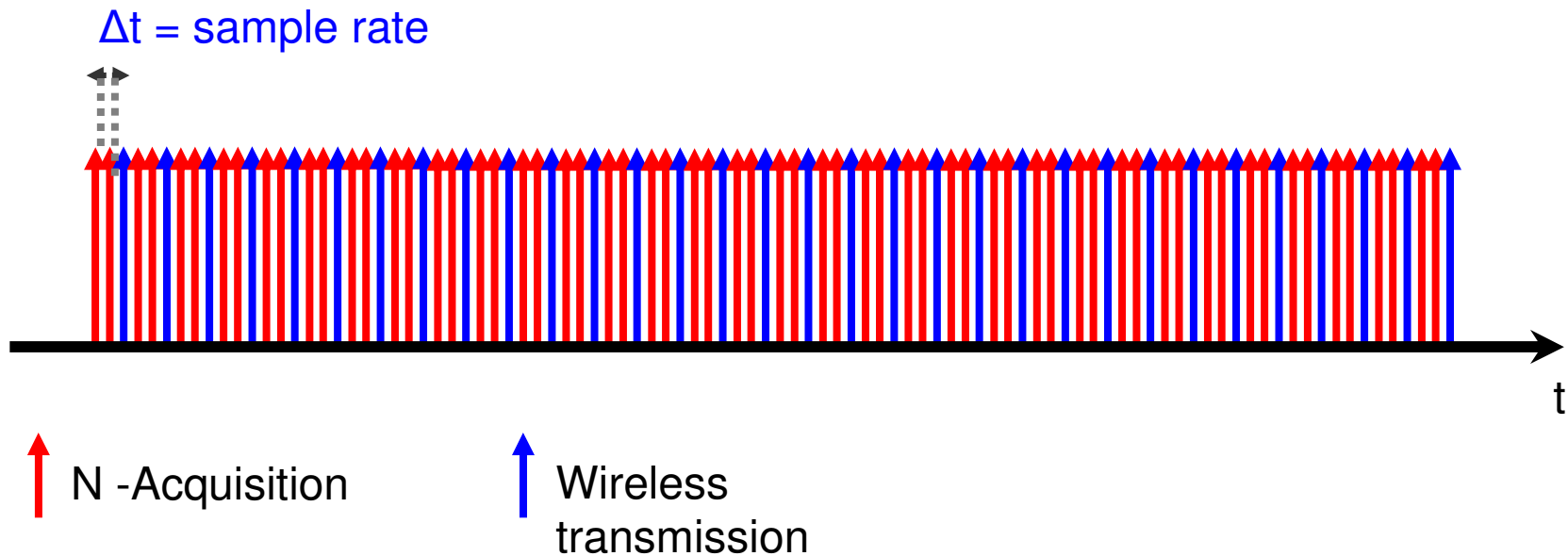
Values such as the mean value, maximum value, maximum value and standard deviation are calculated on sample time series and transmitted by radio.





Streaming mode(1/3) *(available on IEEE 802.15.4 Network only)*

All measured values are transmitted within a continuous flow rate at 5 KHz (mono-channel).





Streaming mode(2/3) ***(available with IEEE 802.15.4 stack only)***

The sample rate depends on the number of channels activated on the network:

- 5 KHz (1 channel)
- 2,5 KHz (2 channels)
- 1,67 KHz (3 channels)
- 1,25 KHz (4 channels)

Nota: 1 KHz == 1Ksamples/s with a 16-bit dynamic measurement

Radio & measurement optimization :

- All the measurement are transmitted in a data packet (one data packet == 50 samples)
- Sample rate is based on a hardware timer with an accuracy of +/-1 us
- The measurement are not stopped during wireless transmission
- Anti-aliasing Butterworth filter (5th order) with a cut-off frequency of 1 Hz to 2 KHz (remotely programmable from the BeanScape®)



Streaming mode(3/3) ***(available with IEEE 802.15.4 stack only)***

Advantages & constraints

Advantages:

- Maximum sample rate 5 KHz (1 channel)
- Fully dedicated to dynamic measurement (vibration, strain gauge, acceleration...)

Constraints :

- Cluster-Tree and Mesh Network Topolgy are not available
- Network & Battery diagnostic are not available during streaming mode
- Idle mode is not possible on the BeanDevice®
- The BeanDevice can not receive request coming from the BeanGateway during the Streaming Mode. A reset on the BeanDevice platform will be necessary.



Mesaurement mode - benchmarking table

	Beacon	Alarm	Math	Streaming
Wireless Stack compatibility	Zigbee & IEEE 802.15.4	Zigbee & IEEE 802.15.4	Zigbee & IEEE 802.15.4	IEEE 802.15.4
Ultra Low Power Strategy	√ √ √ √	√ √ √ √ √	√ √ √	x
Mesaurement Cycle	1s to 365 j	1s to 365 j	1s to 365 j	5 KHz maximum
Wireless Network Topology	Mesh, Cluster-Tree, star, Peer-to-Peer	Mesh, Cluster-Tree, star, Peer-to-Peer	Mesh, Cluster-Tree, star, Peer-to-Peer	star, Peer-to-Peer
Measurement mode	Static	Static	Dynamic & static	Dynamic
Class of measurement applications	Static measurement with idle mode	Monitoring on isolated sites	Measurement in harsh industrial environment	Dynamic measurement: Vibration, Acceleration, strain gauge