Data Management in WSN

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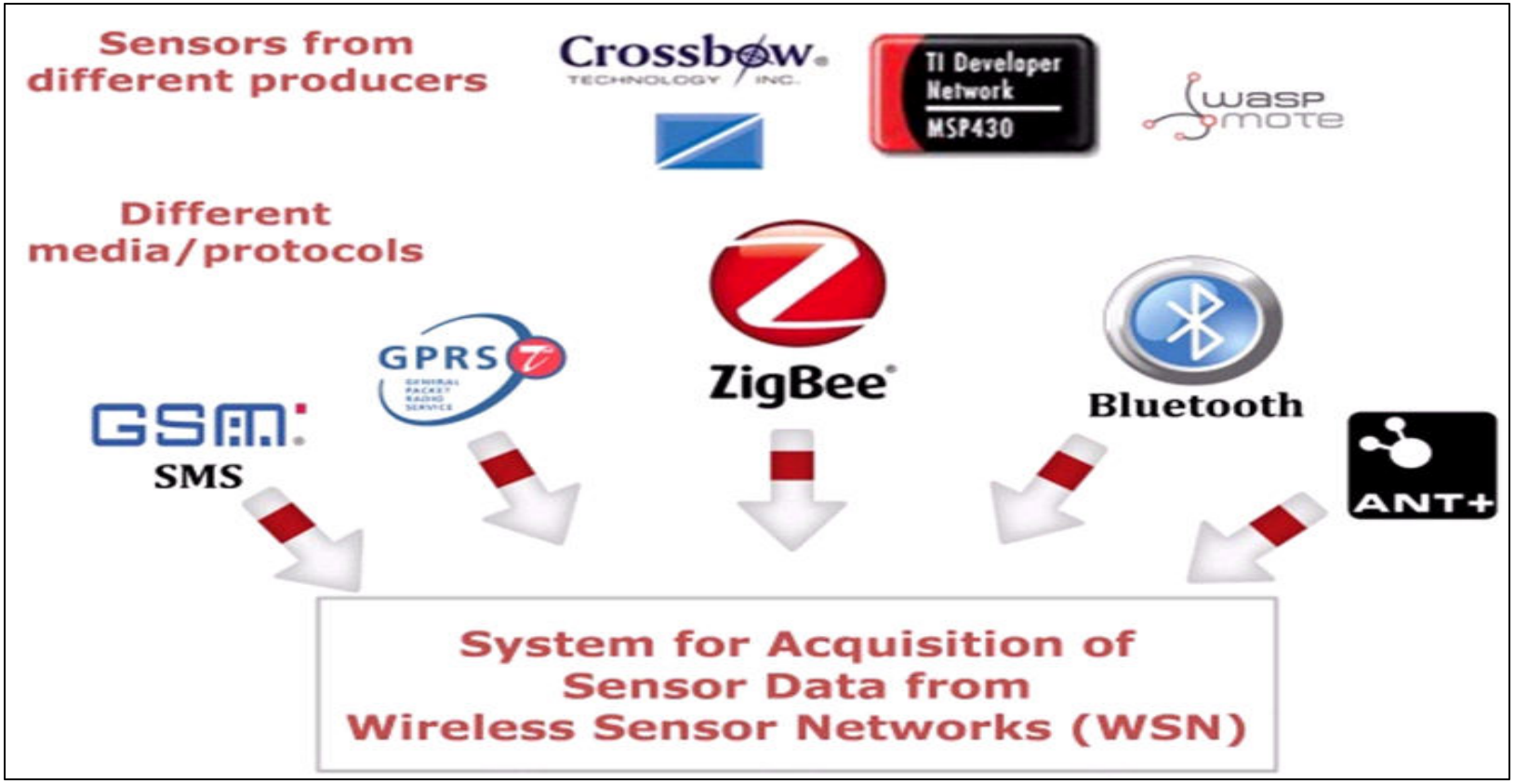
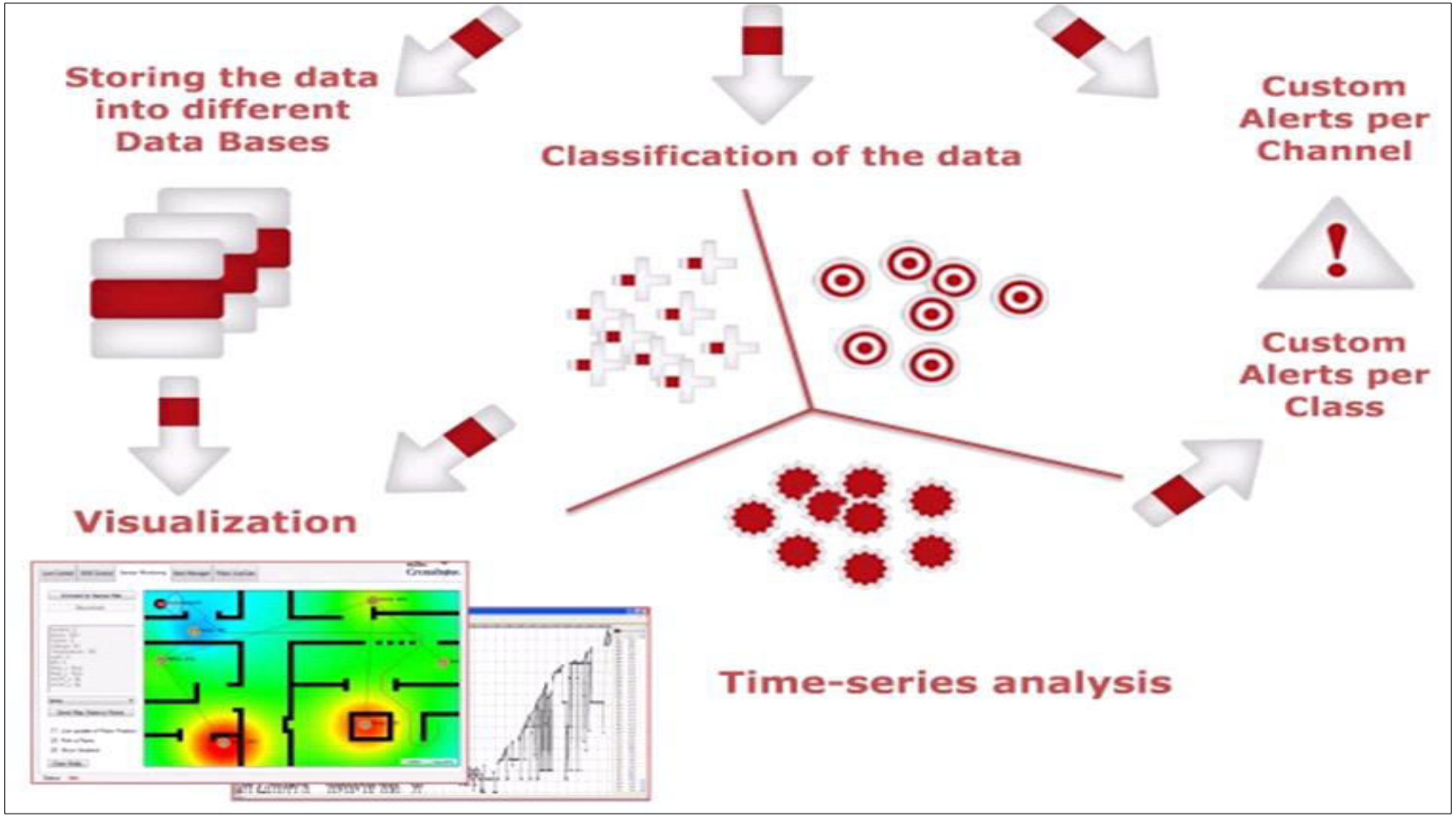
WSN Data Management

- Data acquisition: gathered from a system of multiple sensors deployed in a WSNs.



WSN Data Management

- Data management of the sensed data.

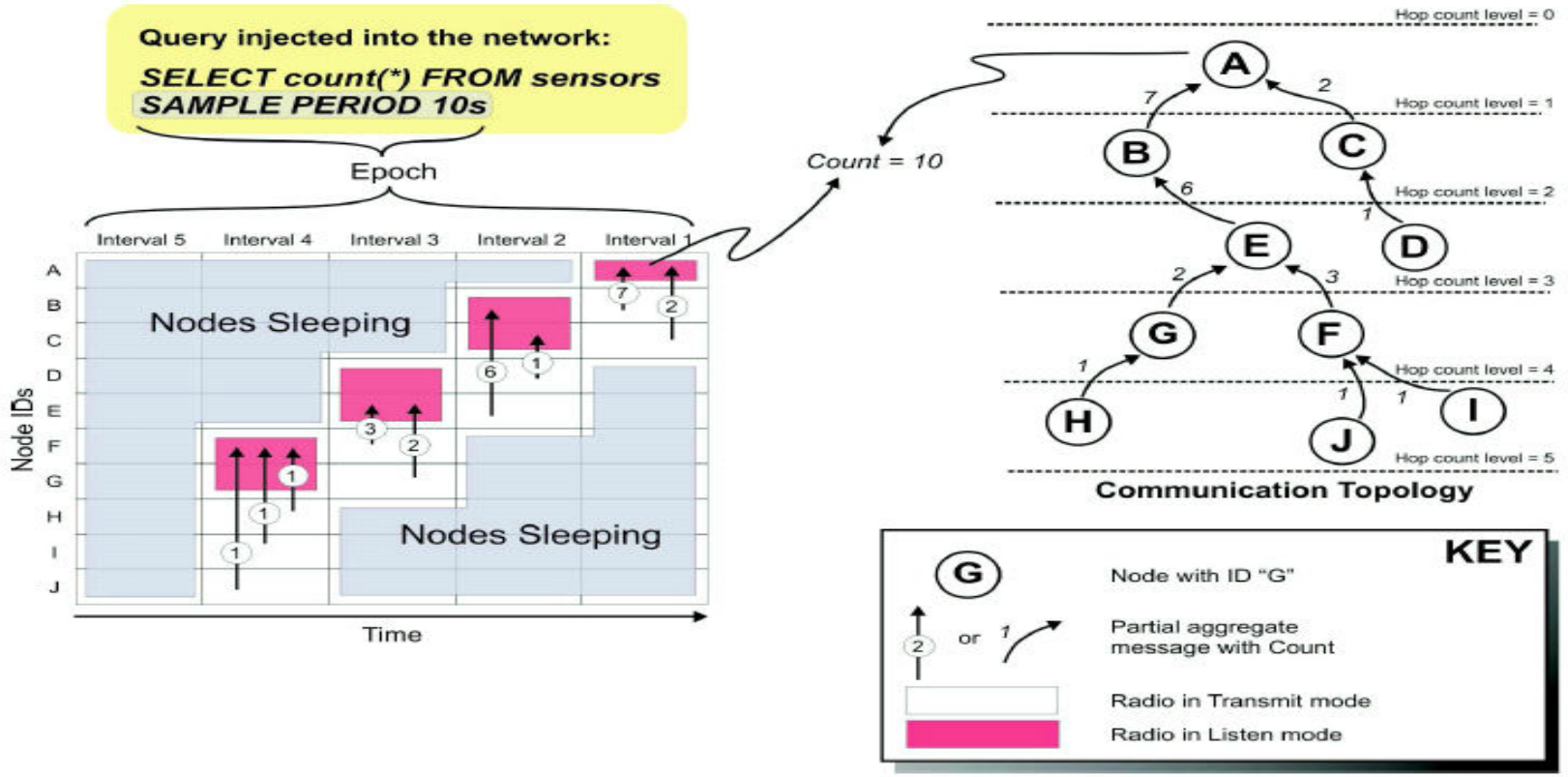


About Sensor Data

- Nature of data in WSNs is different from those on the Internet.
- **Internet** are normally concerned about the data itself rather than **when** and **where** the data was created.
- In **WSNs,** these attributes can have the same importance as the data itself.
- **Naming and indexing sensor data (Second difference)**
- Data (files) on the Internet are usually named by **manually.**
- On the other hand, sensor nodes have to name produced data **automatically.**

About Sensor Data

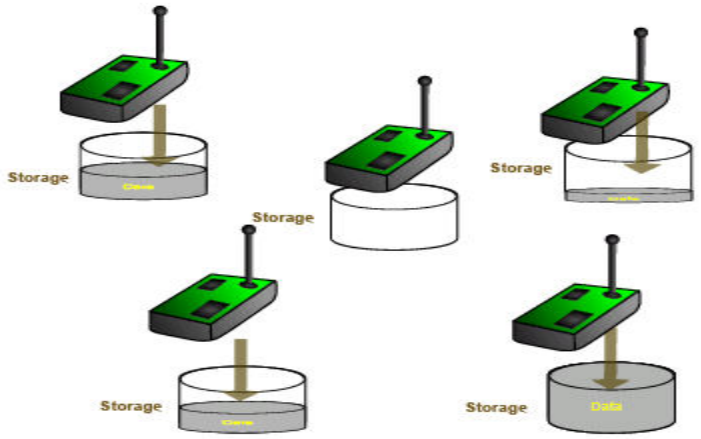
- Two ways to make use of the data produced by the sensors:
- **Push** the data to a base station in real-time.
- **Pull** the data on demand by means of queries.



Data Storage in WSN

- Data storage in WSN can be divided mainly into **3 types.**
- **1st:** Local storage-in which the data is stored on the same node that produced it without placing a reference to the data.
- **2nd :** External storage- Push the data to a base station in real-time.
- **3rd :** In-Network Storage-Store the data on a node that is not necessarily the one that produced it by distributing the data across a number of nodes and implementing a routing scheme which allows one to efficiently lookup the node on which a specific data item is located.

1st: Local Storage

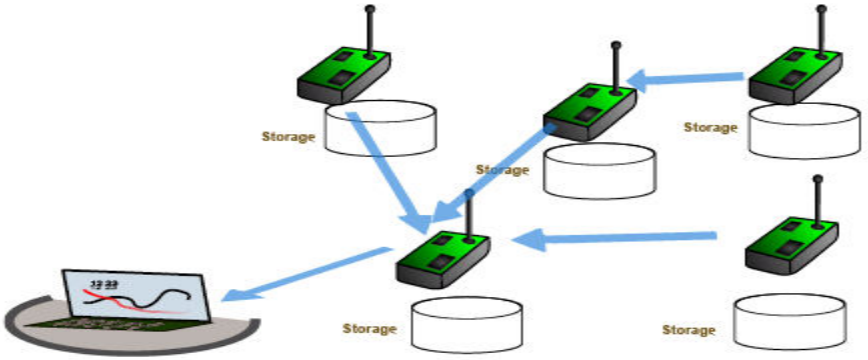


- Storing data locally is cost-effective in terms of communication needed for storing.
- To retrieve data from the network, the only chance is to ask as many participating nodes as necessary, whether or not they presently have the required data item or not.
- Although the complexity for storing is only *O(1), the complexity to* retrieve data from the network is *O(N).*

1st: Local Storage

- **Advantage:**
- There is no need for proactive efforts to maintain a routing table.
- **Disadvantage:**
- Because of the limited storage space in the nodes, the storage capacity of nodes can get quickly exhausted.
- Several approaches can be used to retrieve data from the network.
- Flooding the network with the query to find the answer.

2nd : External storage



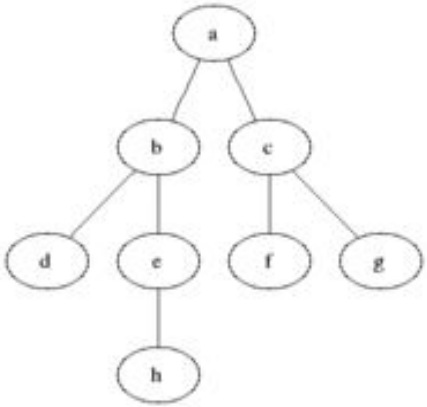
- This approach is similar to Client-Server approach.
- Each sensor reading should be transmitted to a base station in real time.
- In contrast to local storage, external storage does not impose communication cost to retrieve the data.
- Actually this storage strategy could be useful when all sensor readings are important, for example in habitat monitoring .

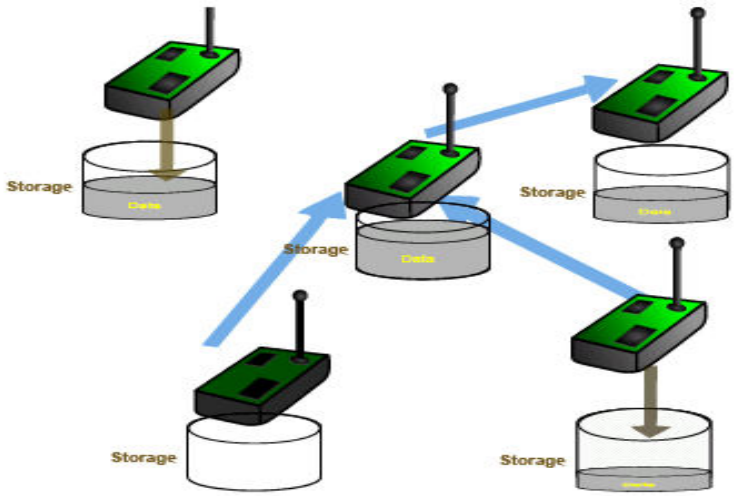
2nd : External storage

- Typical systems employing external storage require efficient routing algorithms to ensure low communication cost for storing data.
- Hence the complexity for storing data is *O(sqrt of N).*
- *Since all the gathered* data are stored in an external server, there is no cost for data retrieval.
- However, the communication channel at the base station may encounter a large traffic load.
- It may represent a bottleneck in the whole system.
- Overall, the external

3rd : In Network Storage

- Both external and local storage exhibit bottlenecks that can affect the scalability and efficiency of a WSN.
- External storage disqualifies itself with a linear complexity for communication at the base station.
- Local storage approach avoids the management of references on other nodes.
- Therefore, they require a costly breadth-first search which leads to scalability problems in terms of communication overhead and energy consumption.





Direct storage: Data is copied upon insertion to the node responsible for it.

Indirect storage: is to store reference to the data.