

Efficient Resource Management for WSN in the Future Internet

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Abstract

Future networks promise to be flooded with Ubiquitous Wireless Sensor Network (WSN). Although technology tends to make WSN more powerful and resourceful in the future, however, there would always be a compromise on certain resources & functionalities for better performance & less expenses. It is an inevitable tradeoff, which creates the anxiety of efficiently managing the WSN itself. System resources for WSN need to be efficiently managed & provided. In this paper we provide an effectual architecture for resource management & provision for sensor network in the Future Internet schema. Resource management architecture, its modules and mechanism are discussed in this paper.

I. Introduction

Although technological enhancements promise multi-functional WSNs [1] in the Future Internet environments, however, implemental trends show us how much resourceful a WSN gets it still cannot be provided with all the required resources. As Unpredicted and Unforeseen events are bound to happen in a WSN. We focus our research on providing a comprehensive architecture for autonomous and intelligent management of WSN in future networks. In this paper we provide an effectual architecture for resource management & provision for sensor network in the Future Internet schema. Resource management architecture, its modules and mechanism are discussed in this paper.

II. Related Work

WSNs are more unpredictable than usual networks. With the deficiency of scarce resources, it is tough to manage them. Management problems of WSN is tried to solve by many researchers, in which policy based systems [2] have more promising solutions. Resource management for WSN is not a new issue but recently, the focused has been shifted to this problem. Some policy based [2] and P2P based system [3] has mentioned this problem. We propose a devisable management system for solving this problem.

III. Proposed Resource Management Architecture

For providing a healthier solution, we need Devisable Management, which is a kind of autonomous management where network manager (software manager) will detect network events and do the necessary based on network resources, predefined policies, intuition and intelligence.

A. TNM (Tiny Network Manager)

TNM resides in the sensor node and performs management for known events using Policy Based

Network Management and Unforeseen Event management using Intuition and Intelligence.

B. Network Manager at WSN Gateway

A modular diagram of the Network Manager at the gateway is shown in figure 1 (a), which is consisting of the TNM as discussed earlier and the Resource Management Module. Resource management module monitors the deployed resources at the sensor nodes, manage them if a change or degradation in the resources is found and even look up and provides new and alternative resources to the WSN. To simplify it performs three main tasks. Data Collector module gathers resource parameters information from the sensor nodes and Data Analyzer measures and identifies the degradations in the current resources. Resource Controller is the main management entity with resources listed in the resource Inventory. Resource Discovery module is responsible for finding new and alternate resources and the Resource Provision module obtains the resource and implements it in the network.

C. Clearing House

Clearing House is like a service & resource broker. It provides the location and connection mechanism to the resources, which are registered at the clearing house by one or many resource managers and providers. Main modules of CH (as shown in figure 1 (c)) are:

Resource Management: All the available resources are registered and maintained in the resource repository by the resource enlist module. Resource Broker is the main entity which handles all the resource requests. Resource look up is to find the required resource in the resource depository, where all the available resources are already registered. It provides the resource location and access mechanism.

Federated Clearing House: As there exists more than one CH, they maintain a federation among themselves. If a solution is not found a request can

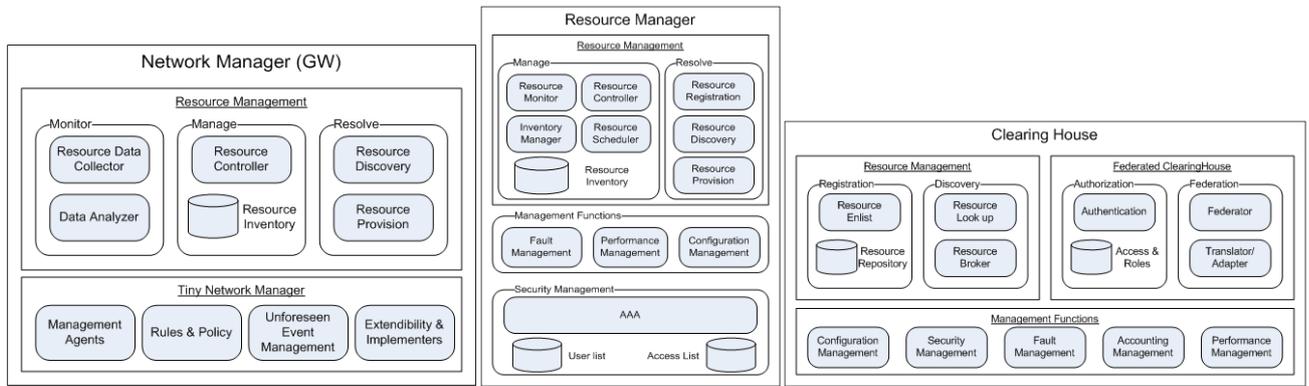


Figure 1: (a) Network Manager at the WSN Gateway composing of TNM and Resource Management Module

(b) Modular diagram of a Resource Manager

(c) Modular diagram of a Clearing House node

also be send to the federated CH. Federator module is responsible to the maintain federations with the other CHs, while Translation is adaptor is required when different CH speaks different protocols. The authorization module entertains the session request and provides authorization and authentication for CH-CH, CH-RM, and CH-Gateway communications. Conventional Management Functions include the traditional management functions for internal management.

D. Resource Manager (RM)

Resource Manager is a logical entity that utilizes the concepts of platform & resource virtualization and provides these resources to the needy WSNs. Figure 1 (b) shows a modular diagram of a Resource Manager.

Resource Management has two main systems, i.e. Manage the resources requests and responses and task delegation to other modules. Resource registration module registers all the resources at the CH (broker) to accessible by the WSN. And Resolve the resource requests as it looks up the resource. Resource provision mechanism is responsible to provide the mechanism by which a resource is reachable. Management Functions includes the traditional management functions for internal management and assisting in the whole network

management. Security Enabler entertains the session request and provides authorization and authentication for CH-RM, and CH-Gateway communications. User list and access list are used for WSN authorized accesses.

IV. Resource Management Architecture

Shown in figure 2 is the proposed resource management architecture. When a resource is degraded at the certain node, the TNM at that node informs the Gateway. The gateway in turn looks up for an alternative resource. For that it initiates a resource discovery. It sends a query to the CH, which look for such a resource in its resource database. It provides the resource location and access mechanism to the gateway. The gateway sends the resource request to the resource manager, which replies with the resource to the Gateway.

V. Conclusion

Implemental trends show us how much resourceful a WSN gets it still cannot be provided with all the required resources. As Unpredicted and Unforeseen events are bound to happen in a WSN. We focus our research on providing a comprehensive architecture for autonomous and intelligent management of WSN in future networks. We extend our architecture to handle such events, provide solutions and fetch resources to implement the feasible solutions.

References

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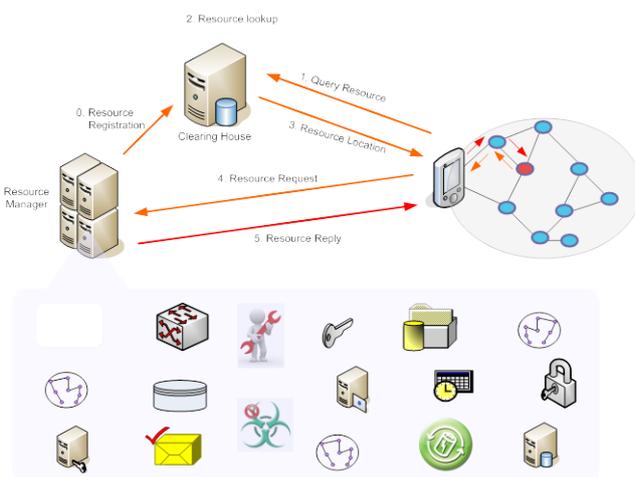


Figure 2: Resource Manager Architecture