

Opporunistic Service Availability Dissemination Protocol

State of the Art

The Opporunistic Service Availability Dissemination Protocol (OSADP) generates resource publications and transmits it periodically whenever the resource is available. These packets are broadcast using User Datagram Protocol (UDP), as it is non-connection oriented protocol. The protocol itself dictates the steps that should be taken by the nodes that receive these publications.

The efficient dissemination of resource availability is a core aspect of OSADP. It is achieved through a decentralized publish-subscribe mechanism. The protocol is designed to notify as many satellites as possible about available services without saturating the network with redundant messages. Inspired by propagation methods from protocols like BATMAN and BMX6, OSADP [1] employs a node-by-node propagation technique. Each satellite processes the publication packet upon receipt, deciding whether to consume the resource or to forward the publication to its neighbors.

OSADP's publication process is controlled by parameters like the Hop Limit (HL), which restricts the number of hops a publication can make within the network. Additionally, the publication packet contains information, including the type of service, provider identifier, and the estimated service lifetime, allowing satellites to make informed decisions regarding resource consumption and federation participation. This information allows the protocol to incorporate mechanisms to manage the propagation of publications. It prevents unnecessary duplication and ensures that only relevant publications are forwarded.

In conclusion, the protocol aims to manage publications efficiently and can be considered complete either when the publication is discarded or when the receiving node communicates back to the originating node its intention to form a federation. At this juncture, the negotiation phase for resource consumption begins, transitioning the communication to the Transmission Control Protocol (TCP) as per the processes outlined in the FeDeCoP protocol.

The management of the publications is detailed in [1]. However, the state diagram that must be implemented on the satellite is presented in Figure 1. The state diagram illustrates the flow of the

protocol as it manages service publications. Starting in the Idle state, the system either updates its service table or checks received publications. If a new service is available or a publication contains new information, the system updates the table and may publish the information. If a service is extinguished or blocked, the system returns to the Idle state, ready for the next event. This process ensures efficient management and dissemination of service availability.

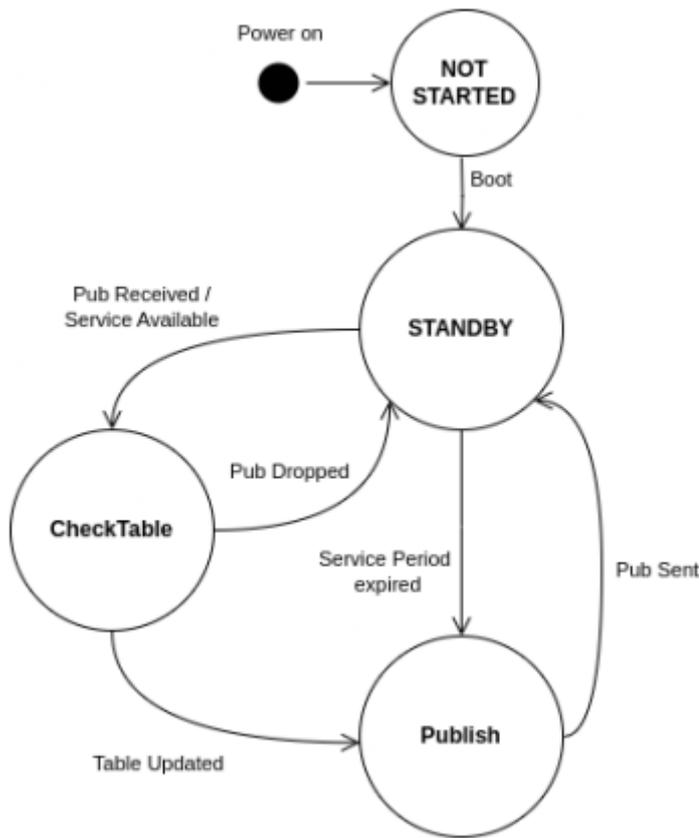


Figure 1: OSADP State Diagram

Packet Structure

In [13] the structure of the packet used in the publication process is shown. This packet shall be transmitted using non-oriented connection protocols such as UDP. Figure B.1 from [1] shows the packet fields. In addition, Figure 2 presents the packet fields and their description. From this Figure, we can retrieve the size of the packet, which is (12 bytes).

Name	Size	Description
Type	1 bit	Identifies the packet as a publication.
Service Category	4 bits	Specifies the type of service being offered.
Reserved	11 bits	Reserved for future extensions.
Provider Identifier	24 bits	Uniquely identifies the satellite providing the service.
Service Lifetime	8 bits	Indicates the estimated duration that the service will remain available.
Period	8 bits	Defines the frequency at which the service provider will retransmit the publishing packet.
Creation Date	32 bits	Timestamp of when the publish packet was originally transmitted by the provider.
HL	8 bits	Specifies the maximum number of network hops the packet can make before being discarded.

Figure 2: Publication packet structure. Reproduced from [1].

Information from OSADP packets is used to determine the next steps to be taken by the receiving node. To do so, the protocol works with the Service Table (ST). Each node generates a ST. Figure 3 shows the structure of the service table. The ST is a table that stores information about the services available in the network. It is updated whenever a publication is received. It is organized by providers. Each provider contains different services. Each service has associated different service entry tables.

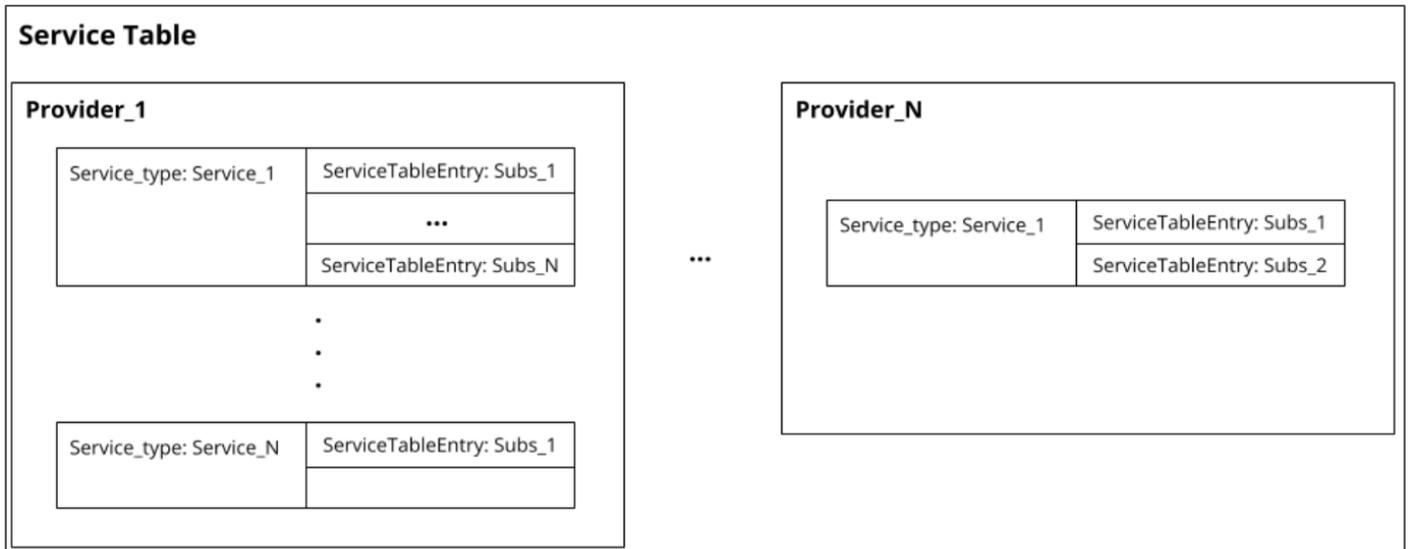


Figure 3: Service Table structure.

References

[1] Joan A Ruiz-De-Azua, Anna Calveras, and Adriano Camps. A novel dissemination protocol to deploy opportunistic services in federated satellite systems. *IEEE Access*, 8:142348–142365, 2020.

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