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Multi-interface Network Connection Manager in Arena Platform
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Abstract

This document presents a "Connection Manager" model implemented in the platform Arena, a mobile OS based on Linux. The introduction of Connection Manager brings two major benefits in Arena. First, it logically decouples the underlining connection approach with the connection management. Second, it plays a central role which executes the policy of OS, especially for multiple interfaces.

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1. Introduction

In current practices, most of applications maintain network by themselves. They directly connect to the network with given parameters leading to the coupling of operation and network management in logic level. Moreover, such type of mechanism does not meet variant requirements in multiple interfaces situations.

This document presents a Network Connect Manager solution which abstracts the network connect function to a class which can be used by the functions to get connection management services. The access approaches, parameter settings, management policies and connection management solicitation processes are handled based on OS predefined or application customized interface settings and are separate with the Network Connect Manager. In this way, the connection link related operations are separated with network management logically. This also makes it possible to address multiple interface cases.

This document will illustrate the scenarios where connection manger applies, the link management model and the procedure to use connection mananger.

2. Scenario

There are three modes of interface selection as depicted in Figure 1.

These modes are summarized as follows.

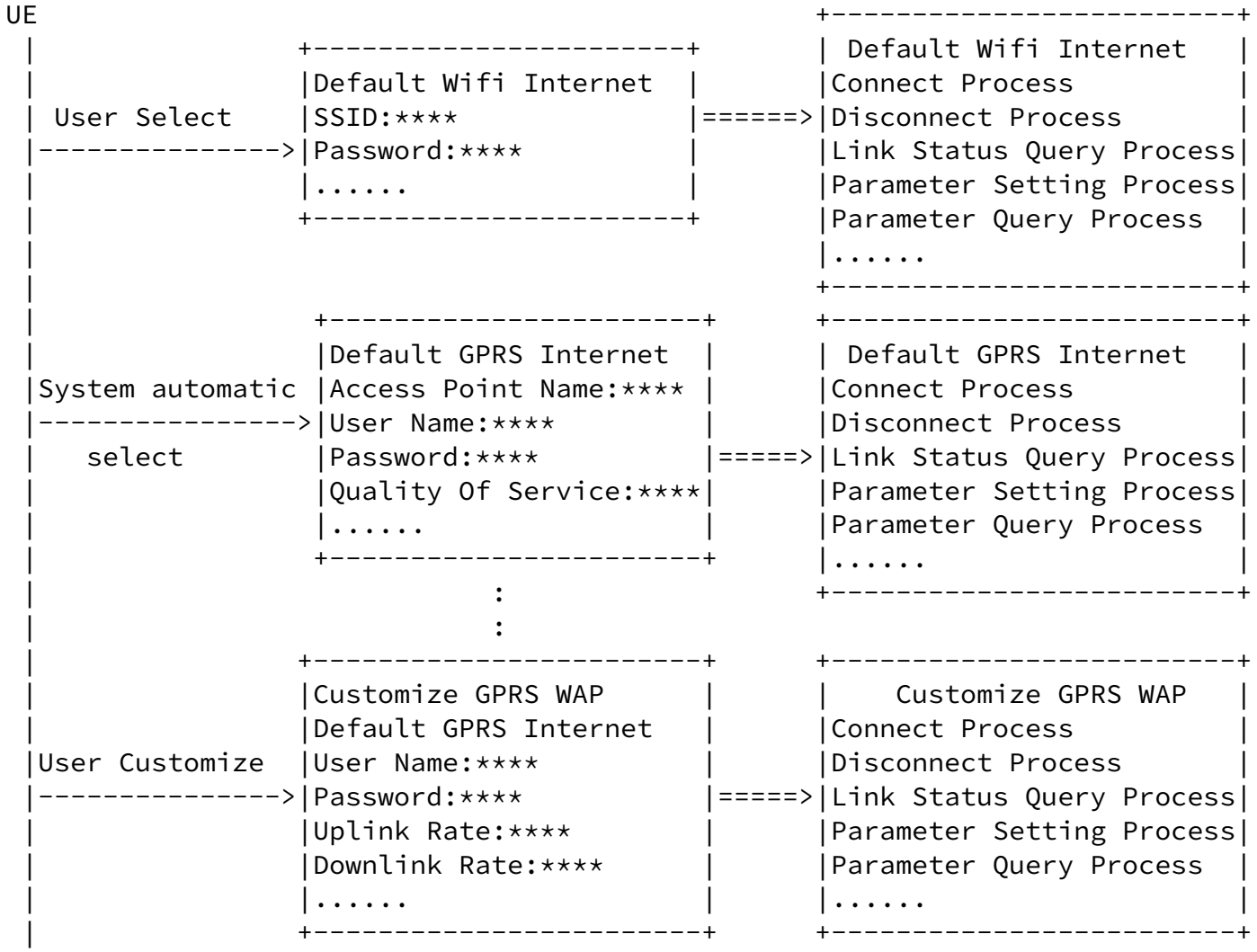

Figure 1 There modes of interface selection

Interface Selection by an Application. If an application selects a system default interface, it calls those default link management service interfaces offered by the Network Connection Manager.

System Automatic Selection. If an application attempts to get connected without specific requirements, the system will evaluate various factors such as bandwidth, cost, stability, then select an interface automatically for the application.

Creating New Interface based on Requirements. When all default interfaces can't meet the requirement of an application, the application can customize a new connect interface and configure the connection parameters, define the detailed processes such as connect, disconnect, status query, parameter settings and query. Then the interface is registered to the Connection Manager. In this way, a new interface is created and can be used as other interfaces in Connection Manager.

Figure 2 illustrates the mechanism of Connection Manager model. All the interfaces must register with the Connection Manager and link manage operations carry out via the multiple network connect interfaces.

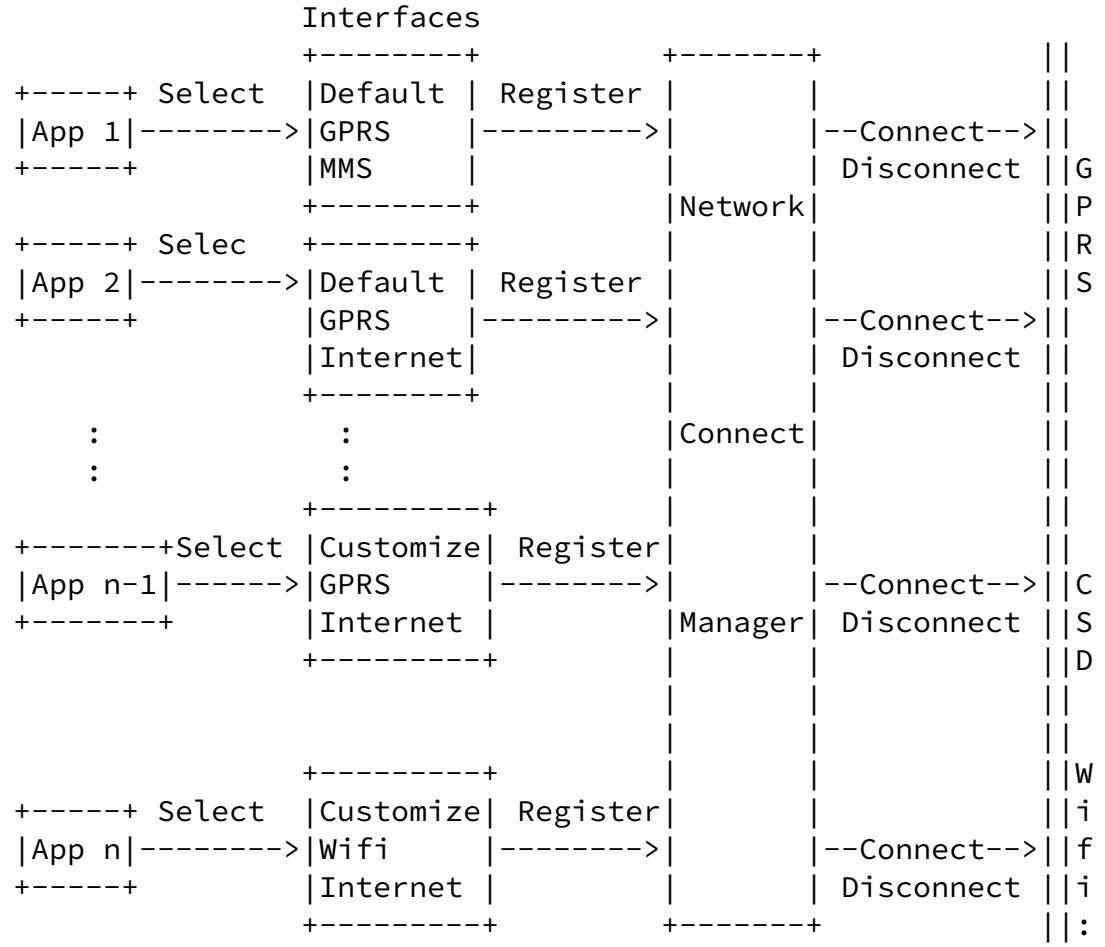

Figure 2 Network Connection Manager Model

3. Connection Manager

3.1. Work Flow

Figure 3 demonstrates the working flow of the Network Connection Manager. In the figure an application select a default interface named "Default GPRS Internet" to connect with the network.

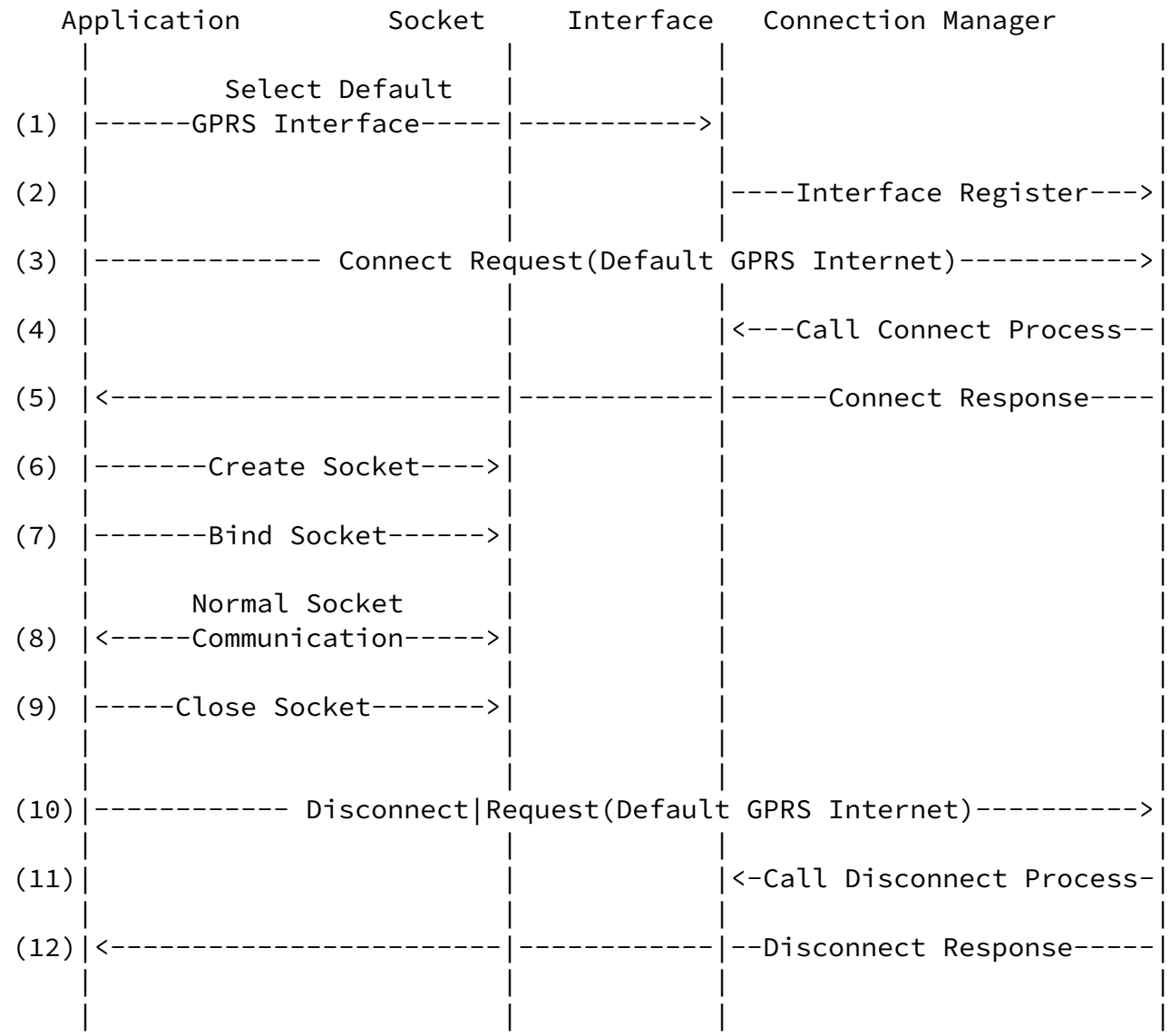

Figure 3 Network Connection Manager Work Flow

The steps are listed as below:

1) An application selects a default interface named "Default GPRS Internet" to connect with network;

2) The Default GPRS Internet interface registers with the Connection Manager;

3) An application requests the Connection Manager to connect with network via Default Network Interface connect interface;

4) When the Connection Manager receives the request of connection, the Connection Manager will select one interface according to the parameter required. The implementation of the interface on connection is called to establish link for network access.

5) The Connection Manager informs the success of connection to the application and saves the information about this link such as PDP context, IP address, DNS etc.;

6) From step (6) to step (9), the application creates a socket and binds it with the IP address of the active link. The communication is established via the socket. The socket will be closed at the end of the communication.

7) The disconnect procedures from step(10) to (12) are similar as, previous procedures for connection establishment.

Note: In the case of interface customization, a new interface should be created through configuring parameters and implement network management at step (1).

3.2. Interface Reuse

The Connection Manager has the ability to make connections work simultaneously. Multiple applications can share a connect interface at the same time. In such situations, operations such as link establish and disconnect will be shared.

3.3. Link route consideration

Under the circumstance that multiple interfaces are connected simultaneously, applications should bind socket with IP address of the corresponding interface to make sure that each socket created by every application exactly communicate via its respective link and route.

4. Conclusions

The Connection Manager model in Arena platform improves the efficiency for application developers and makes it convenient to manage connections over variant network resources. Further work will be conducted on link resource management, task scheduling and policy control.

5. Informative References

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[I-D.blanchet-mif-problem-statement] Blanchet, M., "Multiple Interfaces Problem Statement", draft-blanchet-mif-problem-statement-00 (work in progress), December 2008.

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