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Click Router and GNRS Communication using Socket Programming in Mobility First

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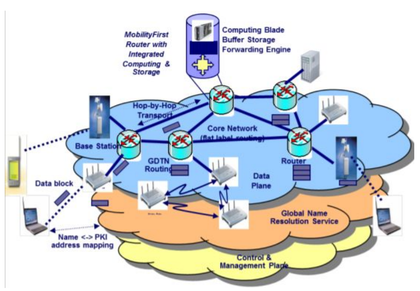
Introduction to Mobility First

Motivation:
Historic inflection point, with mobile platforms and applications poised to replace the fixed-host/server model

Challenges:
•Multi Homing
•Host and Network Mobility.

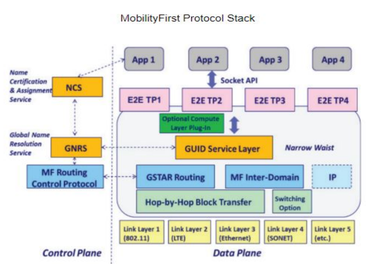
Use cases:
•Emergency Response
•Vehicular Networking
•Virtual Networks
•Content Delivery

Mobility First Architecture



Highlights of Architecture:
- Separation of name and addressing
- Storage Aware Routing, Ad-hoc networking.
- Connectionless, hop-by-hop transport (hop-by-hop link layer protocol)

Essential components of the Mobility First Architecture



Mobility First Routers:
- Generalized Storage Aware Routing (GSTAR)
- GUID and network address based routing

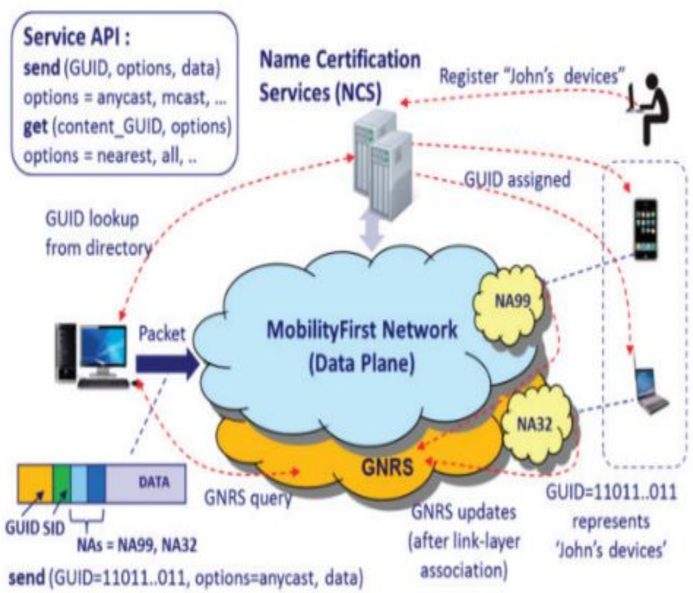
GNRS:
- Global Name Resolution Service
- Distributed approach based on hashing functions.

Configuring the essential Components

Mobility First Routers:
- The software Click is used for configuring each Moblity First router.
- The click program required for a router is built in C++.
- Each router is configured using various click elements which can be built-n or user-defined elements.
- Each element consists of a header file and a program file.
- By using the Configure method in each element's program, the element is configured appropriately with available parameter values.

GNRS:
- GNRS is built in Java.
- It is built as an UDP server which returns one or more network address for every GUID query from the routers.
- It uses Hashing to obtain the network address from the received GUID.

Working Scenario



1. A host wishing to send a message to all John's devices, tries to get the GUID from the Name Certification Services (NCS). The NCS Converts the name of a device to a GUID.
2. Upon retrieving the GUID of the required destination(s), the host uses the Service API send(GUID, options,data).
3. The Router/Autonomous System then tries to obtain the required network address of the destination host(s) by sending query requests to the GNRS, through UDP Socket programming.
4. The Global Name Resolution Service, GNRS, has a special hash functions that can be used to determine/generate the IP network address(es) for a given GUID.
5. The GNRS, which acts as a UDP Server will be in listening mode and whenever a message is received through it's port, it retrieves the request GUID from the message packet and then by using the hashing functions can generate all the network addresses, mapped to the specified GUID.
6. Once the required network addresses are available at the GNRS side, it will send these network addresses through UDP Socket address and port from which the request was received.
7. The router upon receiving the network addresses, forwards the host's message to that particular network address(es).

Expected End Result

- Develop communication between the routers built using click elements and program and the GNRS server built in Java.
- Use UDP Socket prgramming for hop-by-hop transmission of packets.
- The UDP server code whenever received a GUID should call appropriate functions of GNRS Server by passing the received GUID from a router.
- Once the network address is calculated using the hashing techniques, the generated network address should be sent to the router from which the look up address is received.

Work Accomplished

- Learned how to use a click program for Socket Programming.
- Used the basics of Socket programming and the programming rules to create a Client and server module for Socket Programming.
- Successful in creating the communication between the UDP client configured in the router built using Click program and a basic Java server.

References

- ***[MF routing] GSTAR: generalized storage-aware routing for mobilityfirst in the future mobile internet*, ACM MobiArch 2012, https://dl.acm.org/doi/10.1145/1999916.1999922**
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