XIA: EFFECTIVE NETWORK MOBILITY SUPPORT AND MIGRATION IN INTERNETWORKING

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1. INTRODUCTION

The design of the internet, protocols, and applications provided by the IP protocol carries various physical layers and access technologies. However, this design does not give us a clear path for the development of new abilities. Expressive Internet Architecture (XIA) enhances these problems by maintaining features like narrow waist and default on communication. Expressive Internet Architecture (XIA) alters the network layer to achieve several goals like 1) Security, which is the most significant challenge in the Internet. 2) Supports the long-term evolution of usage models.3) Supports long-term technology evolution. 4) Supports explicit interfaces between network actors.[1]

2. PRINCIPLES OF EXPRESSIVE INTERNET ARCHITECTURE (XIA)

There are 3 principles of this architecture which are explained in detail below. The first principle of this architecture is that communication between various entities will be explicitly supported. This will enable users to express their intent to the network, creating numerous opportunities for in-network optimization and innovation in support of current and future usage models.

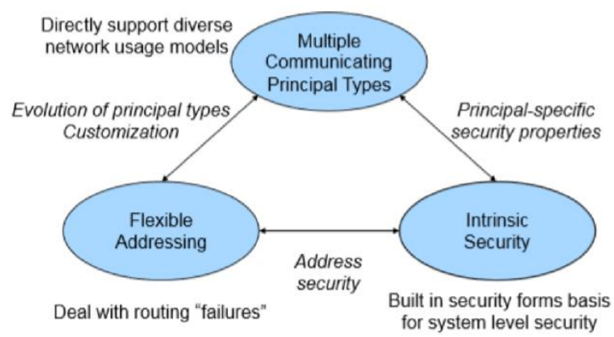

Figure 1: XIA Principles

For example, it helps Expressive Internet Architecture (XIA) deliver many goals of alternative architectures such as content-centric networks that support different forms of content retrieval and service-centric network that provide powerful primitives such as service-level anycast.

The second principle of this architecture is that the essential security properties associated with each communication operation should follow as a direct result of the design of the system. Expressive Internet Architecture (XIA) achieves this goal by using self-certifying identifiers for all forms of principle types (communication between different entities) providing a set of integrity and accountability properties.

This architecture's third principle is that it will support flexible addressing supporting fallback addressing. Combined with the first principle, the flexible approach directly supports evolvability (two and three goals). It contributes to the last aspect of our vision because it gives the user some control over how communication operations are carried out.[1]

3. ARCHITECTURAL SPECIFICATION OF EXPRESSIVE INTERNET ARCHITECTURE (XIA)

The specification of a XIA principal type includes the semantics of communication with principles of this type, the processing that is required to forward packets with addresses of this type, and the intrinsic security properties of the principle. The initial XIA architecture defines four basic XIA identifier (XID) types and their intrinsic security properties:

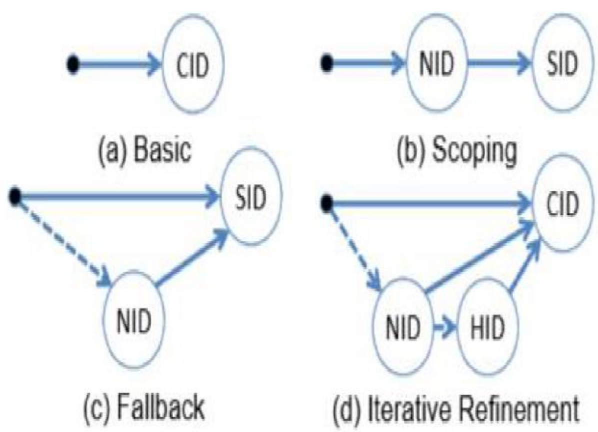

Figure 2. Examples of address DAG.

Host XIDs: HIDs support unicast host-based communication semantics like IP. HIDs are a hash of the host's public key, supporting AIP-style accountability. HIDs define who you communicate with.

Service XIDs: SIDs support communication with (typically replicated) services and realize anycast forwarding semantics. SIDs allow clients to verify the identity of the service. SIDs define what entities do.

Content XIDs: CIDs allow hosts to retrieve content from "anywhere" in the network, e.g., content owners, CDNs, caches, etc. CIDs are defined as the hash of the content, so the client can verify the correctness of the received content. CIDs define what it is.

Network XIDs: NIDs specify a network, i.e., an autonomous domain, and they are primarily used for scoping. They allow an entity to verify that it is communicating with the intended network.[1]

In the third XIA principle, flexible addressing is possible by using Directed Acyclic Graphs (DAG) of XID's as addresses. DAG are very flexible and allow packets to express fallbacks as well as scope to realize user intent. The simplest Expressive Internet Protocol (XIP) address has only a dummy source '•', representing the conceptual source of the packet, and intent as the sink, e.g., a CID as shown in figure 2(a). In some environments, for example, LANs, this type of flat addressing is useful, but will not necessarily extend to the public Internet. DAG can also be used for scoping implementation as shown in figure 2(b). Routers will first deliver the packet to a network NID starting with the source •. Once the NID is reached, the SID will be used by routers to deliver the packet to the intended service. This DAG is similar to the [network prefix, endpoint Id] format of IP addresses. Also shown in Figure 2(c) is a fallback NID and fallback edge shown as a dotted line. A router uses the fallback edge if the intent SID is not acknowledged or available. Considering that SIDs have anycast semantics, packets that use this DAG will be delivered to the closest service for a globally routable SID but delivered to the service instance in the NID network if global SID routing fails. Finally, Figure 2(d) combines the two mechanisms with the DAG address. Note that the intention can be met directly by any router along the fallback path (solid edges to CID).[1]

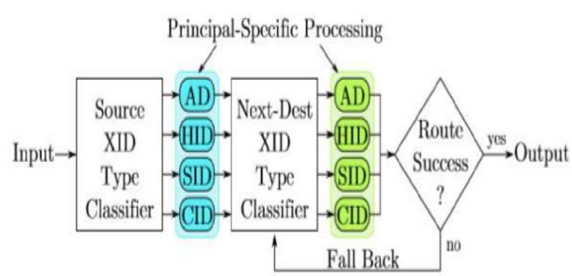

Figure 3: XIA Forwarding Engine

Figure 3 shows a simplified diagram of how packets are processed in a XIA router. The edges represent the flow of packets among processing components. Shaded elements are principal-type specific, whereas other elements are common to all principals. This design isolates principal-type specific logic to make it easier to add support for new principals. The XIA packet header contains a node to show the latest forwarding progress within the DAG within the destination address. The router evaluates the outgoing edges in priority order using that node as a starting point, invoking type-specific forwarding logic. The packet will be forwarded if the XID is recognized; otherwise, it will be returned to the classifier, which will seek the next edge. More details, including a forwarding engine performance evaluation.[1]

4. MOBILITY SUPPORT IN XIA

We have explored how XIA's DAG-based addresses, service identifiers, and intrinsic security can be used to assist both the establishment and maintenance of a cellular mobile end-point connection. There has been a remarkable deal of work on supporting mobility in the Internet, but two concepts have emerged as the foundation for most solutions. The first is the use of a rendezvous factor records the cellular device's present address (locator) and is used to reach a mobile cell host.

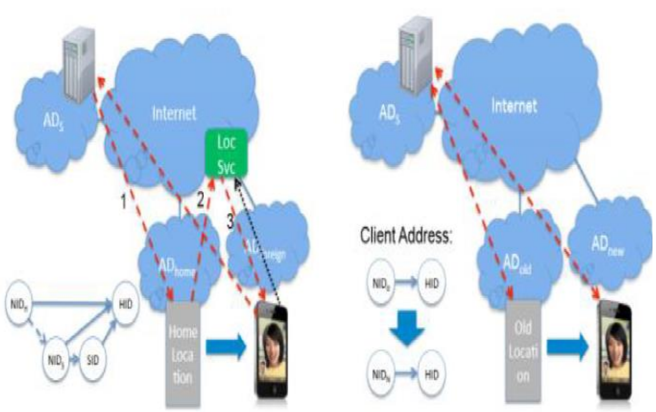

Figure 4: Mobility Support: first contact (left) and during a session (right)

The second is the observation that, once a connection is established, the cellular host can tell its desk bound peer of any change in location, without the need for a rendezvous factor. Both of these standards are fairly easy to implement, in part because XIA distinguishes between the identifier for an endpoint (HID or SID) and its locator (an address DAG). We now sketch a possible implementation of every concept, using HIDs as an example. To establish a connection with a cell device, a communicating consumer will first do a name Research. As proven in Figure 4(a), the address DAG this is back ought to include the device's "Home" locator (NIDH : HID) as the reason, and the place of a rendezvous carrier (NIDS : SID)), if the device is attached to its home network, it's far introduced with the aid of following strong arrows in the DAG. If not, it is routinely delivered to the rendezvous provider the using the fallback. The rendezvous service could be hosted via the home network, or ought to be a distributed commercial service. The carrier Forwards the packet to the cellular device, which then establishes the connection to the communicating client, as shown by using the dashed arrows in Figure 4(a). It additionally affords its new address DAG, signing the address trade, by the usage of the private key related with its HID. Clearly, many different answers are viable. For example, the cellular machine could register the DAG of the rendezvous point with its name service when it leaves its home network. To preserve a session during mobility, the mobile host keeps the stationary host informed of its new address, as proven in Figure 4(b). Similar to the strategies above, use of intrinsically secure identifiers simplifies securing this procedure for the reason that the mobile host can signal the address alternate the usage of the private key associated with its HID or SID. The mechanisms described above solely support basic connectivity, but optimizations are fundamental in practice.[1]

5. NEMO: EXPRESSIVE INTERNET ARCHITECTURE (XIA)

Now, looking into the mobility support of the network architecture, preserving in context with the Expressive Internet Architecture, to support the continuous, optimal and reliable network access, the mobile gadgets in an automobile use NEMO technology. This technology is fast, strong and reliable and implemented in network areas like trains, cars, even aircrafts and also further in Personal Area Networks (PAN) attached to people. The goal of the network mobility NEMO support is that each community node is reachable to the device is shifting around.

5.1 Basic idea

Terms used in the topics below are:

- MN: - Mobile Node
- MR: - Mobile Router
- LFN: - Local Fixed Node
- VMN: - Visiting Mobile Node
- RA: - Rendezvous Agent
- CN: - Correspondent Node
- BU: - Binding update sent to RA.

A new entity rendezvous factor is delivered which is indicated as RA. The project of RA is to redirect the packets to MN.

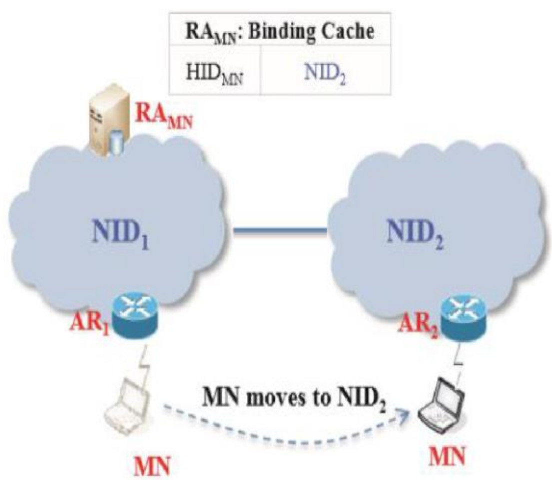

Figure 5: Host-mobility Scenario

RA supports the mobility and updates the network table with the assist of MN. RA maintains the current location information of MN and is accountable of redirecting packets to MN.[2]

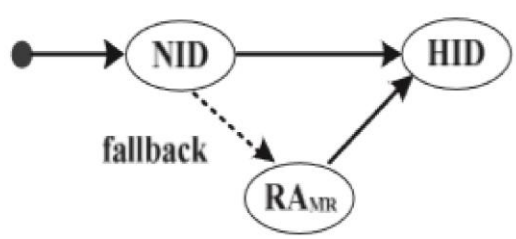

Fig.6 MN's Support of Mobility

The scenario is particularly clear. When it moves to every other network, it takes a one-of-a-kind Network ID and registers itself with that network ID. MN sends a binding update packet RAmn, to update its binding cache

5.2 SIMPLE NEMO SCENARIO

A simplest NEMO scenario consists of one MN and one LFN as shown in the figure below.

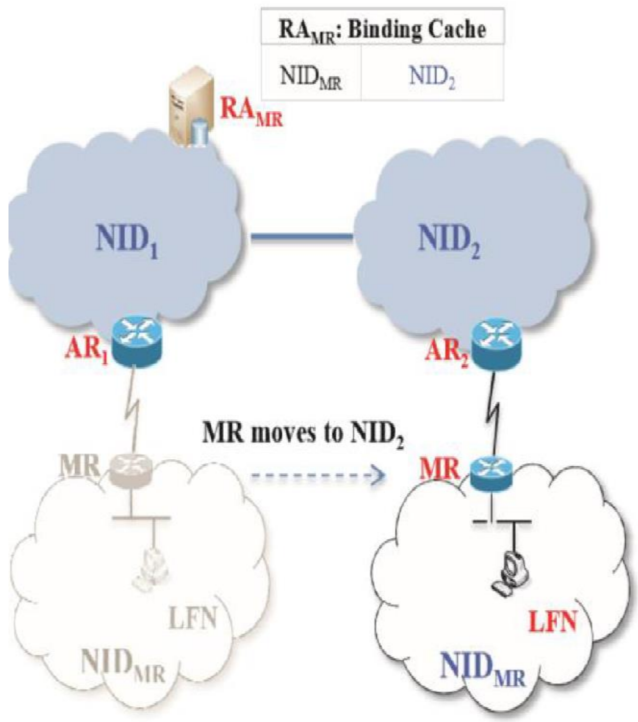

Figure 7: Simple NEMO Scenario

MR sends RAMR a BU message to update the binding cache entry, which is (NIDMR, NID1). There are two network ID's, NID1 and NID2. In this situation, the network ID in the RA's Binding cache changes from NID1 to NID2. [2]

6. MIGRATION IN EXPRESSIVE INTERNET ARCHITECTURE (XIA)

As the fundamentals of XIA have been investigated, a subset of the XIA protocol is the XIA Migration protocol. With each smartphone related to Wi-fi and

LTE, smartphone moving from area to place, continuity of the session and efficiency of the community are the challenges that arise. Considering the scenario, there's already an established protocol which is Mobile IPv6, however there are some pros of the XIA migration protocol compared to the IPv6 protocol. Today's technology i.e. TCP/IPv6, poorly supports migration. Also, the protocol is complex and heavily dependent on anchor point. Intrinsic security, use of DAG's is some key aspects of Expressive Internet Architecture. (XIA). Another gain of XIA is that, even in quickly changing environments, it offers a commendable performance. [3]

Migration protocol comes from basic two needs:

1) Mobility

2) Multihoming

As the machine is in motion, on the way it might also connect to distinctive networks that come along the path. So, an unexpected change in the access of the network can also motive disrupt in the communication among the cellular host and the one that is in motion. Further a situation might also arise, where a certain time has surpassed but, nevertheless a new connection hasn't been established yet. Thus, a migration protocol is wanted to migrate the communication when there is switching from one network access point to the other.

A. Migration in IPv6.

TCP/IPv6 has three main set of protocol migration:

1) MIPv6 for host migration

2) NEMO BSP for network migration

3) MPTCP for flow migration

An exterior TCP extension known as MPTCP is the one that end to end connection by making use of multiple paths. A shim layer is used by using MPTCP between the application layer and the TCP Layer, that layer is transparent. There are unique perspectives of the MPTCP layer, considering the viewpoint of an application it's a TCP layer, while to the network it looks like a multiple independent layer. To the troubles of mobility, this MPTCP provides an answer in the transport layer, additionally it is vital that each endpoint support MPTCP, no longer enough that solely one endpoint might also support. [3]

Another protocol that supports multihoming is the SCTP (Stream Control Transmission Protocol) which is a reliable protocol for the statistics data transfer. Further a benefit of this that its port can be associated with more than one IP addresses. It supports multihoming, also dynamic address reconfiguration, but there are some limitations due to which it is no longer general-purpose migration solution.

B. XIA Migration Protocol

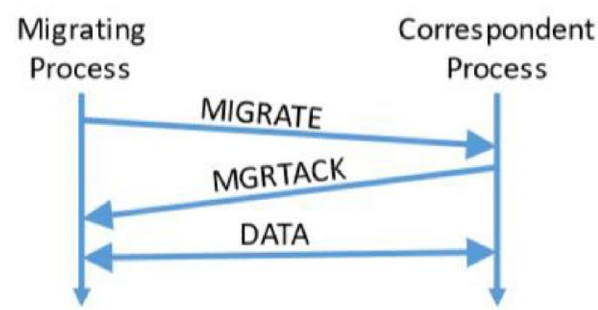

Figure 8 Time Sequence Diagram of XIA Migration Protocol

To allow an endpoint during the migration to preserve the same identifier, the venture that XIA undertakes is it separates identifier and the locator. The same goal is achieved by Mobile IPv6 that uses two IP addresses,

1)Identifier

2)Locator

Identifier is the home address and other IP address used as locator. To ensure the delivery of packets at some stage in the migration process, the endpoint in the IPv6 sets a new locator directly to the route optimization mode.

a) The message MIGRATE, indicated that XIA Migration Protocol is a flow migration protocol. A notification device is also set to notify when there is a change in the locator. Further the migrate message consists of the new and the old location of the application we are considering, the sequence range of it and its public key. Also, it is checked at the receiver of the second application that the message which is receives is fresh or replayed. To check this, first the sequence number is taken into consideration. If the message is fresh, then the message is verified, if the verification fails, the message is discarded.

b) MGRTack is the acknowledgement indicating the confirmation in the structure of a receipt of the message that used to be sent, additionally it can be an echo of the message's sequence number and also the application B1's public key. [3]

7. CONCLUSION

Expressive internet architecture highlights three thoughts that can assist improve the IP's current design:

- Multiple principal types
- Intrinsic security
- Flexible addressing.

Keeping in mind the potentials of Expressive Internet Architecture, it still lacks in addressing the details on how to implement this architecture.

XIA's design is reasonably efficient; as no tunnels are used the complexity of the hand off procedure reduces.

8. REFERENCES

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