

A Vision of the Next Generation Internet: A Policy Oriented Perspective



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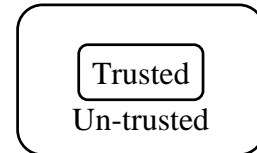


1. A New Architectural Perspective
2. Locators, Identifiers, Realms, and Zones
3. Policy Oriented Naming Architecture (PONA)
4. Benefits of PONA

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Key Problems with Current Internet

1. Designed for research
⇒ Trusted systems
Used for Commerce
⇒ Untrusted systems
2. Difficult to represent organizational, administrative hierarchies and relationships.
Perimeter based.
⇒ Difficult to enforce organizational policies



Problems (cont)

3. Identity and location in one (IP Address)
Makes mobility complex.
4. No representation for real end system: the human.



Our Proposed Solution: Internet 3.0

- ❑ Take the best of what is already known
 - Wireless Networks, Optical networks, ...
 - Transport systems: Airplane, automobile, ...
 - Communication: Wired Phone, Cellular nets,...
- ❑ Develop a consistent general purpose, evolvable architecture that can be customized by implementers, service providers, and users



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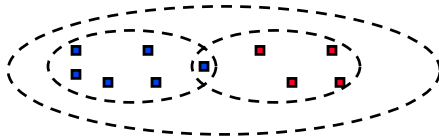
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Realms



- ❑ Object names and Ids are defined within a realm
- ❑ A realm is a **logical** grouping of objects under an administrative domain
- ❑ The Administrative domain may be based on Trust Relationships
- ❑ A realm represents an organization
 - Realm managers set policies for communications
 - Realm members can share services.
 - Objects are generally members of multiple realms
- ❑ Realm Boundaries: Organizational, Governmental, ISP, P2P,...

Realm = Administrative Group

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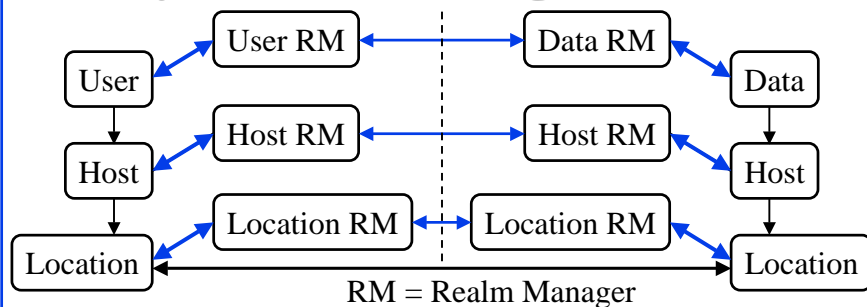
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User- Host- and Data Centric Models

- All discussion so far assumed host-centric communication
 - Host mobility and multihoming
 - Policies, services, and trust are related to hosts
- User Centric View:
 - Bob wants to watch a movie
 - Starts it on his media server
 - Continues on his iPod during commute to work
 - Movie exists on many servers
 - Bob may get it from different servers at different times or multiple servers at the same time
- Can we just give addresses to users and treat them as hosts?
 - No! ⇒ Policy Oriented Naming Architecture (PONA)



Policy Oriented Naming Architecture

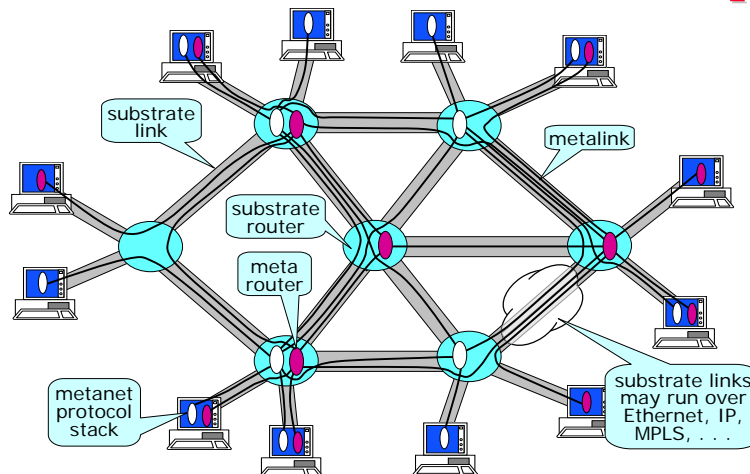


- Both Users and data need hosts for communication
- Data is easily replicable. All copies are equally good.
- Users, Hosts, Infrastructure, Data belong to different realms (organizations).
- Each object has to follow its organizational policies.

PONA (Cont)

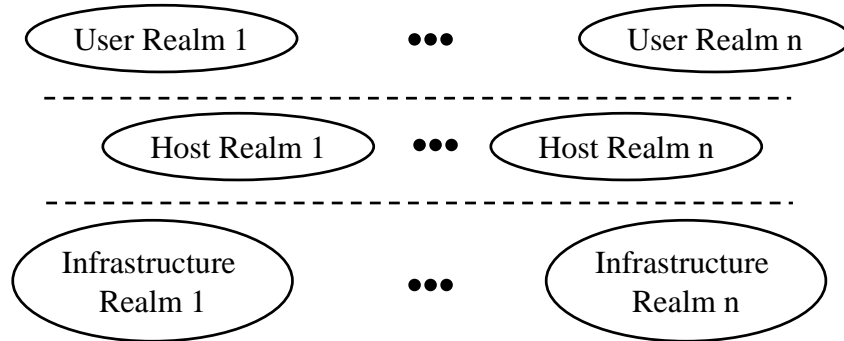
- ❑ User and data realms are higher level than host realms
- ❑ Most communication is user-data communication
- ❑ User, Host, and Data can move independently
 - Hosts move from one location to next
 - Users and data can move from one host to the next
- ❑ User ID \Rightarrow Host ID \Rightarrow Host Location = Address
- ❑ User realm managers provide User ID to Host ID translation
- ❑ Realm managers enforce organizational policies
- ❑ Realm managers setup trust relationships between organizations

Virtualizable Network Concept



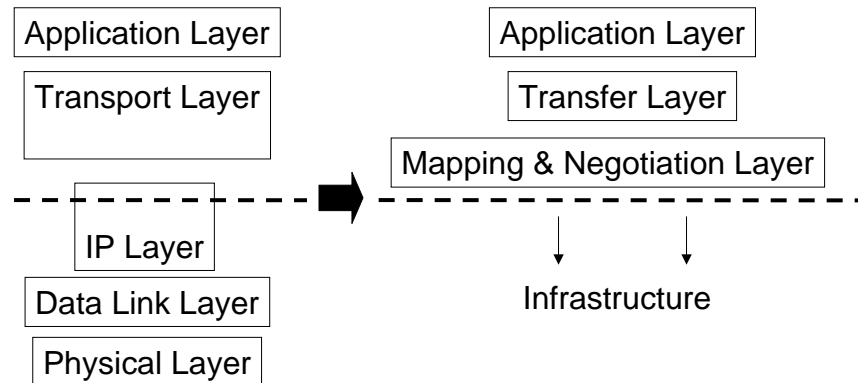
Ref: T. Anderson, L. Peterson, S. Shenker, J. Turner, "Overcoming the Internet Impasse through Virtualization," *Computer*, April 2005, pp. 34 – 41.

Realm Virtualization



- ❑ Old: Virtual networks on a common infrastructure
- ❑ New: Virtual user realms on virtual host realms on a group of infrastructure realms. 3-level hierarchy not 2-level. Multiple organizations at each level.

Protocol Stack

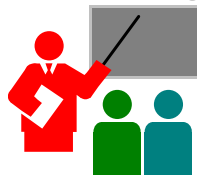


- ❑ M&N Layer provides id-locator split and policy enforcement

Benefits of PONA Architecture

- ❑ Enforcement of Organizational structure and Policies
 - Hosts/Users/Data/Network Infrastructure may belong to different organizations (realms)
 - Each organization can enforce its policies on its members
- ❑ Security: Policies for realm boundaries and between objects
- ❑ Mobility: Hosts/Users/Data can move indendently
- ❑ Representation of non-electronic end systems: Users and Data
- ❑ Multi-Layer virtualization

Summary



1. The next generation of Internet must be secure, allow mobility, and be energy efficient.
2. Must be designed for commerce
 - ⇒ Must represent multi-organizational structure and policies
3. Moving from host centric view to user-data centric view
 - ⇒ Important to represent users and data objects
4. Users, Hosts, and infrastructures belong to different realms (organizations). Users/data/hosts should be able to move freely without interrupting a network connection.

References

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References: Coming Soon

2. Jianli Pan, Subharthi Paul, Raj Jain, and Mic Bowman, “MILSA: A Mobility and Multihoming Supporting Identifier-Locator Split Architecture for Naming in the Next Generation Internet,” Globecom 2008, Nov 2008.
3. Subharthi Paul, Jianli Pan, Raj Jain and Mic Bowman, “A Survey of Naming Systems: Classification and Analysis of the Current Schemes Using a New Naming Reference Model,” to be submitted for publication, 2008.