Overview on Modeling and Simulation in DOSN & DOSN Current trends and Platforms

University of Cyprus

Introduction: Why DOSNs?

- **Privacy**: There is no central server holding the data.
  - The users can truly keep their privacy hosted on their **own** computers or on the nodes that they **trust**.
  - Users participate in a Social Network without being **censored** by a **central authority**.
- **Scalability**: DOSN scale easily as more nodes join the network either in a **P2P** network or in a **federation** of servers.

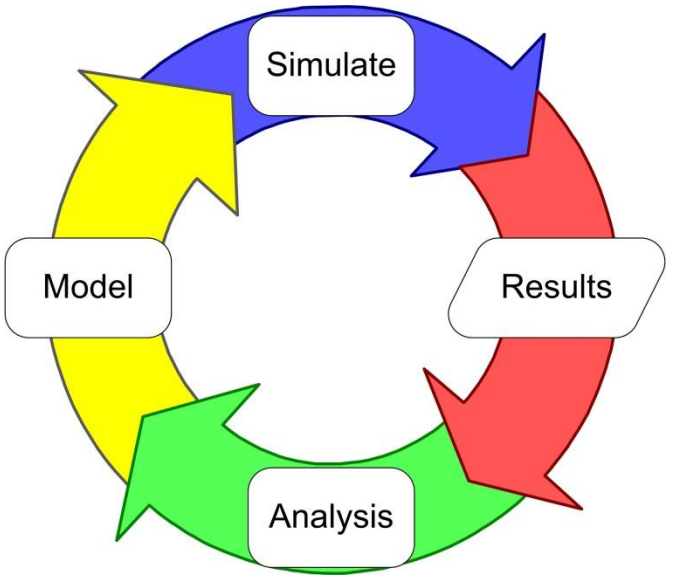
Roadmap

- **Overview on Modeling and Simulation in DOSNs**
  - **Modeling in DOSNs ←**
  - Simulation in DOSNs
  - Research
- DOSN Platforms: Current Status and Trends
  - Current Platforms
  - Protocols
  - Protocol Architecture
  - Limitations
  - Challenges
  - Research


Modeling and Simulation

Why modeling and simulation is important?

- After designing or developing a new approach
  - Evaluation:
    - Real-life environment and situations
    - Simulated real-life environments
- Modeling and simulation provides:
  - Simulation in real-life environment and results in a short period of time
  - The ability of investigating values that are difficult or impossible to use in real-life situations (Large-scale scenarios, Extreme values scenarios, etc.)

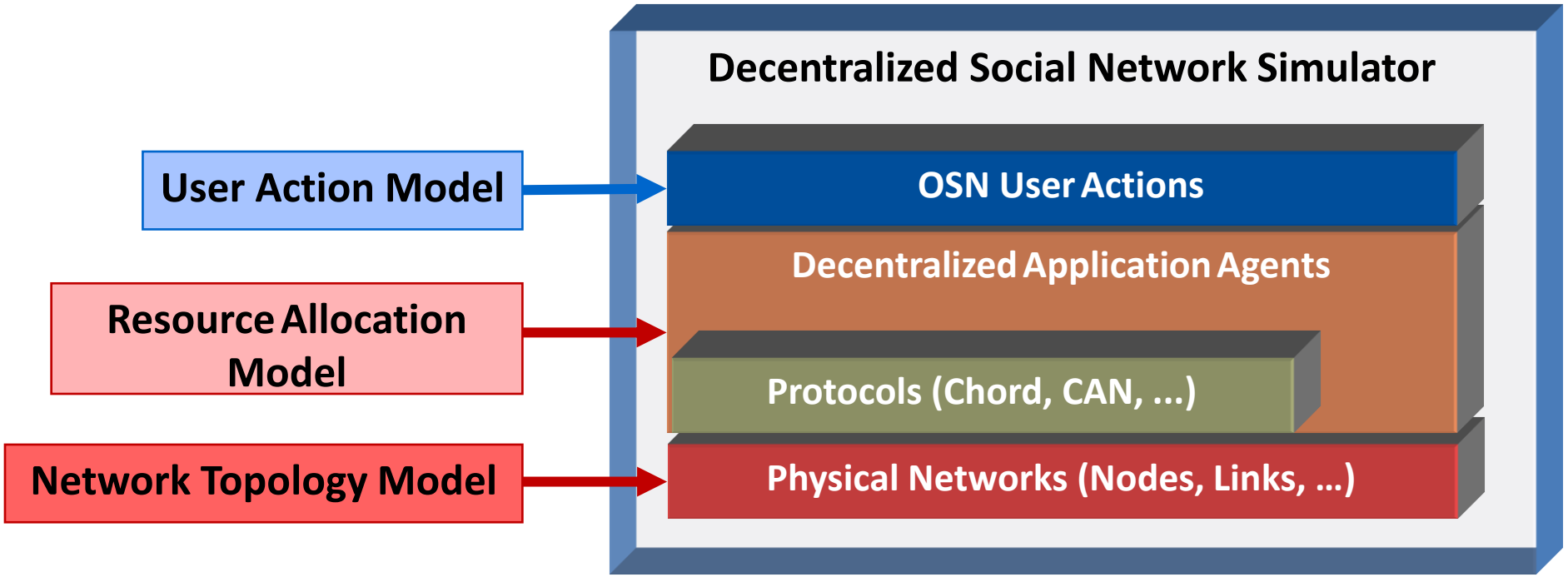


Modeling and Simulation in DOSNs

- Test new findings for robustness, speed, reliability, maintainability, etc.
- Provide evaluation based on different scenarios:
  - **User Actions**: Register, Connect, Publish, Search
  - **Resources:** Bandwidth limitations, Nodes hardware limitations
  - **Network topologies**: Different number of nodes, different types of nodes
  - **Combination of different scenarios**


Modeling in DOSNs

Goal: *Provide the simulator with real-life scenarios in order to achieve real-environment simulation.*



Modeling in DOSNs

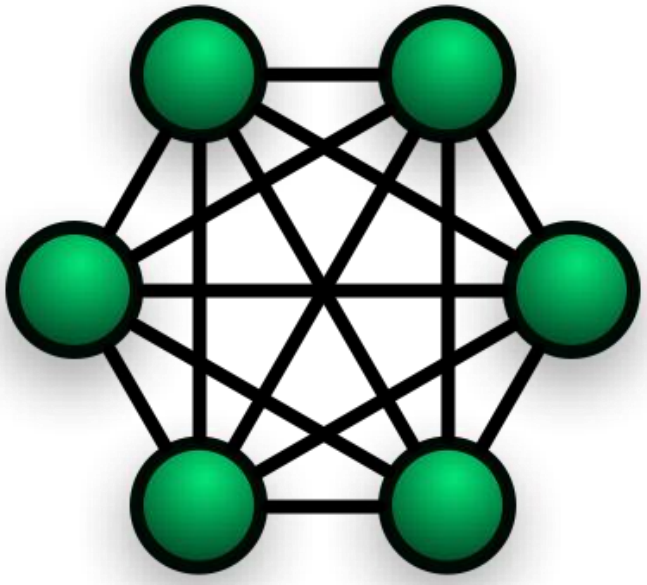
- **User Action Model:**
  - Models the actions of the user that will be simulated
  - A DOSN should be able to execute OSN user actions
  - Basic OSN user actions:
    - Account registration – Profile creation
    - Connection creation – Friendship
    - Messaging – Posting – Publishing
    - Search – Data retrieval

Modeling in DOSNs

- **Resource Allocation Model:** Provides configurations for the simulation
- Such as:
  - Bandwidth
  - Response speed
  - Data exchange limitations
  - Priorities
  - Resources limitations

Modeling in DOSNs

- **Network Topology Model:** Provides network related information
- Such as
  - Nodes topology
  - Type of nodes
  - Links between nodes
  - Network restrictions



Centralized VS DOSNs modeling

- Differences in Resource Allocation and Network Topology models
- Resource Allocation model
  - Based on the approach that data flows between the central service and the nodes
  - Based on more complex approaches, such as data flows via several and different types of hops before arrives at the destination
- Network Topology Model
  - Network nodes are connected with each other through a central service
  - The connection between nodes is based on different decentralization approaches like peer-to-peer, decentralized servers and hybrid
- User Action Model
  - A DOSN social network should support OSN users' actions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Simulators in DOSN

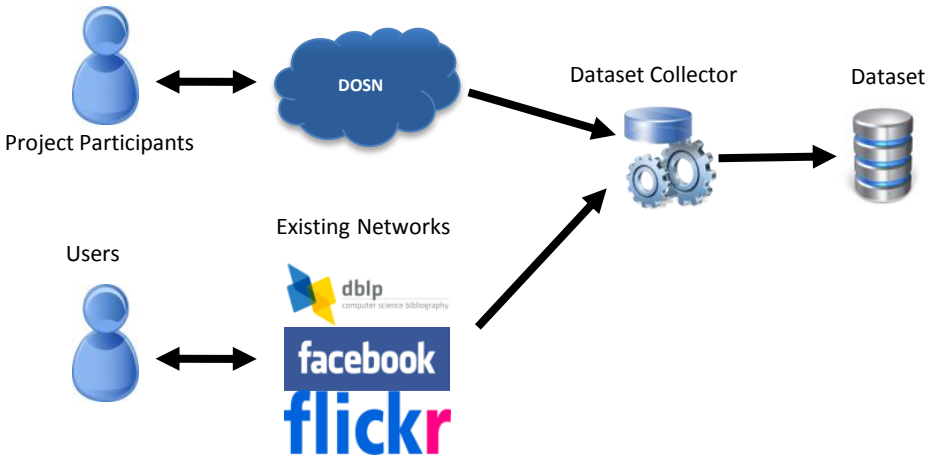
Simulator	Language	Status	Usability	Scalability
P2PSim	C++	Active	Poor documentation	3000 nodes
PeerSim	Java	Active	Poor documentation	1 million nodes
Narses	Java	Inactive	No documentation	600 nodes
FreePastry	Java	Active	Well documented + API	1000 nodes – extendable
PlanetSim	Java	Active	Well documented + API + Tutorials	300,000

- **Language**: Programming language used for the implementation
- **Status**: Project current status
- **Usability**: How easy is the simulator to learn and use? Does it provide an API?
- **Scalability**: How does the simulator scales regarding the amount of nodes?

Simulation in DOSN: Dataset Collection

- **Data from existing networks (DBLP co-authorship graph, Facebook, Flickr)**
  - Crawl data from a public dataset
  - Store data based on proposed model –architecture

- **Data from participants**
  - Attract a number of participants
  - Monitor the behavior of the model according to participants' interaction



Simulation in DOSN projects

DOSN	Dataset	Scope	Metrics
SuperNova	DBLP co-authorship Graph	Relation of online/offline time behavior to data availability	Data Availability + Reliability
eXO	Facebook + Flickr	Search and Data retrieval	Data Availability + Performance
PrPI	Own (Auto-generated users)	Queries performance (common-friends, friends' friends, friend's pictures, Top50 songs)	Response Time/Performance + Data Availability
Vis-a-Vis	Own (Auto-generated users)	Join, Update, Search operations according to nodes distribution	Response Time/Performance + Data Availability + Reliability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Research

- **Our Vision:**
  - How to design and develop a simulator that takes as input DOSN model(s) and provides insights and results about all possible metrics?
- **Research Questions:**
  - How to design and develop a modeling tool that takes as input the requirements for a DOSN and produces the corresponding models?
  - How to identify patterns between the values of different metrics and DOSNs functionalities?

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The Trendiest DOSNs!

Tent

***Partial connection to other OSN(e.g. Facebook)**

STATUS·net

***Project Fork**

node.js

pump.io

(e.g. identi.ca)

There are already DOSN platforms currently in production.

- **Diaspora** is currently leading in terms of users.
- **Tent** is a **protocol** and a **service** that aims to unify **Social Networking** services with **Cloud Storage**.
- **Friendica** is on of the few DOSNs that offers “some” support to **connect** to other **OSNs**.
- The **StatusNet** project was divided in a **LAMP** Stack as **GNUSocial** and as a new implementation in **node.js** under the name of **pump.io.**

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Other Trendy DOSNs…

- **Kune** focuses on **document collaboration.**
- **Jappix** is a French project that has seen some progress in **microblogging**.
- **Retroshare** is on the leading front regarding **desktop applications**, it also emphasizes privacy.
- **Lorea** has become the DOSN of choice for movements that were **censored** in other services.

cunity®

jappix

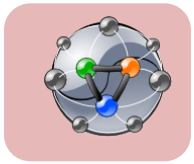
kune

*Document Collaboration

buddycloud

STATUS·NET

*Project Fork



*Desktop Peer-to-Peer

LAMP

gnusocial

LOREA.org

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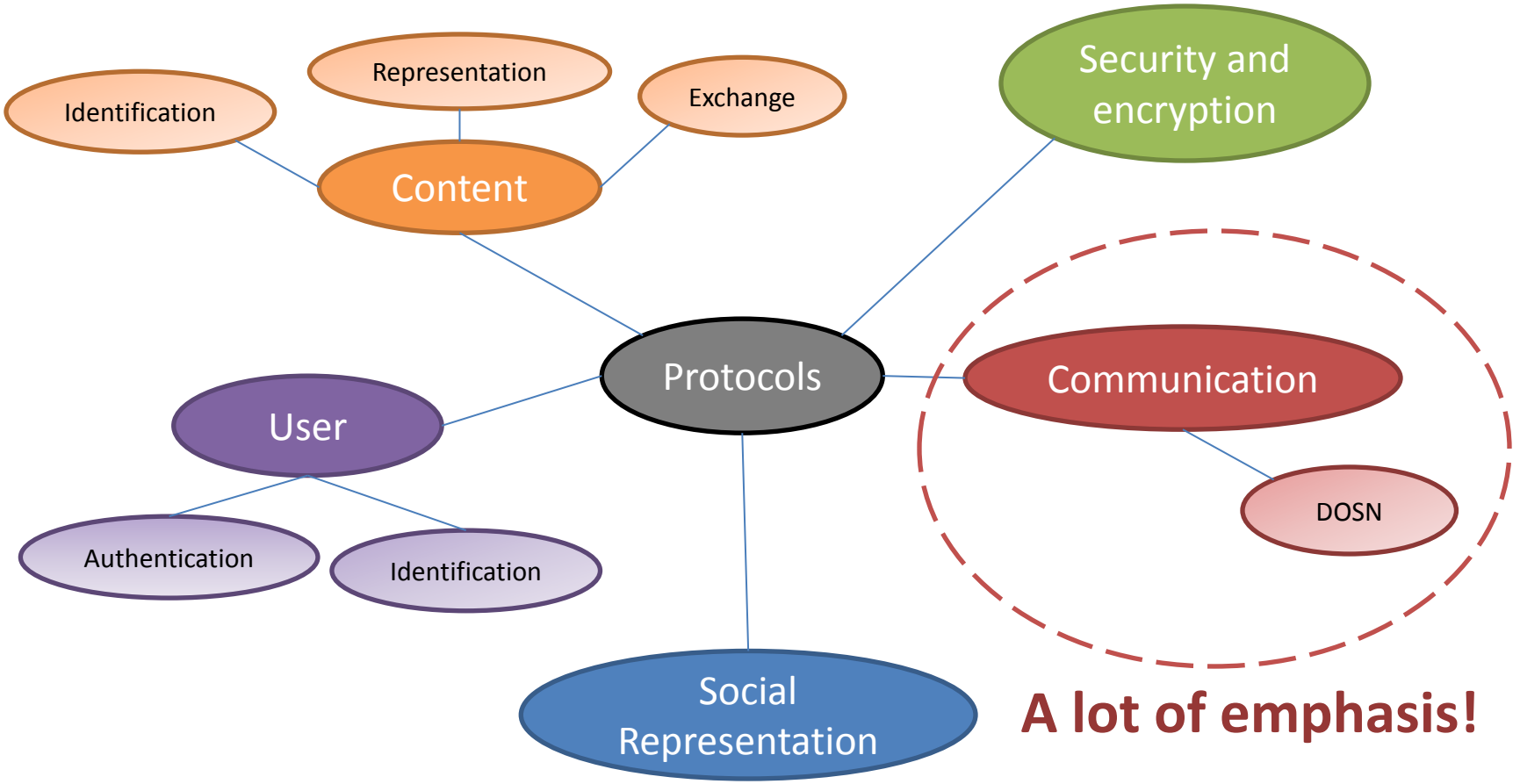
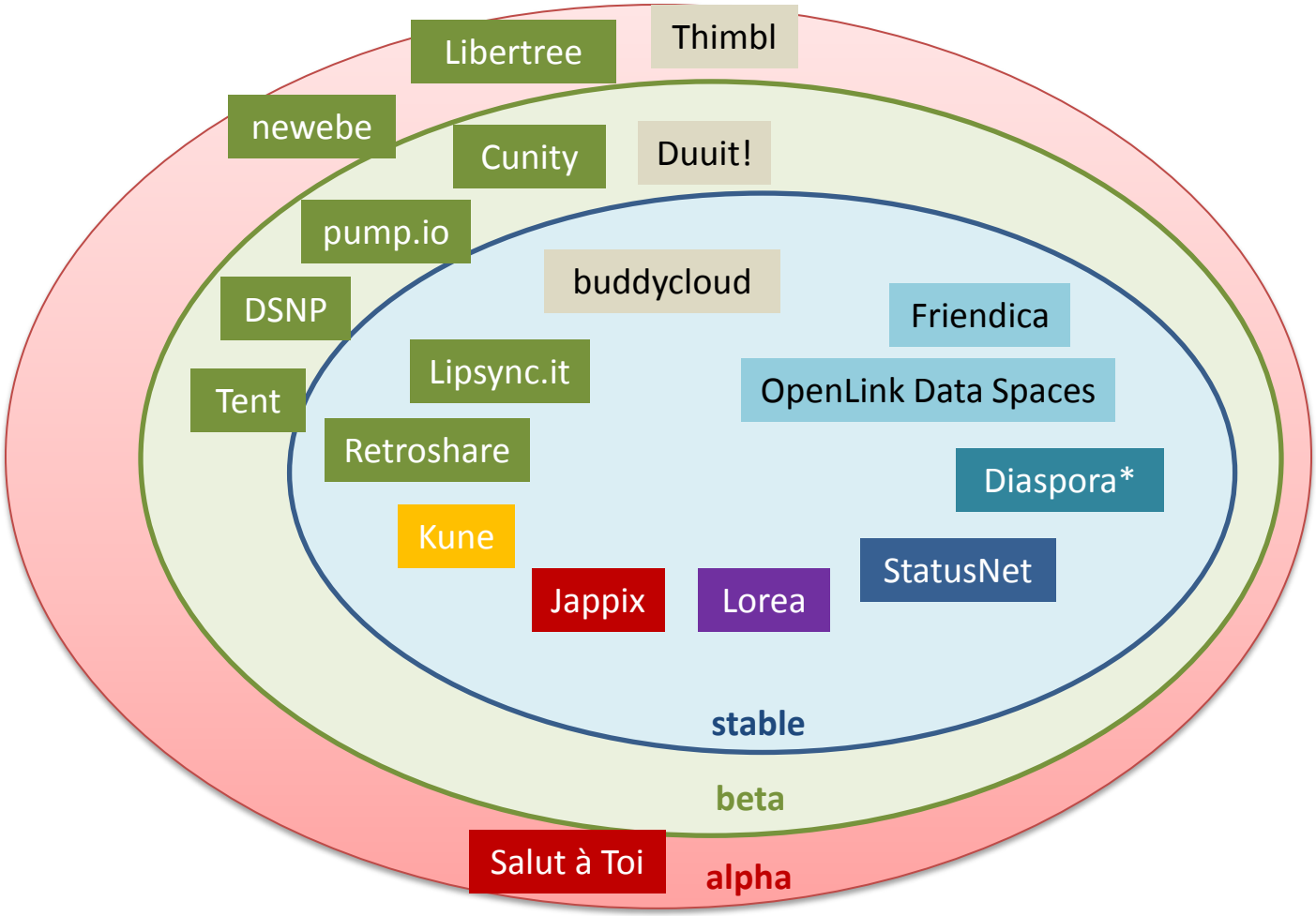
The Building Blocks of DOSNs: Protocols



Platforms by Protocols and Maturity

- XMPP
- XMPP + Others
- All
- XMPP + OStatus
- OStatus + Others
- Partial OStatus + Others
- OStatus
- Others



What is XMPP?

- The **Extensible Messaging and Presence Protocol (XMPP)** is an open technology for real-time communication, which powers a wide range of applications including **instant messaging**, presence, multi-party chat, voice and video calls, collaboration, **lightweight middleware**, content syndication, and generalized routing of **XML data**.

xmpp.org


What is Ostatus?

- **OStatus** is an open standard for distributed status updates that references a suite of open protocols including **Atom**, **Activity Streams**, **PubSubHubbub**, **Salmon**, **Webfinger**, that allows different messaging hubs to route status updates between users in **near real-time**.

Wikipedia

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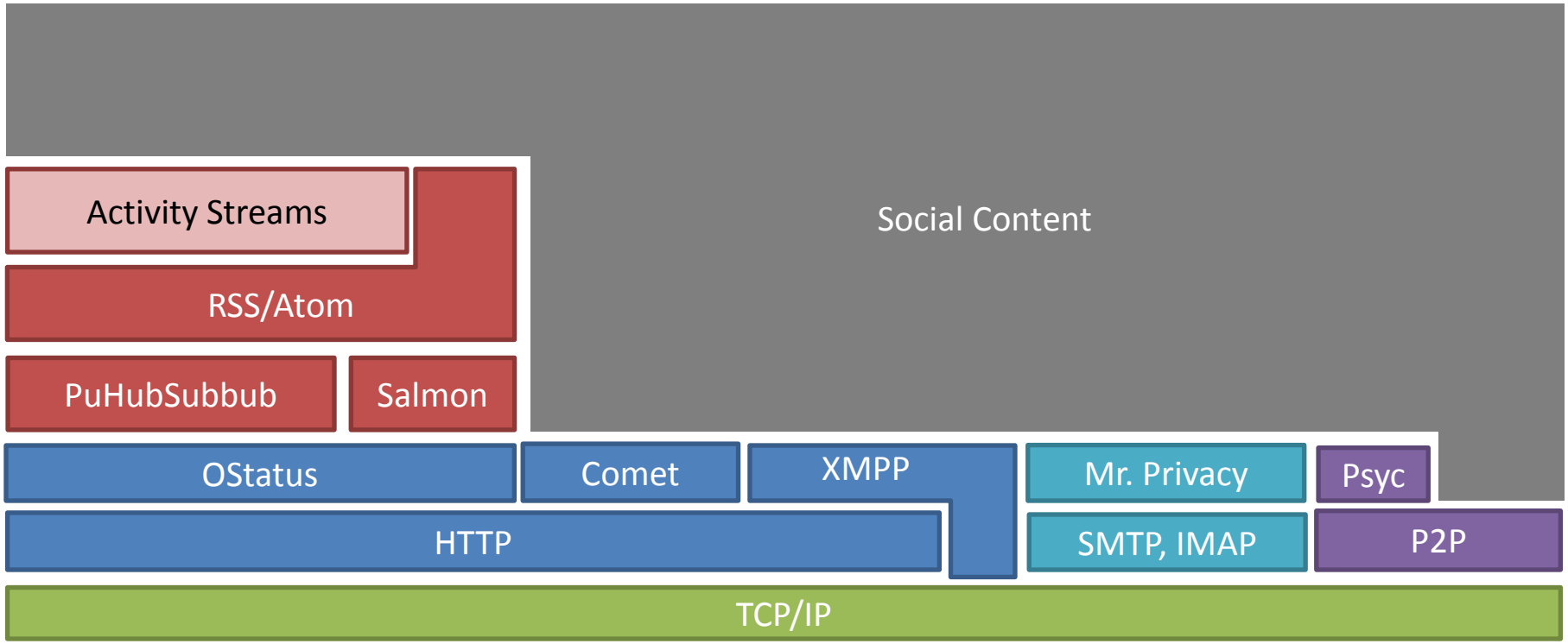
How do these protocols collaborate?



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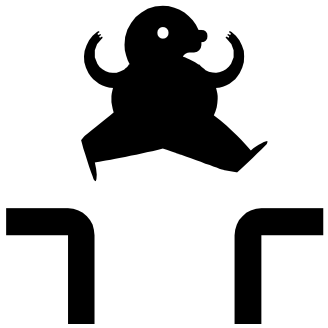
Limitations of Current DOSN Platforms



Tent

pump.io

Diaspora*

- Current **federated DOSN** (e.g. Diaspora*, Tent and Friendica) platforms have **not** been **widely** adopted mostly because the users require **technical skills** to install their own server. Otherwise they have to "**trust**" an administrator to host their profiles.

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Limitations of Current DOSN Platforms

- **Peer to Peer applications** (e.g. RetroShare) have **not** been **widely** adopted because the user **interface** is different from widely used OSNs (mostly Facebook and Twitter) and also because an **installation** process is **required**.

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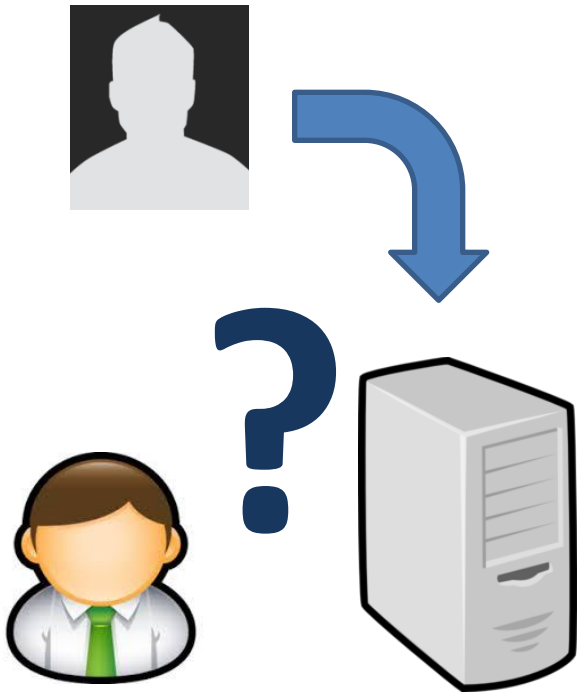
Challenges

- DOSN platforms **must** provide their **services** via a **web browser** and through well-defined **APIs** (for mobile applications).

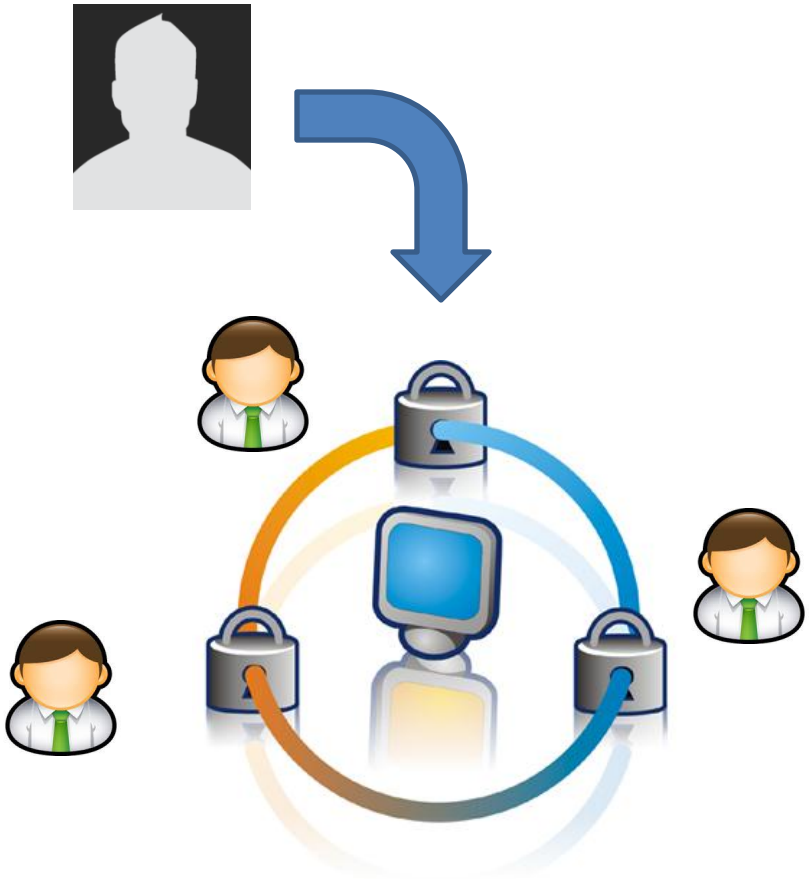
Challenges



- Users **should not** be required to **set up** their own **server** nor "**trust**" system administrators to host their profiles.

Challenges

- There **should be mechanisms** in place so that the users can **host** their profiles in **any** server without running the **risk** of having their **data compromised**.



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Research

After taking a look at the existing DOSN platforms and protocols, we spotted their limitations and elaborated on what challenges need to be addressed.

How to provide a user-friendly DOSN service that overcomes the limitations of the current platforms?

Conclusions

- There are modeling and simulation tools but none of them specializes on DOSNs.
- Currently there are DOSN platforms and protocols but they have considerable limitations.

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Questions?

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