Security, Privacy, Trust and Identity in the Future Internet and the "Cloud": a role for Self-Organization?

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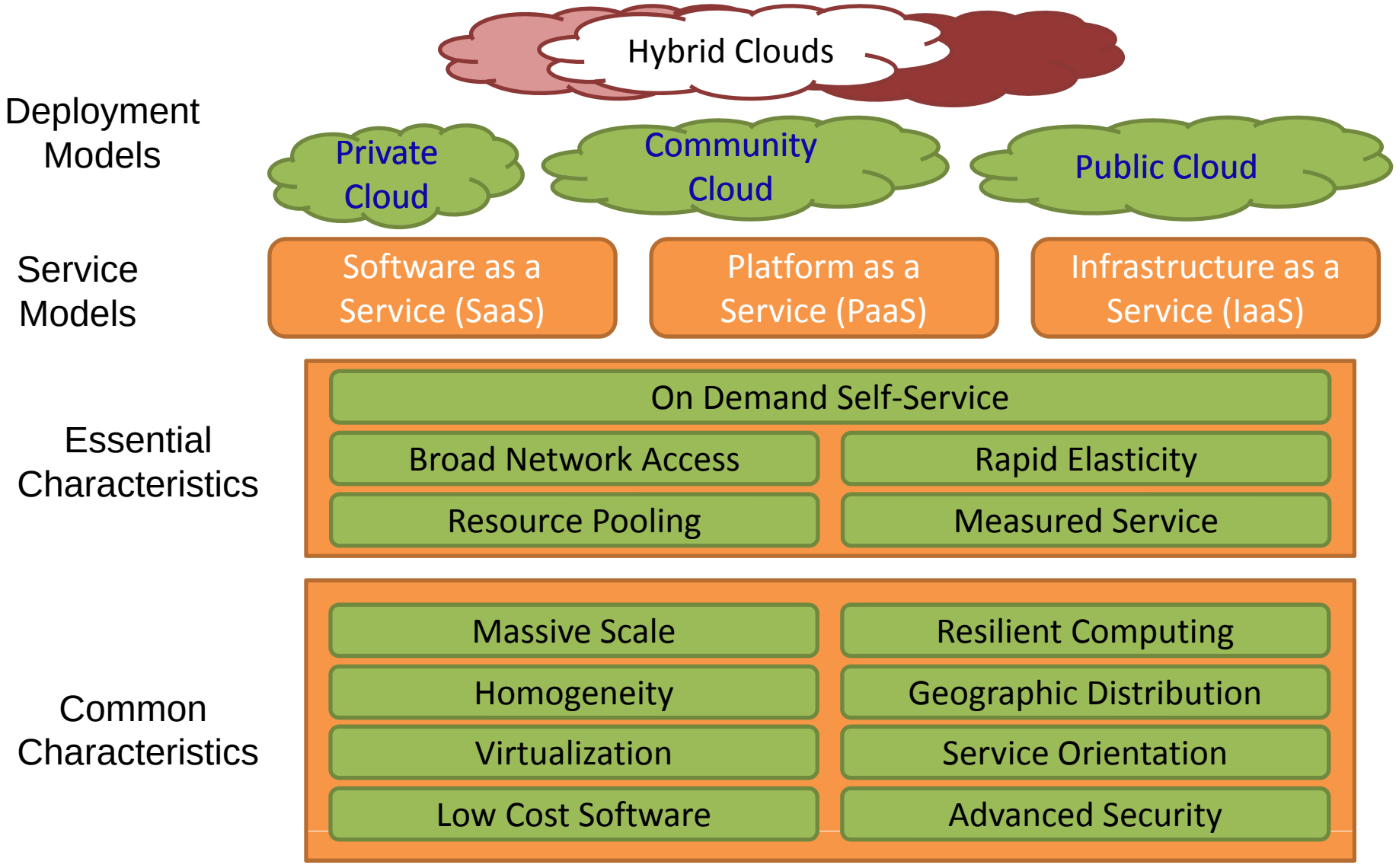
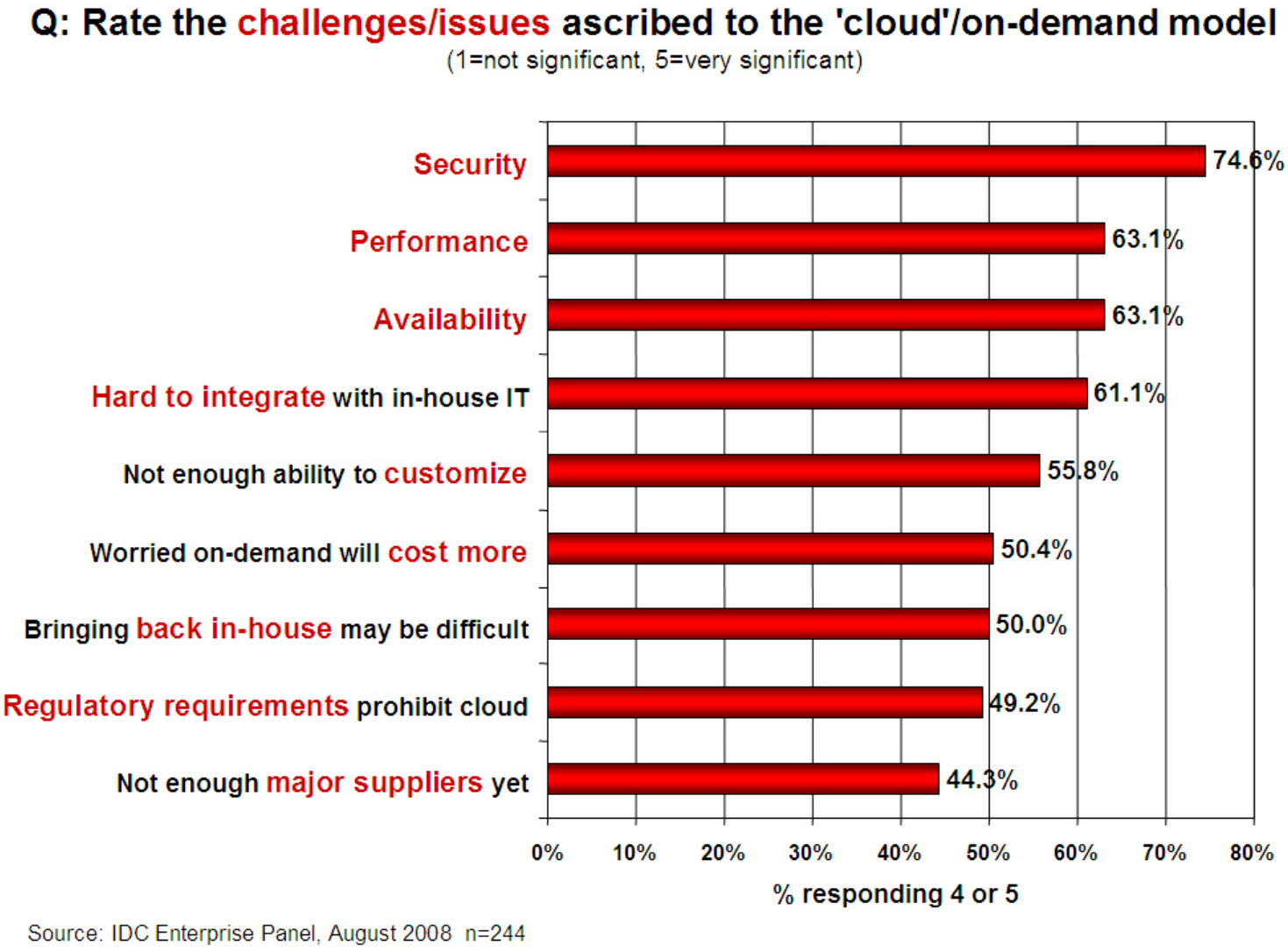
The Internet

The Cloud



Source: NIST - National Institute of Standards and Technology (USA)

Security in the Cloud is a Major Issue

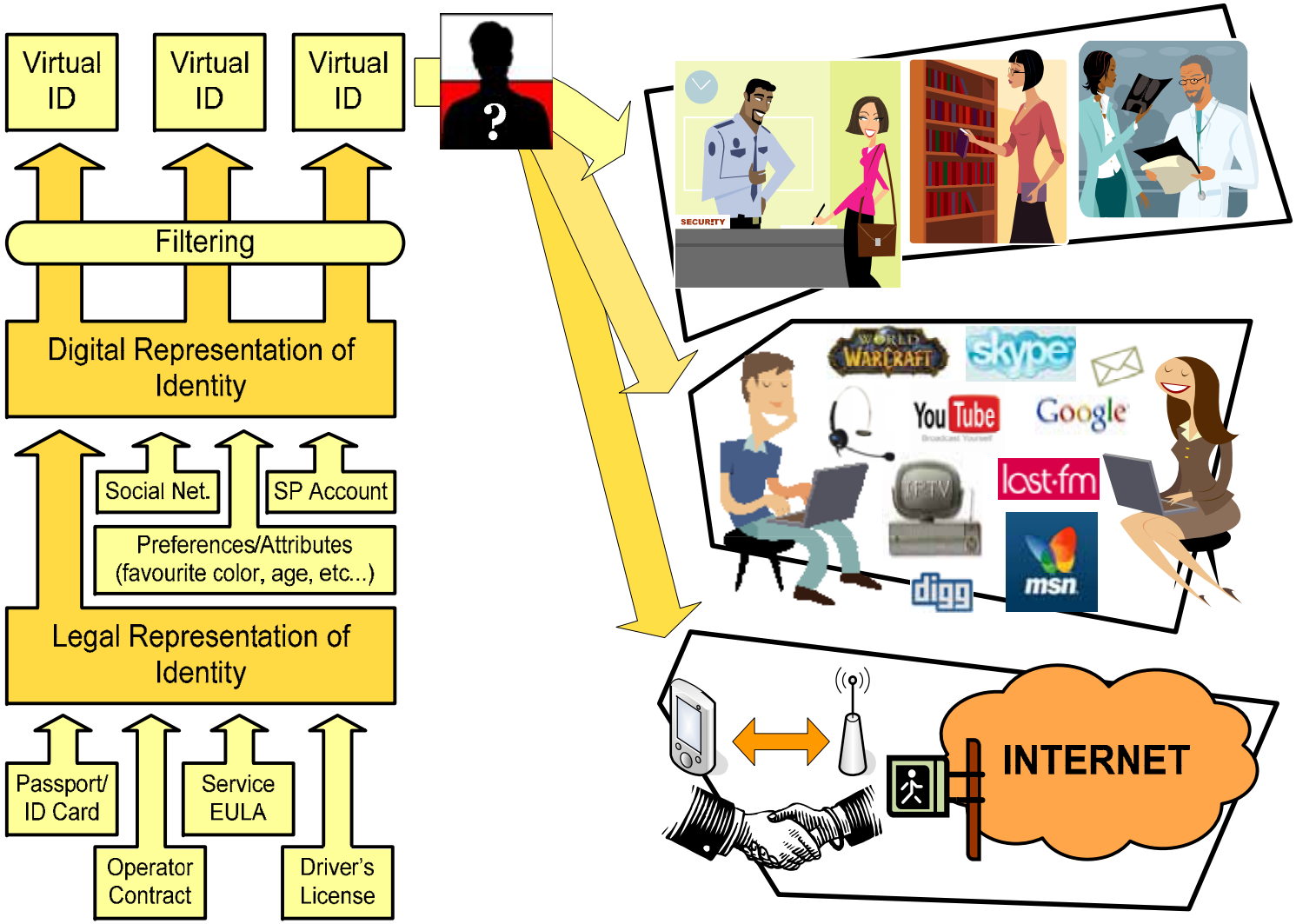


Source: IDC Enterprise Panel, August 2008 n=244

Improving Security, Privacy, Trust

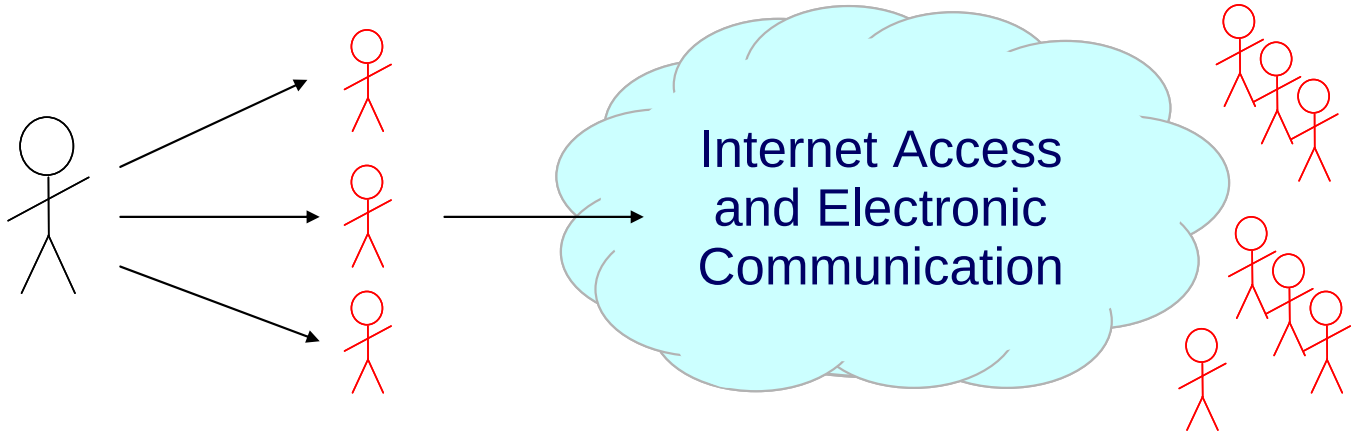
- Adding new components, rules and mechanisms into the Internet
  - Does global behaviour actually “improve” security etc.?
  - Can we use self-* or specifically self-organization to solve some of the issues

Identities and Virtual Identities



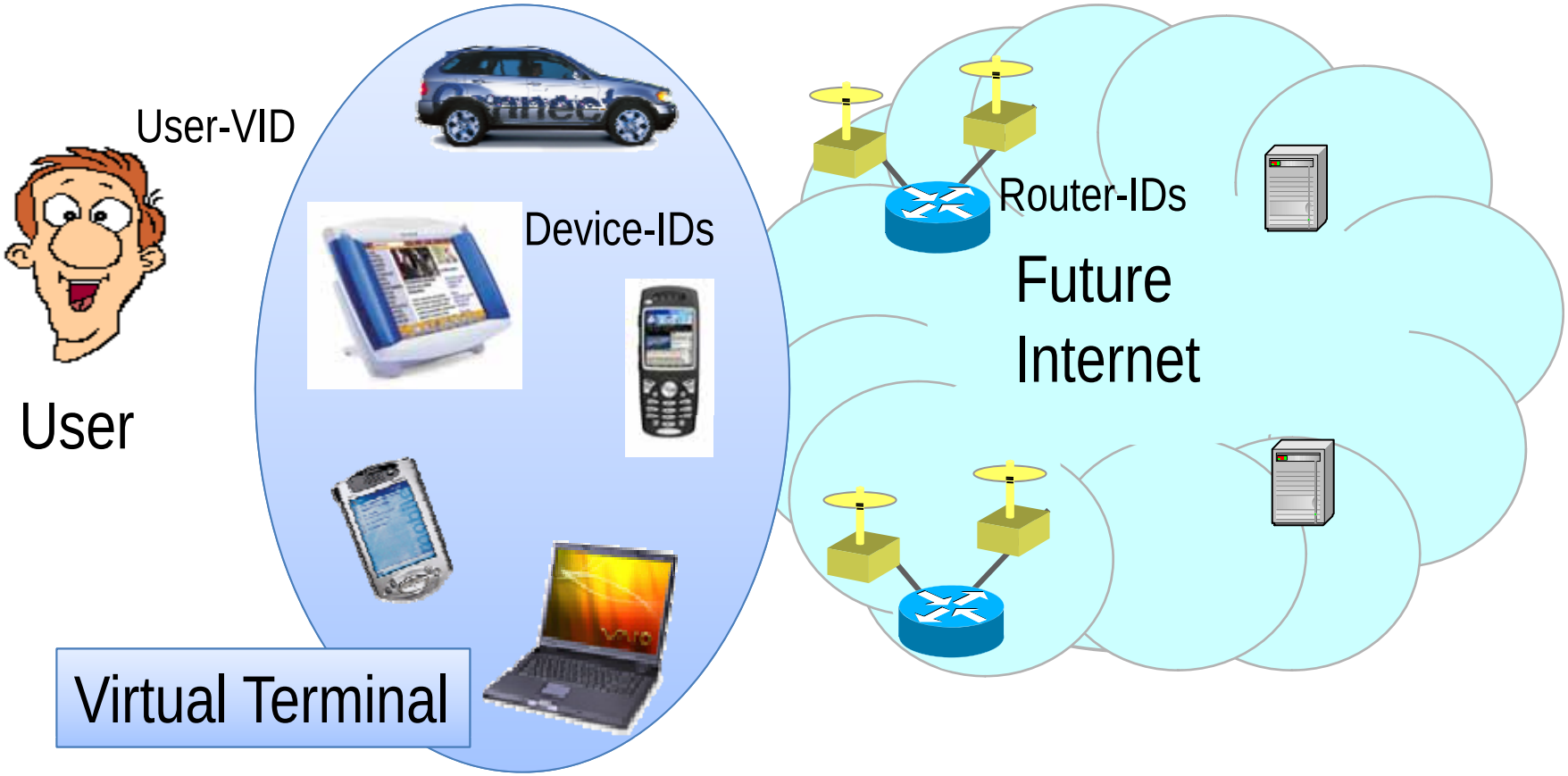
Virtual Identity for Privacy

- Virtual Identities supports privacy of the user



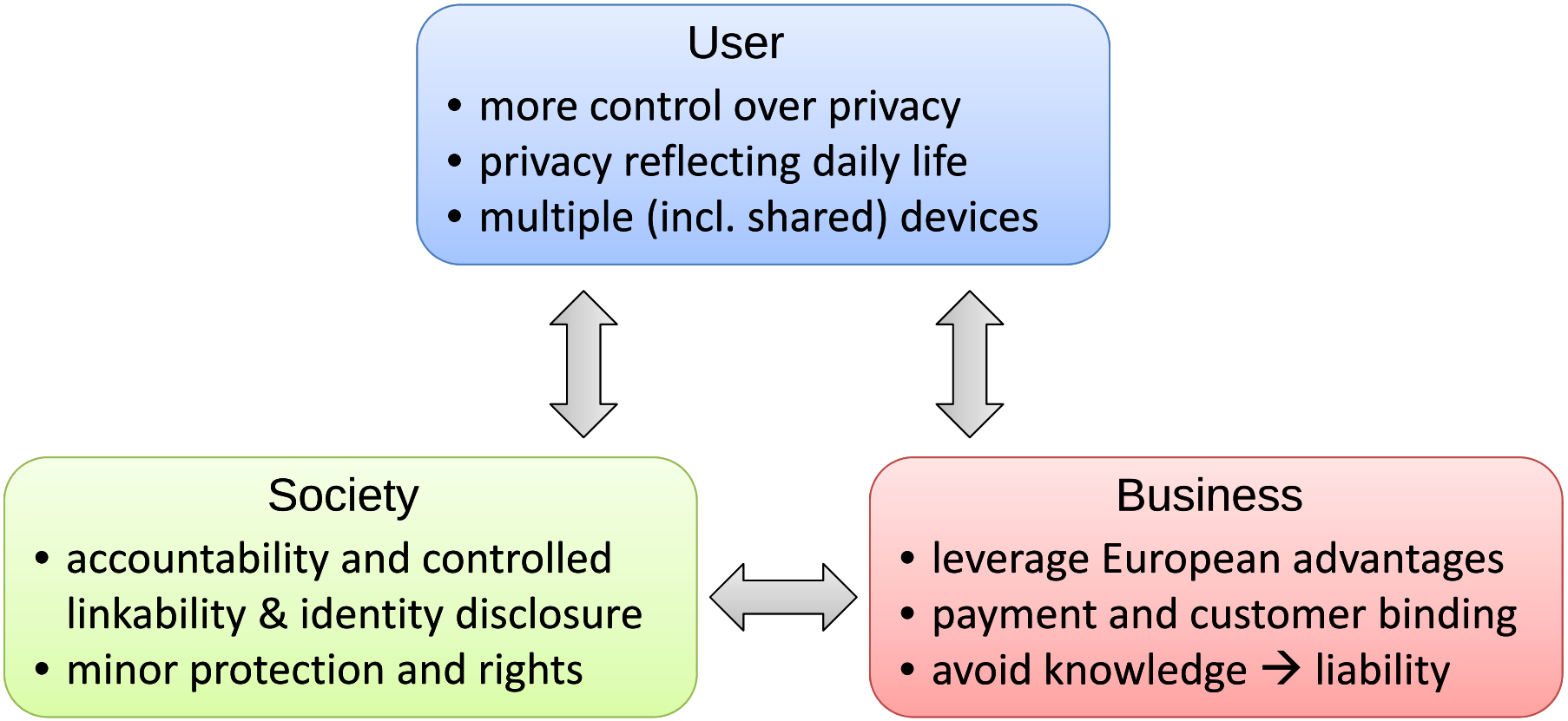
- Many “faces” for transactions to separate roles or for privacy reasons
- These “personalities” or “avatars” or Virtual Identities (VIDs) must be unlinkable despite shared attributes
- The user must control the policies on data (revealing)

Virtual Terminals in Heterogeneous Networks



- Create time limited ID links user – device
- Local knowledge for self-organising e.g. while moving sessions

Supporting needs of stakeholders



- How do we solve possibly conflicting requirements “on the fly”?
- Automatic distributed rule / policy combination
- Ensuring that such combination techniques learn and become better

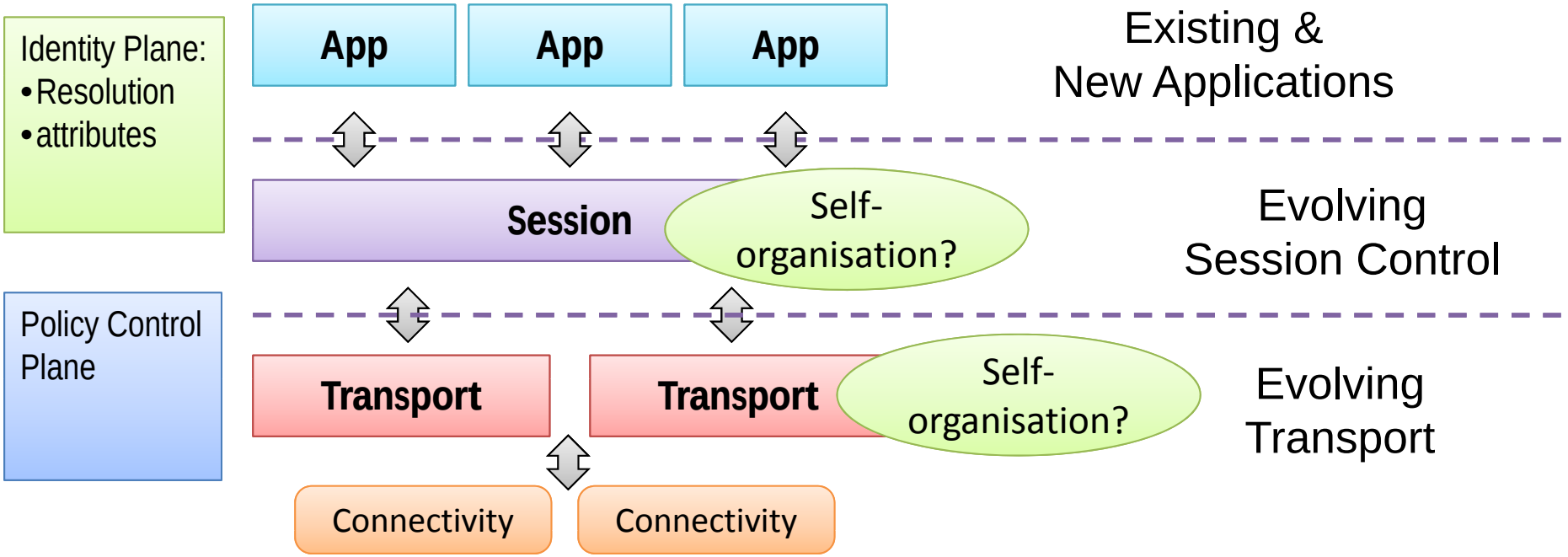
Distributed Policies for Access Control

- Users and other stakeholders define policies on how their data can be accessed
- At system level, these are defined in languages e.g. XACML
- Problem of locally combining policies from various sources
- The resulting global behaviour is not always predictable
  - Can we develop methods for this?
  - How relaible are they?
- How do we include principles of rewarding right behaviour and punishing the wrong ones?

State-of-the-art and Gaps

- A lot of things self-* already
  - But rules are historical and ad-hoc, not designed
- The outcome is not always what is desired
  - Privacy and security problems
  - Usability is problem → Intransparent to user
- Gaps and bridging them
  - Adapt rules or add new ones to SO system
    - Is there any way to predict even with uncertainity what the new steady state will be?
  - Change the rules without disrupting services
    - Any scope for prediction based knowing the changes?

Long-term Goal



- Identity, policy and transport aware session control
- Session, identity and policy aware transport
- Identity and policy can be locally mapped and policies applied to provide the conditions → dynamic, local information based self-organization