An Anti-Phishing mechanism for Single Sign-On based on QR-Code

Syamantak Mukhopadhyay
&
David Argles

School of Electronics & Computer Science
University of Southampton

Introduction

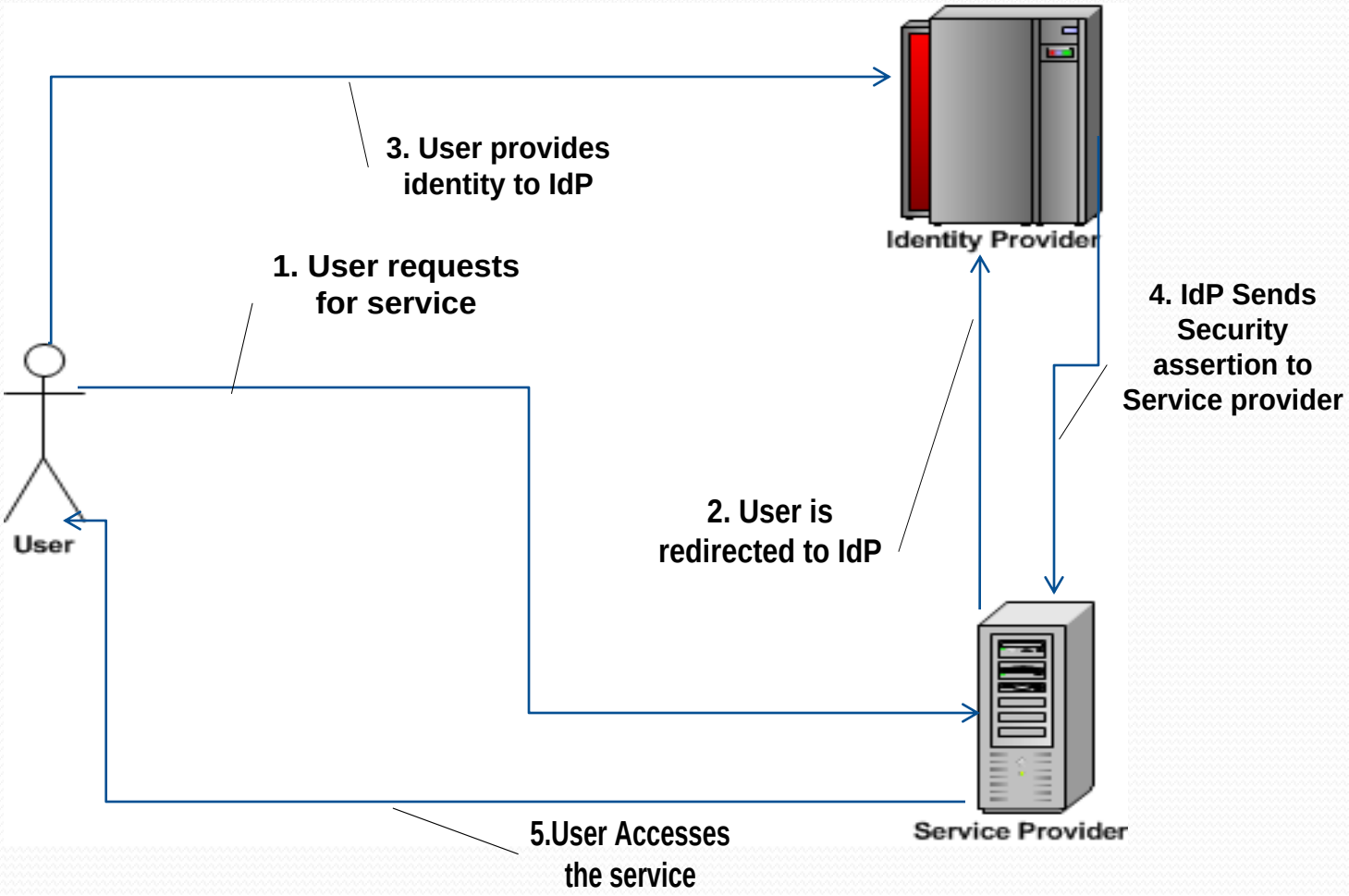
- Internet & Web 2.0
  - User-centric services
  - Services available Online.
  - Most services require username/password for authentication & authorization
    - Too many of them to remember(25 on an average)
      - Use same password !! -> Password fatigue
  - Single Sign-On to the rescue

Single Sign-On

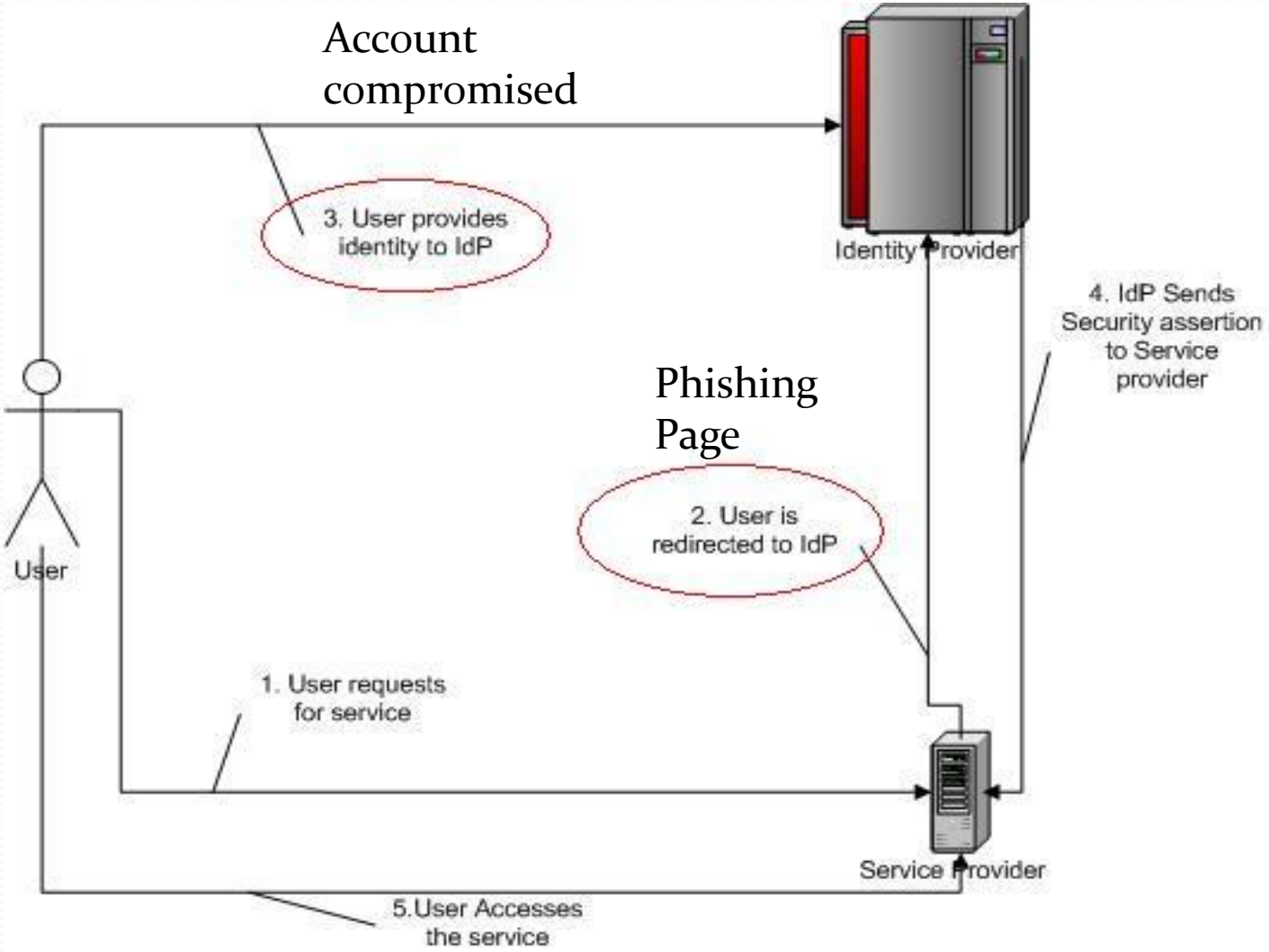
- One ring to rule them all !

- Shibboleth
  - Uses SAML
  - Best suited for portal or Intranet applications
- OpenID
  - User can chose his/her Identity provider
  - No pre-established contract required between Service Provider and Identity Provider
- Information Card & MS Cardspace
  - Different Identity sectors for different purposes.
  - Identity sectors are stored in client machine!!

Single Sign-On process



Phishing & Single Sign-On



Previous works on anti phishing

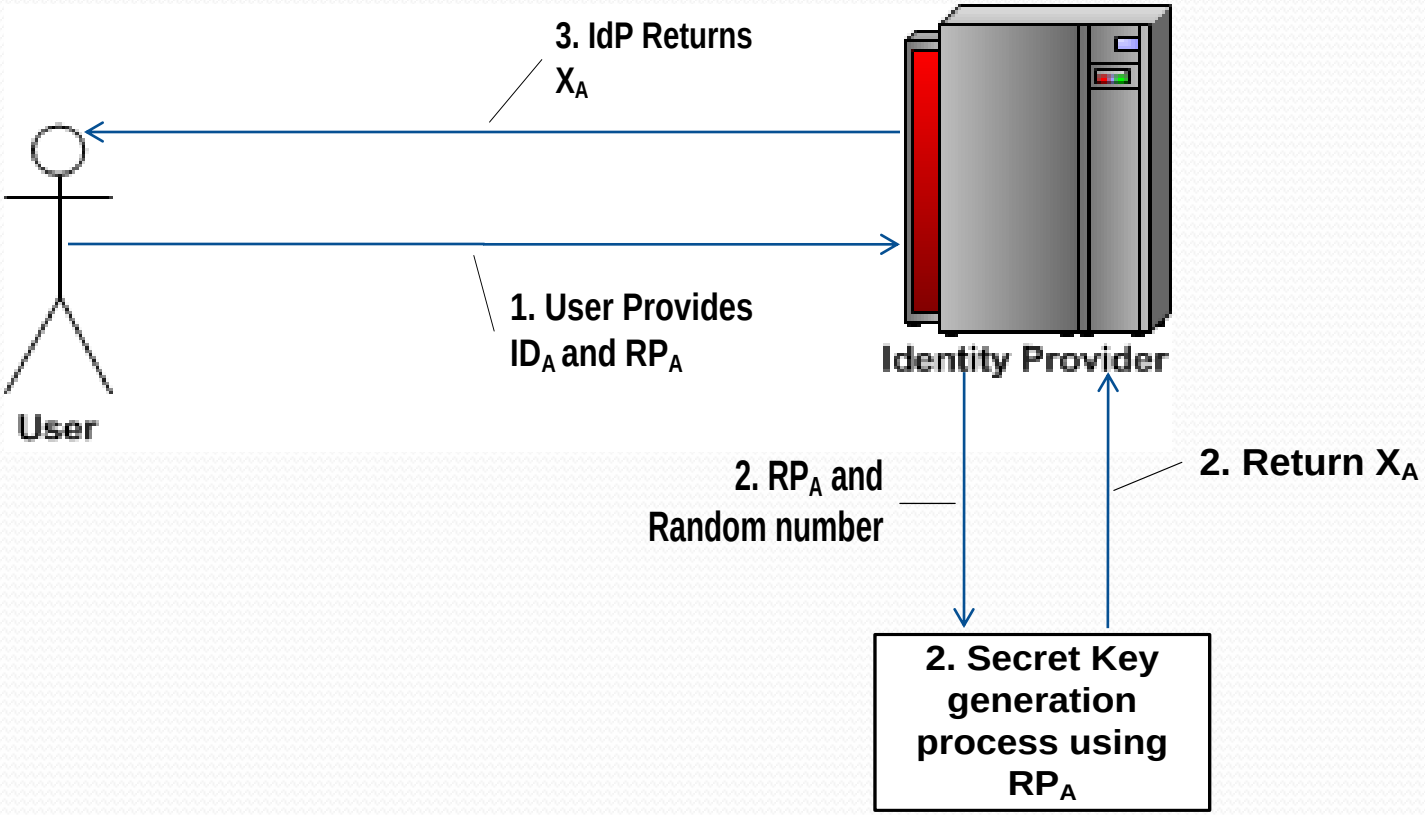
- Client side(Browser solutions)
  - Personal icon from myOpenID
  - VeriSign -Validation Certificate for IE7 and seatbelt for Firefox
- Use two passwords –Based on Kerberos
  - Show two phishing page instead of one!!
- Use mobile SIM in authentication
- For each login generate a token and send it to the user as email
  - breaks SSO, user needs to login to open email first -> Single Identity Sign On (SISO)
- Use I-PIN
  - Can't be implemented globally

Proposed Model

- Avoid passwords when accessing a service
  - Use QR-Code to generate one time password
- Based on the assumption that most internet users are equipped with a mobile device that has a camera.
- Uses two phase approach
  - User registration phase
  - User verification phase

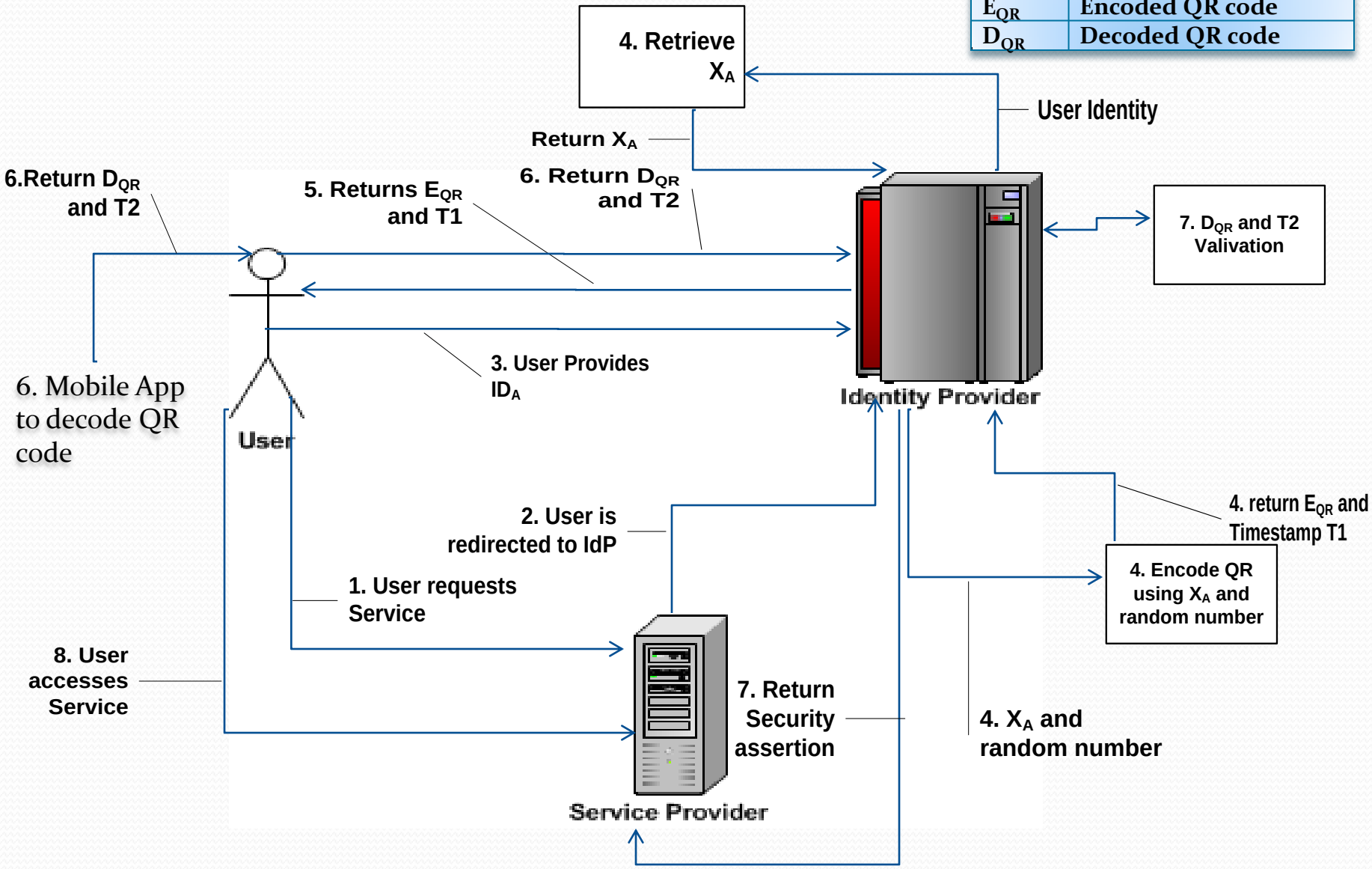
User Registration Phase

ID_A	Username or identity of the User
RP_A	Root password of the user
X_A	Secret key of the user
E_{QR}	Encoded QR code
D_{QR}	Decoded QR code

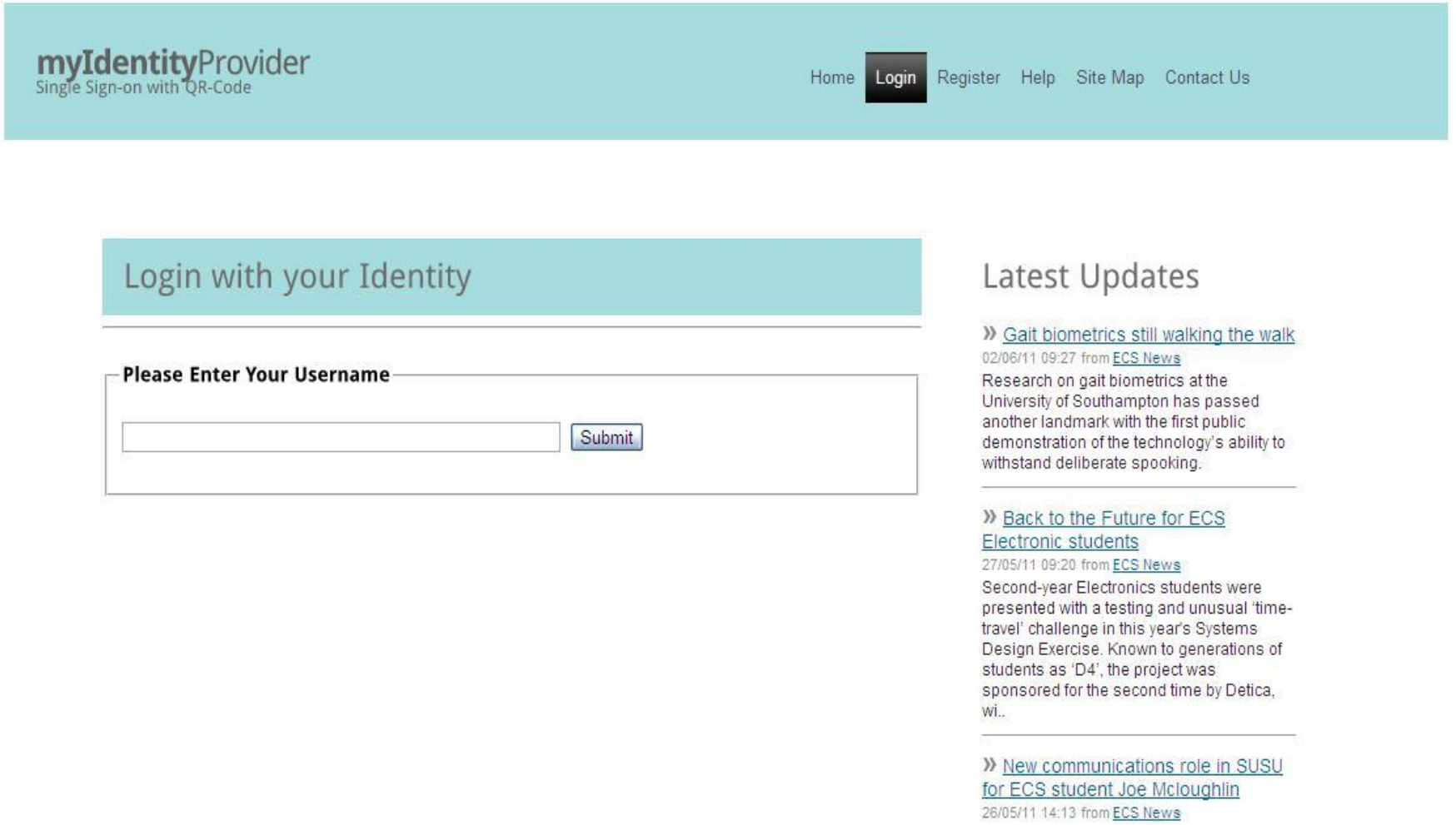


User Verification Phase

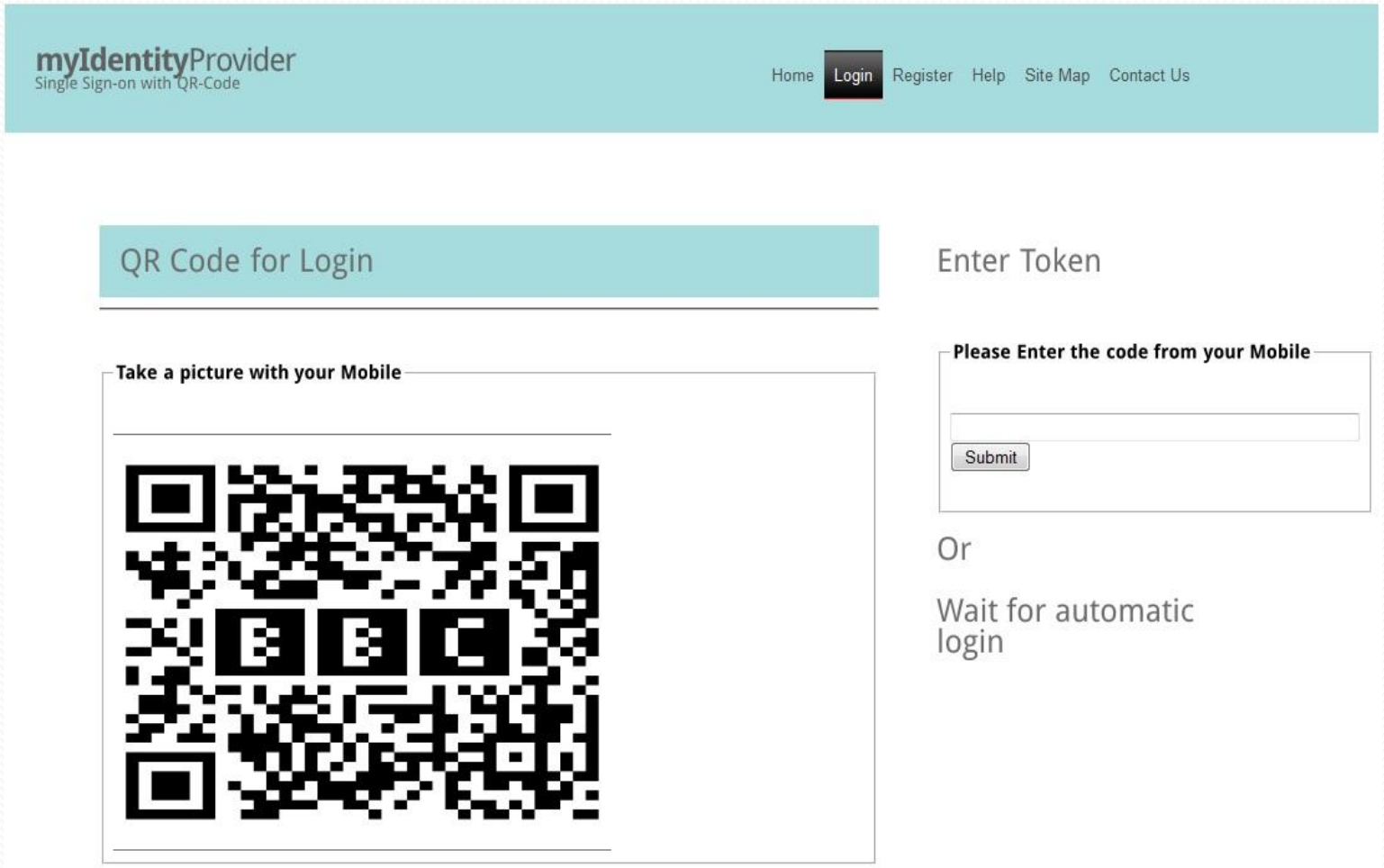
ID_A	Username or identity of the User
RP_A	Root password of the user
X_A	Secret key of the user
E_{QR}	Encoded QR code
D_{QR}	Decoded QR code



Proposed Model – User Interaction 1



Proposed Model – User Interaction 2



Proposed Model – User Perspective

User's Action

App()

- Decode the QR Code
- If web enabled mobile
  - Send the decoded value using https
- Else display the decoded value to be entered manually.
- Users logs in!

Image Source : http://www.revvedupwithduo.com/2011/03/15/are-customers-comparison-shopping-at-your-dealership-with-their-smartphones-hell-yea/qr-code-mobile/

Proposed Model – Key Points

- Generation of Secret key(X_A) is dynamic
  - X_A is compromised – generate again
    - Reset root password
- Does not introduce any new complications in user verification phase
- Simple and usable

Proposed Model - Security Analysis

- Phishing Attack
  - Root password in never disclosed during verification phase.
  - Secret key is generated from Root password using one way hash.
    - Hence Root password can't be derived from Secret key
  - If secret key is compromised, simply generate another one.

- Other attacks
  - QR-Code is generated using a random number
  - Decoded value uses Timestamp - accepted only within a small time limit
  - Fairly safe from both man in the middle attacks and replay attacks

Conclusion

- New SSO model with mobile QR code based onetime password schema
- Secure from phishing
- Prevents other attacks as well (replay & man in the middle)
- Simple from users perspective
- Can be substituted in any system that uses username/password

Thank You!

Questions ?