Title: USER AUTHENTICATION VIA MOBILE PHONE

Abstract: User Authentication. A mobile user authentication application is operable to perform one or more of the following operations: authenticate a user in a voice call to a telephony service by passing an authentication code to the telephony service within the voice call; validate a user instruction during a secure messaging session; and authenticate a user at a physical local service by obtaining a challenge code at that local service, validating the challenge code with a remote authentication service, obtain a confirmation code from the authentication service and presenting the confirmation code for validation at the local service.
Claims

1. A method of user authentication by means of a mobile device, the method comprising:
   a) generating a challenge code independently of any user authentication session;
   b) presenting the challenge code so as to be accessible to the mobile device;
   c) capturing the challenge code at the mobile device;
   d) sending a response code derived from the challenge code from the mobile device to an authentication service,
   e) validating the response code at the authentication service and sending a confirmation code to the mobile device if the response code is validated;
   f) outputting the confirmation code at the mobile device;
   g) capturing the confirmation code from the mobile device; and
   h) authenticating the user by means of the confirmation code.

2. The method of claim 1, wherein the confirmation code is derived from the response code.

3. The method of claim 1 or 2, wherein a plurality of mutually different challenge codes are generated and presented, and the mobile device captures a selected one of said challenge codes.

4. The method of any preceding claim, wherein the challenge code is indicative of a physical location at which the challenge code is presented.

5. The method of any preceding claim, wherein the challenge code is indicative of a time at which the challenge code is presented.

6. The method of any preceding claim, wherein the confirmation code is indicative of a location, and the user is not authenticated unless the confirmation code is captured at that location.

7. The method of any preceding claim, wherein the confirmation code is indicative of a time period, and the user is not authenticated unless the confirmation code is captured within that time period.
8. The method of any preceding claim, including sending a status message to the user after at least the step of sending the response code from the mobile device.

9. The method of claim 8, wherein the status message is sent to the user's mobile device.

10. The method of claim 8, wherein the status message is displayed at a location at which the challenge code is presented.

11. The method of any one of claims 8 to 10, including determining a priority level of the user, the status message being derived from the priority level.

12. The method of any one of claims 8 to 11, including determining service information for the user, the status message including the service information.

13. The method of any preceding claim, including authenticating a user input at the mobile device prior to sending the response code.

14. The method of claim 13, wherein the user input comprises a passcode, graphical input or biometric input.

15. The method of claim 13 or 14, wherein the user input is authenticated by the authentication service.

16. The method of any preceding claim, wherein the step of authenticating the user comprises validating the confirmation code with the authentication service.

17. The method of any preceding claim, wherein the step of authenticating the user includes validating user information.

18. The method of claim 17, wherein the user information is validated by the authentication service.

19. The method of any preceding claim, wherein the or each capturing step is performed by optically scanning a displayed machine-readable code.

20. The method of claim 19, wherein the machine-readable code comprises a two dimensional matrix code.

21. A method comprising at least steps c), d) and f) of any preceding claim, performed by the mobile device.
22. A method comprising at least steps b), g) and h) of any preceding claim, performed by a local service.

23. A method of user authentication by means of an application (la) on a mobile telephony device (1), the method comprising:
   a) registering the application (la) on the mobile telephony device (1) with a remote authentication service (4), to generate one or more cryptographic keys for secure communication between the mobile application (la) and the remote authentication service (4);
   b) authenticating (Sl.1, Sl.2, Sl.3) the user by interaction with the application (la), to receive a call identifier from the remote authentication service (4);
   c) initiating (S1.4) a telephone call to a remote telephony service (9), and after the call has been connected (Sl.5) to the remote telephony service (9),
   d) sending the call identifier within the telephone call to the remote telephony service (9), by means of which the user is authenticated (S1.6) to the remote telephony service (9).

24. The method of claim 23, wherein the step of registering includes storing data associated with the mobile application (la) by the remote authentication service (4).

25. The method of claim 23 or 24, wherein the one or more cryptographic keys are generated from a passcode entered by the user.

26. The method of any one of claims 23 to 25, wherein the user is further authenticated by verbal validation (Sl.7) within the telephone call.

27. The method of claim 26, wherein the verbal validation (Sl.7) comprises confirming data relating to the user.

28. The method of claim 27, wherein the data relating to the user is obtained from the remote authentication service.

29. The method of any one of claims 23 to 28, wherein the user is authenticated locally at the mobile telephony device (1) at step b).
30. The method of any preceding claim, including communicating a purpose of the telephone call from the mobile telephony device (1), and routing the telephone call by the telephony service according to the communicated purpose.

31. The method of claim 30, wherein the purpose is communicated by a telephone number called by the mobile telephony device (1).

32. The method of claim 30, wherein the purpose is communicated by the call identifier.

33. The method of any one of claims 23 to 32, wherein the call identifier is included as an audio signal within the telephone call.

34. A method of user authentication by an application on a mobile device, the method comprising:
   a) initiating a messaging session with a remote service;
   b) receiving an authentication request from the remote service within the messaging session;
   c) in response to the authentication request, authenticating the user by interaction with the user at the mobile device; and
   d) in response to authentication of the user, sending an authorization message to the remote service.

35. The method of claim 34, further including authenticating the user by interaction with the user at the mobile device before initiating the messaging session.

36. The method of claim 34 or 35, wherein the authentication request is received in response to an instruction message sent by the user within the messaging session.

37. The method of claim 36, wherein the authorisation message is derived from the instruction message.

38. The method of any one of claims 34 to 37, wherein the user is authenticated by means of a remote authorisation service.
39. A method substantially as herein described with reference to and/or as shown in Figure 3 of the accompanying drawings.

40. A method substantially as herein described with reference to and/or as shown in Figure 4, 4a and/or 4b of the accompanying drawings.

41. A computer program including program code means arranged to perform the method of any preceding claim, when executed by a suitably arranged processor or processors.

42. A computer program product comprising the computer program of claim 41.

43. Apparatus arranged to perform the method of any one of claims 1 to 42.

44. A system comprising:
   a) a mobile device running a mobile application; and
   b) a messaging service;
wherein the messaging service is arranged to request user authentication during a messaging session with the mobile application; and
the mobile application is arranged to authenticate the user in response to the request.

45. The system of claim 44, further including an authentication service remote from the mobile device and from the messaging service, wherein the mobile application is arranged to authenticate the user with the authentication service.

46. A system comprising:
   a) a mobile device running a mobile application; and
   b) a local service;
wherein the local service is arranged to present a challenge code;
wherein the mobile application is arranged to capture the challenge code, and to output a confirmation code in response to validation of the challenge code; and
wherein the local service is arranged to capture and validate the confirmation code.

47. The system of claim 46, further including an authentication service remote from the mobile device and from the local service, wherein the authentication service is
arranged to validate the challenge code and send the confirmation code to the mobile application, and wherein the local service is arranged to validate the confirmation code with the authentication service.