CLAIMS:

1. A smart padlock comprising:

a body, a shackle or a locking pin and a set of electric terminals; and

a housing that is removably connected to the body, with the housing comprising a set of electric contacts matching the set of electric terminals on the body, a circuit board, an electronic chip, an antenna dipole and a battery;

wherein, when a registered user operates a mobile device, an associated mobile application and an associated lock management software, and requests access to an area secured by the smart padlock, the lock management software captures a media access control (MAC) address of the mobile device and uses the MAC address to generate a softkey, so that after the softkey has been received by the antenna dipole, and the softkey is decrypted and authenticated inside the electronic chip, an output signal is sent to the set of electric terminals to unlock the smart padlock for a predetermined duration.

2. The smart padlock according to claim 1, wherein the electronic chip and antenna dipole are operable for near field NF communication, including Bluetooth.

3. The smart padlock according to claim 1, wherein the electronic chip and antenna dipole are operable for LPWA, LoRa, LTE-M or Sigfox communication.

4. The smart padlock according to claim 1, wherein the electronic chip and antenna dipole are operable for NB-IoT communication.

5. The smart padlock according to any one of claims 1-4, further comprising a touch sensor and/or a vibration sensor operable to wakeup the electronic chip from a sleep mode to an operational state or operable to send an alert upon detecting an intrusion.

6. The smart padlock according to claim 5, further comprising a fingerprint scanner to capture a fingerprint for authentication of a user or further comprising a camera.

7. The smart padlock according to any one of the preceding claims, wherein the housing is configured as a separable, standalone portable key, with the portable key being configured with a matching micro-port for supplying emergency power or for emergency operation of the smart padlock.

8. The smart padlock according to any one of claims 1-6, further comprising a micro-port for connection with an external power source for supplying emergency power.

9. The smart padlock according to any one of the preceding claims, further comprising a lock sensor that is operable to determine a state of locking.

10. The smart padlock according to any one of the preceding claims, wherein the lock management software is operable to capture a GPS location of the mobile device.

11. The smart padlock according to any one of the preceding claims is used for controlling access into a nested area.

12. The smart padlock according to any one of claims 1-11 is used for securing, tracking or locating goods or assets in a shipping container or a delivery truck or for securing, tracking and locating mobile assets, including bicycles or motorbikes.

13. The smart padlock according to claim 12 being modified and configured into a door lock for securing a control box that controls a public utility function.

14. A smart padlock operating system comprising:

a gateway;

a server and a database connected to the gateway;

a workstation at a command centre being connected to the server, with the workstation operating a lock management software;

a mobile device registered for communicating with the server and workstation via the gateway; and

a smart padlock according to any one of claims 1-13 being deployed in near field communication with the mobile device;

so that, when a user using the registered mobile device requests access to an area secured by the smart padlock, the lock management software captures a media access control (MAC) address of the mobile device and uses the MAC address to generate a softkey, and after the softkey is decrypted and authenticated inside the smart padlock, and

in response to positive authentication, a signal is outputted to unlock the smart padlock for a predetermined duration.

15. The system according to claim 14, wherein the gateway is an internet, a cellular or an LTE network.

16. The system according to claim 14, wherein the gateway is configured as a low-power (LP) gateway, which comprises a wide-area network (LPWAN), a long-range (LoRa) network, a LTE-M or a Sigfox network.

17. The system according to claim 16, further comprising a sensor or sensors located in the area secured by the smart padlock.

18. The system according to claim 17, further comprising a sense hub for connecting a plurality of smart padlocks or sensors at a site through the LP gateway.

19. The system according to claim 14, wherein the gateway is configured as a narrow-band IoT (NB-IoT) gateway.

20. The system according to claim 19, further comprising an IoT hub for connecting a plurality of smart padlocks or sensors at a site through the NB-IoT gateway.

21. The system according to any one of claims 14-20, wherein the lock management software allows an operator of the system to set different security access rights for different categories of users or users with different roles, with some users having privileged access rights.

22. The system according to any one of claims 14-21, wherein when the predetermined access duration has expired, the lock management software sends an alert to the user or the command centre for extending the access duration.

23. A smart padlock management software code for operating the lock system or lock/sensor system according to claims 14-22, wherein the code is recorded on a computer readable medium.

24. A method of securing, tracking and locating goods or an asset, the method comprising:

securing the goods or the asset located in a controlled access area or in a mobile enclosure using a smart padlock or a door lock configured according to any one of claims 1-13;

remotely generating a softkey for opening the smart padlock or the door lock from a lock management software, with the lock management software for capturing a media access control (MAC) address of the mobile device and using the MAC address to generate a softkey, sending the softkey to the smart padlock or the door lock via a gateway and allowing the smart padlock or the door lock to unlock for a predetermined duration after the softkey is decrypted in the smart padlock or the door lock and the user identity is authenticated;

tracking a state and time of unlocking of the smart padlock or the door lock; and

sending an alert to the user or a control station if the predetermined duration of unlocking has expired or if the smart padlock or the door lock is tampered with.

25. The method according to claim 24, wherein the goods or asset is tracked or located by using the GPS of the associated smart padlock, the door lock or the mobile device.

26. The method according to claim 24 or 25, wherein the gateway comprises one of the following or any combination of: IoT, LPWA, LoRa, LTE, LTE-M, Sigfox, internet and cellular network.