**Digital Financial Services Security Clinic** 

Addressing security risks to digital finance ecosystem

### Recommendations to mitigate SS7 and SIM swaps

**Arnold Kibuuka**Project Officer, ITU





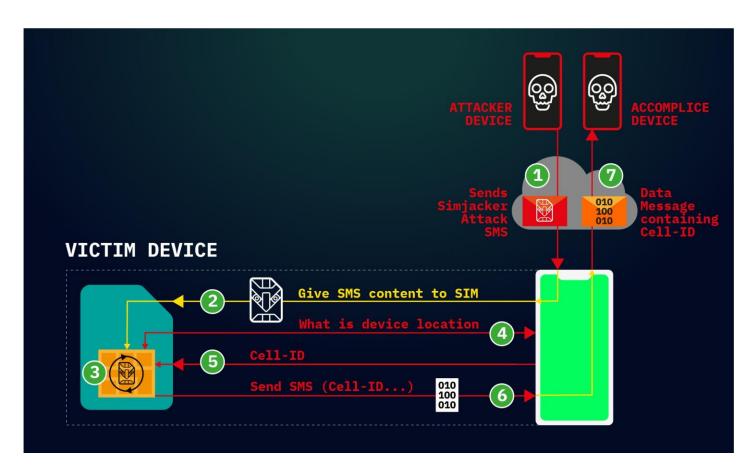
#### Recommendations

- 1. <u>Security recommendations to protect against DFS SIM related risks like SIM swap fraud and SIM recycling</u>
- 2. Recommendations to mitigate SS7 vulnerabilities
- 3. <u>Template for a Model MOU between a Telecommunications Regulator and Central Bank related to DFS Security</u>
- 4. Mobile Application Security Best practices

# Regulatory Guidance to mitigate SIM risks

#### **SIM** risks

- 1. SIM Cloning
- 2. SIM Swaps
- 3. SIM Recycling
- 4. Binary over the air attacks (Sim jacker and WIB browser attacks)

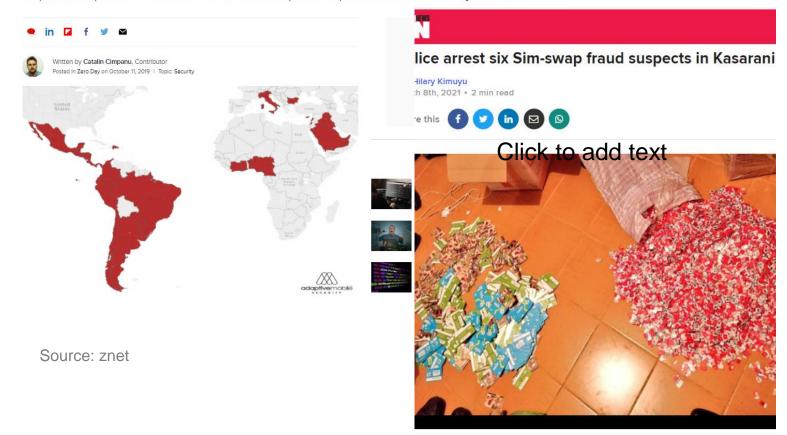


Source: adaptive mobile

#### **Examples of DFS attacks**

#### These are the 29 countries vulnerable to Simjacker attacks

Adaptive Mobile publishes the list of countries where mobile operators ship SIM cards vulnerable to Simjacker attacks.



Source: Nairobi News

- March 2021, Times Of India, <u>2 duped of</u> <u>Rs 82k in SIM swap fraud</u>
- March 2021, Nairobi News: Police arrest six Sim-swap fraud suspects in Kasarani
- The Daily Monitor: <u>Thieves use 2,000 SIM</u> cards to rob banks
- Ghana Chamber of Telecommunications:
   Mobile Money Fraudsters Now Target
   Bank Accounts Linked To MoMo
   Accounts
- February 2021, CNN: <u>Police arrest eight</u> <u>after celebrities hit by SIM-swapping</u> attacks

#### Regulatory Guidance to mitigate SIM risks

- a. Regulatory coordination between telco and DFS regulator on SIM vulnerabilities.
  - e.g. An MOU between the DFS regulator and Telco regulator
- b. Standardization by regulators of SIM swap rules amongst MNOs/MVNOs
  - including SIM swaps leading to porting of numbers to other MNOs/MVNOs
- c. Recommending security measures for MNOs on SIM risks.

#### Regulatory Guidance to mitigate SIM risks

- a. An MOU between the DFS and MNO that includes:
  - i. Areas of cooperation and cooperation strategies general provisions
  - ii. National Telecommunications Regulator Designated roles
    - Continuous controls monitoring of DFS entities
  - iii. Central Bank-designated roles

#### **MNO** controls on SIM swaps

- a. Where SIM replacement is carried out by proxy, the MNO/MVNO or its agents must capture a biometric, facial image of the proxy which must be kept for a specified period.
- b. MNOs should notify DFS providers on swapped SIMs, ported and recycled numbers.
- c. Biometric SIM swap verification
- d. Multifactor user validation before SIM swap
- e. Information sharing with DFS provider on SIM swaps and SIM recycling:
- f. SIM swap notifications to users
- g. Secure SIM data protection
- h. Holding time before activation of a swapped SIM
- Customer support representatives training

#### **DFS** operators controls to mitigate SIM swaps

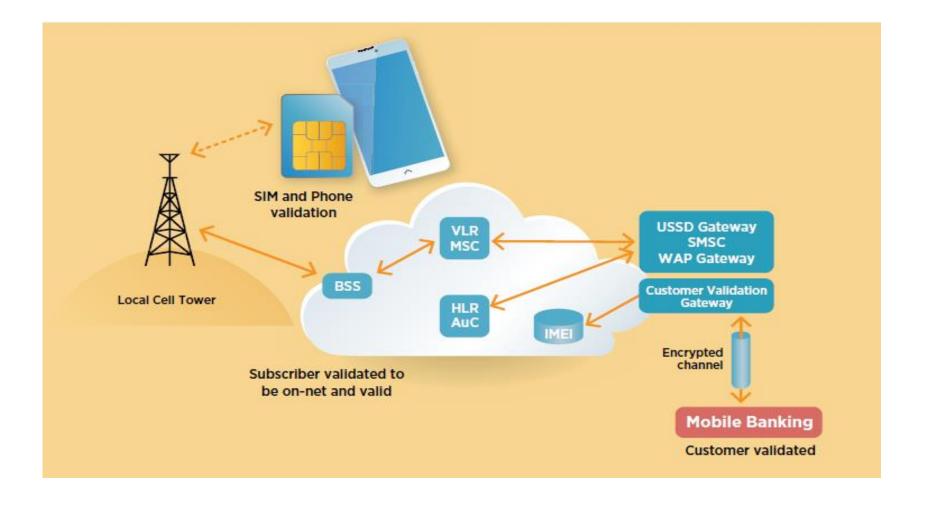
- Real time IMSI/ICCID detection
- Real time device change detection
- Encourage use of secure DFS access

## Guidance to mitigate SS7 threats

#### Regulatory Guidance to mitigate SS7 risks

- Regulatory coordination between telco and DFS regulator on SS7 vulnerabilities.
- Incentivize the industry
- Education for telecom and financial services regulators on SS7 vulnerabilities and impact to DFS
- Telecom regulators to establish baseline security measures for each SS7 risk category
- IMSI validation gateway

#### **IMSI** validation gateway



#### Recommendations for MNO to mitigate SS7 risks

- Secure GSM ciphers for radio network traffic
- Session time out
- USSD PIN masking
- Secure and monitor core network traffic
- Limit access to traces and logs
- SMS filtering
- SMS home routing

```
1 13:08:00.624000
                                       1841
                                                              8744
 Frame 1: 218 bytes on wire (1744 bits), 218 bytes captured (1744 bits)
> Ethernet II, Src: Private_01:01:01:01:01:01:01:01:01), Dst: MS-NL8-PhysSer
 Internet Protocol Version 4, Src: 1.1.1.1, Dst: 2.2.2.2
> Stream Control Transmission Protocol, Src Port: 2984 (2984), Dst Port: 2984
  MTP 2 User Adaptation Layer
  Message Transfer Part Level 3
> Signalling Connection Control Part
  Transaction Capabilities Application Part
GSM Mobile Application

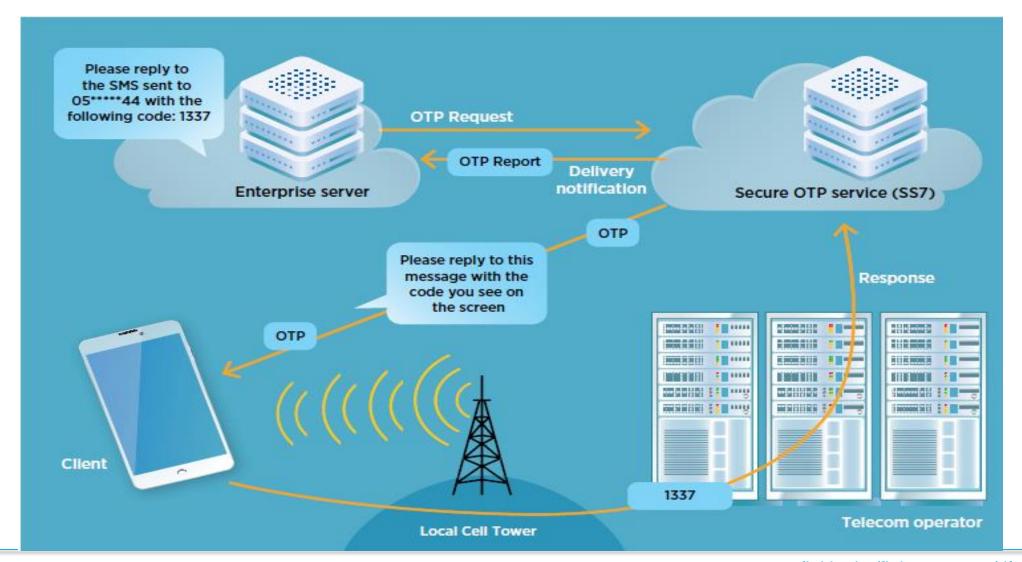
∨ Component: invoke (1)

     v invoke
          invokeID: 1
       > opCode: localValue (0)
         ussd-DataCodingScheme: 0f
       ussd-String: aa180da682dd6c31192d36bbdd46
             USSD String: *140*0761241377#
       msisdn: 917267415827f2
             1... - Extension: No Extension
             .881 .... * Nature of number: International Number (8x1)
             .... 8001 = Number plan: ISDN/Telephony Numbering (Rec ITU-T E.1
          E.164 number (MSISDN): 27761485722
               Country Code: South Africa (Republic of) (27)
```

#### DFS operator controls to mitigate SS7 risks

- Session time out
- Transaction limits for insecure channels
- User education
- Detecting and mitigating social engineering attacks with MT-USSD and interception of USSD
- Bidirectional OTP SMS flow

#### **Bidirectional OTP SMS flow**





### Questions



Contact: dfssecuritylab@itu.int

https://figi.itu.int/figi-resources/dfs-security-lab/

