FHSS

Elmer Huitz
Allen Guerra
Johann Hoare

What is it?

- *frequency-hopping spread spectrum (FHSS)*
- communication scheme between a transmitter and a receiver
- Involves spread spectrum modulation and switching frequency according to a known standard

- FHSS is a very robust technology, with little influence from noises, reflections, other radio stations or other environment factors
- multiple networks can operate in close proximity without interfering

How is it affected by noise?

- **Narrow band interference** – A narrow band interference signal present on a specific frequency, will block only one hop. The FHSS receiver will not be able to operate at that specific hop, but after hopping to a different frequency, the narrow filter will reject the interfering signal, and the hopper will execute reception without being disturbed

- **Multipath interference** – the receiver receives multiple copies of the original signal due to reflective surfaces.

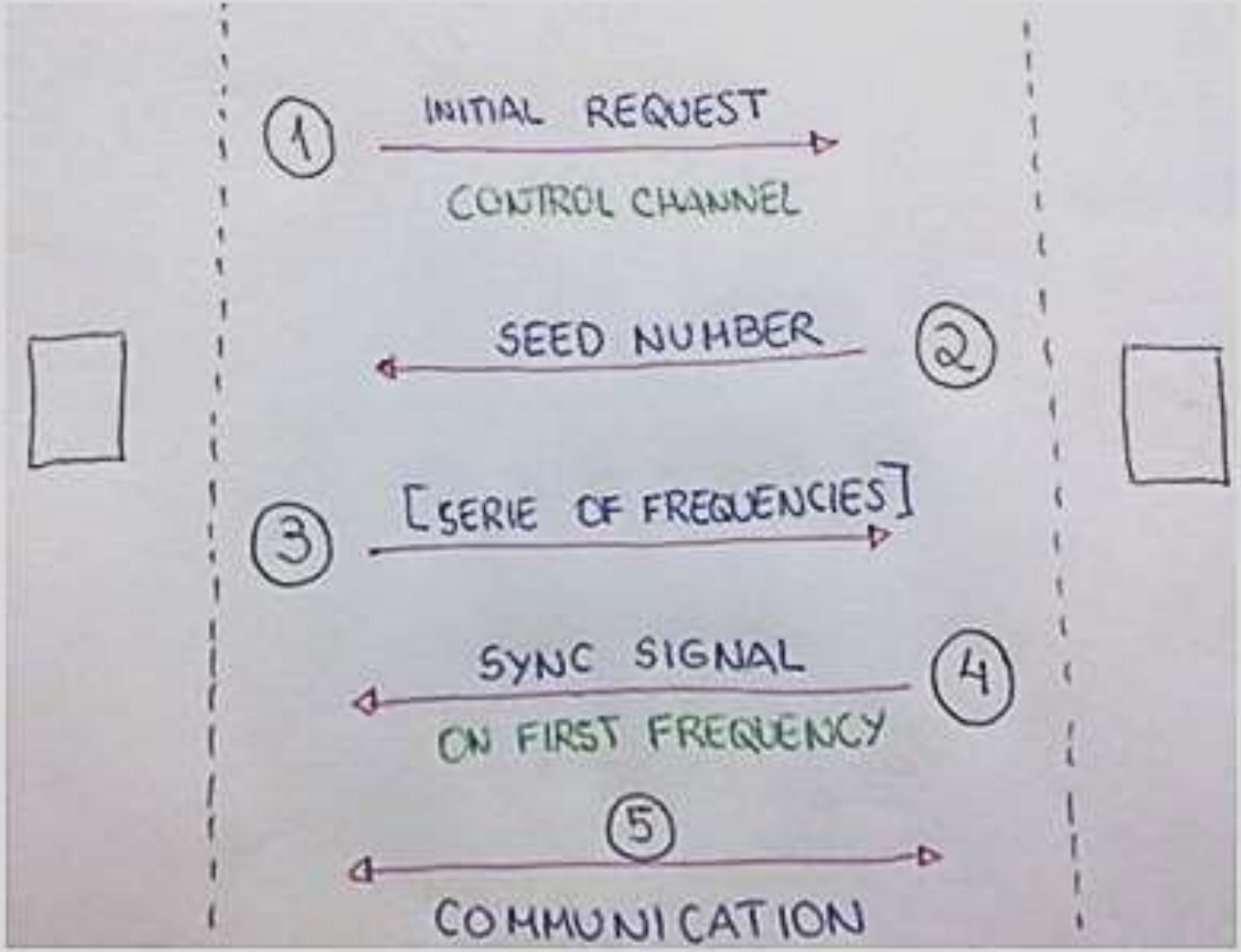
Advantages

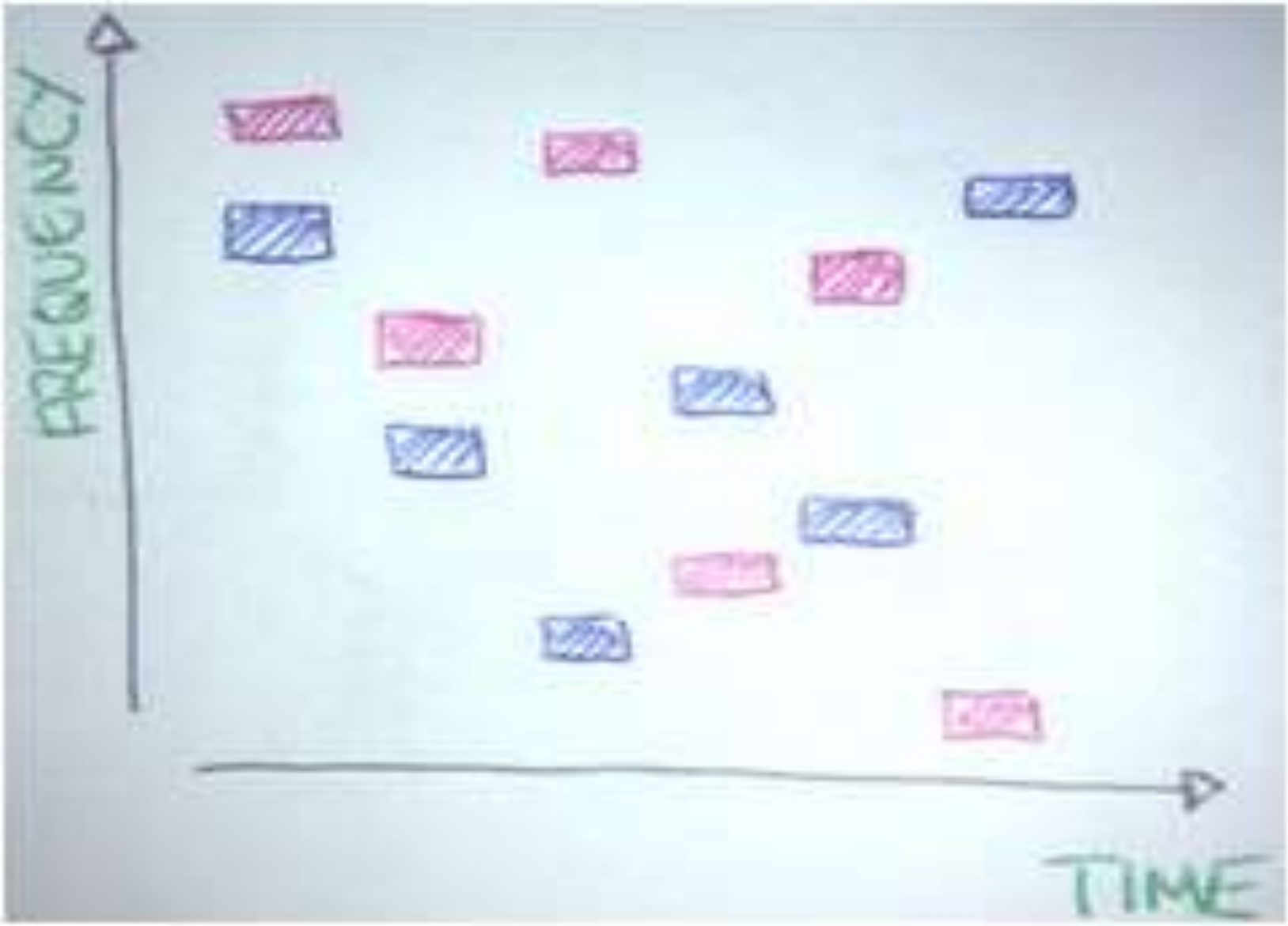
- Very resilient when it comes to noise
  - Reflections (buildings, walls, etc.)
  - Radio Stations
  - Harsh environments (long distances,
- Added security free of cost
- Can work along other frequency bands

Disadvantages

- Needs a larger band of frequency
- The time taken to sync between the receiver and transmitter.

How it works


1
INITIAL REQUEST
CONTROL CHANNEL
SEED NUMBER
2
3
[SERIE OF FREQUENCIES]
SYNC SIGNAL
4
ON FIRST FREQUENCY
5
COMMUNICATION


FREQUENCY
TIME

Uses

- FHSS main use to provide secure calling features and data transfer for:
  - terrestrial military use [1]
  - aerial military use
  - civilian use

Importance

- Avoids eavesdropping
  - This type of modulation made specifically to provide a **secure, anti-jam** connection for military use and now being implemented in civilian equipment.

Applications

FHSS Modulation in military communication equipment:

HAVE QUICK

Is a program that uses FHSS Modulation to secure military communication after Vietnam War

SINCGARS

Single Channel Ground and Airborne Radio System (SINCGARS) is the “new version” of HAVE QUICK. Used in **US Armed Forces, Navy, NATO.**

SINCGARS RT-1523

SINCGARS RT-1523 [2]

Single Channel Ground and Airborne Radio System (SINCGARS) provide communication to the U.S Armed Forces. 25 kHz channels in the VHF FM band, from 30 to 87.975 Mhz. It has single-frequency and frequency hopping modes. The frequency-hopping mode hops 111 times a second.

Frequency Range: 30-88 MHz

Motorola DTR-620

Is a walkie-talkie for everyday use in any small business that needs on-site communication. Its uniqueness is its secure private connection using FHSS Modulation.

It transmit at 900 MHz ISM FHSS (902-907MHz, 915-928 MHz)

Reference

- [1] Frequency-hopping spread spectrum, Princeton, https://www.princeton.edu/~achaney/tmve/wiki100k/docs/Frequency-hopping_spread_spectrum.html , September 2014

- [2] SINCGARS RT1523 Radio, Exelis, -http://www.exelisinc.com/solutions/SINCGARS-RT-1523/Pages/default.aspx, September 2014

- [3] DTR620 Digital On-Site Two-Way Radio, Motorola, http://www.motorolasolutions.com/web/Business/Products/Two-way%20Radios/Portable%20Radios/Small%20Business%20Portable%20Radios/DTR650/_Documents/Static%20Files/MOT_DTR_620_Brochure_EN_070611.pdf, September 2014