

# Time Division Multiple Access Technology

Mobile Device Investigations Program

(b)(6)

Senior Instructor

Technical Operations Division

DHS - FLETC

# TDMA

Time Division Multiple Access or TDMA is a digital transmission technology that allows a number of users to access a single radio frequency (RF) channel without interference by allocating unique times slots to each users within the channel.

TDMA multiplexes three signals over a single channel.

# TDMA

In 1989 the Telecommunications Industry Association and the Cellular Telecommunications & Internet Association chose TDMA over FDMA as the standard to use for 800 Mhz cellular market and the emerging 1.9Ghz markets.

With growing competition between CDMA, GSM and TDMA the CITA decided to let the carriers make their own technology selection

# TDMA – Digital Advantages

Digital technology is now the standard for public telephone systems.

Analog calls are converted into digital form for transport across the telephone systems back bone.

There are a number of advantages that digital has over analog transmissions. They are;

# TDMA – Digital Advantages

1. It economizes on bandwidth.
2. It allows easy integration with personal communication systems (PCS) devices.
3. It maintains superior quality of voice transmissions over a distance.
4. It's difficult to decode.
5. It can use lower average transmitter power.
6. It enables smaller and less expensive individual receivers and transmitters.
7. It offers voice privacy.



# TDMA – How It Works

TDMA takes the digitized audio signal and transmits them on a RF in very short burst, no longer than milliseconds.

Audio packets are assigned a time slot on RF with audio burst portions of other communications.

It allocates a channel frequency for a short time and then moves to another channel.

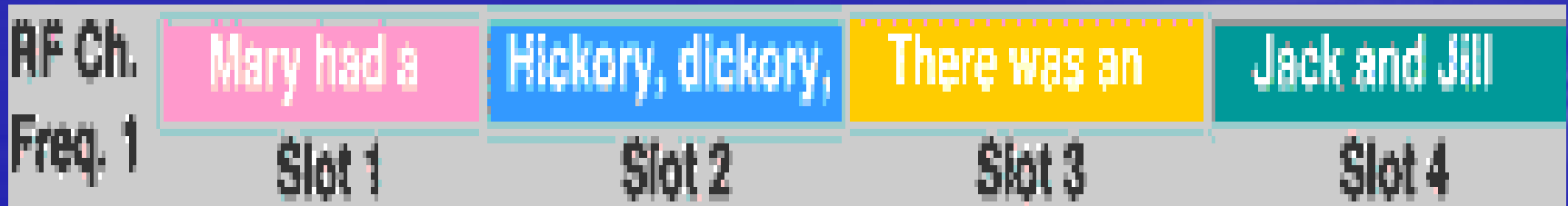
# TDMA – How It Works

Consider having four conversations going on at one time on four different channels.

<b>Conversation</b>	<b>A</b>	Mary had a little lamb.
	<b>B</b>	Hickory Dickory Dock – the mouse ran up the clock.
	<b>C</b>	There was an old woman who lived in a shoe.
	<b>D</b>	Jack and Jill ran up the hill.

# TDMA – How It Works

This is how the same four conversations would look time slotted with TDMA





# TDMA – How It Works

The IS-54 and IS-136 in effect tripled the capacity of cellular frequencies by dividing the 30 KHz channel, allowing more users per channel.

Today TDMA and other standards allow for more slotting giving rise to more users on the systems.

Proponents of TDMA such as AT & T Cingular state they will have the ability to carry 40 or more conversations on a single channel in the near future.

# Extended TDMA or ETDMA

The weakness in TDMA is the waste of bandwidth, which in effect is a waste of possible on air time.

ETDMA uses a control channel to detect and assign a channel dynamically when voice activity is detected.

When ETDMA determines there is no conversation or there is a pause it reassigns the channel to a party having a conversation

# Extended TDMA or ETDMA

Consider the pace in which this presentation is being given.

ETDMA uses these natural pauses to transmit the short millisecond burst of information.

# TDMA - Advantages

As previously stated TDMA was the technology used to improve upon AMPS.

There are distinct advantages to using TDMA

TDMA easily transmitted data as well as voice communications.



# TDMA - Advantages

TDMA's nature prevented interference because the transmission of data is timed.

TDMA uses less power because the units are in use only when they are timed.

TDMA offered ease of transfer from analog systems to digital systems.

TDMA utilized hierarchical cell structures, i.e. Pico, micro and macrocells



# TDMA - Advantages

TDMA systems offered dual band options.

The handoff between 800 Mhz and 1900 Mhz was also seamless.

# TDMA – Disadvantages

In TDMA systems each user has a predefined time slot.

If the user enters into a cell area in which all the time slots are allocated he/she may not be able to complete a call.

# TDMA – Disadvantages

Multipath distortion is another problem in TDMA systems. Multipath distortion occurs when the signal sent to a mobile unit, which may come from any one of several directions, bounce off objects in route. This may cause interference.

To limit this problem, TDMA systems often time signals, as in they must receive, treat, and process a signal in a predetermined time frame. If the signal can not be handled within that time period the signal is ignored.

This problem usually occurs when the mobile unit is at the fringe of a cell site where the possibility of refraction and reflection can interfere with a signal.