

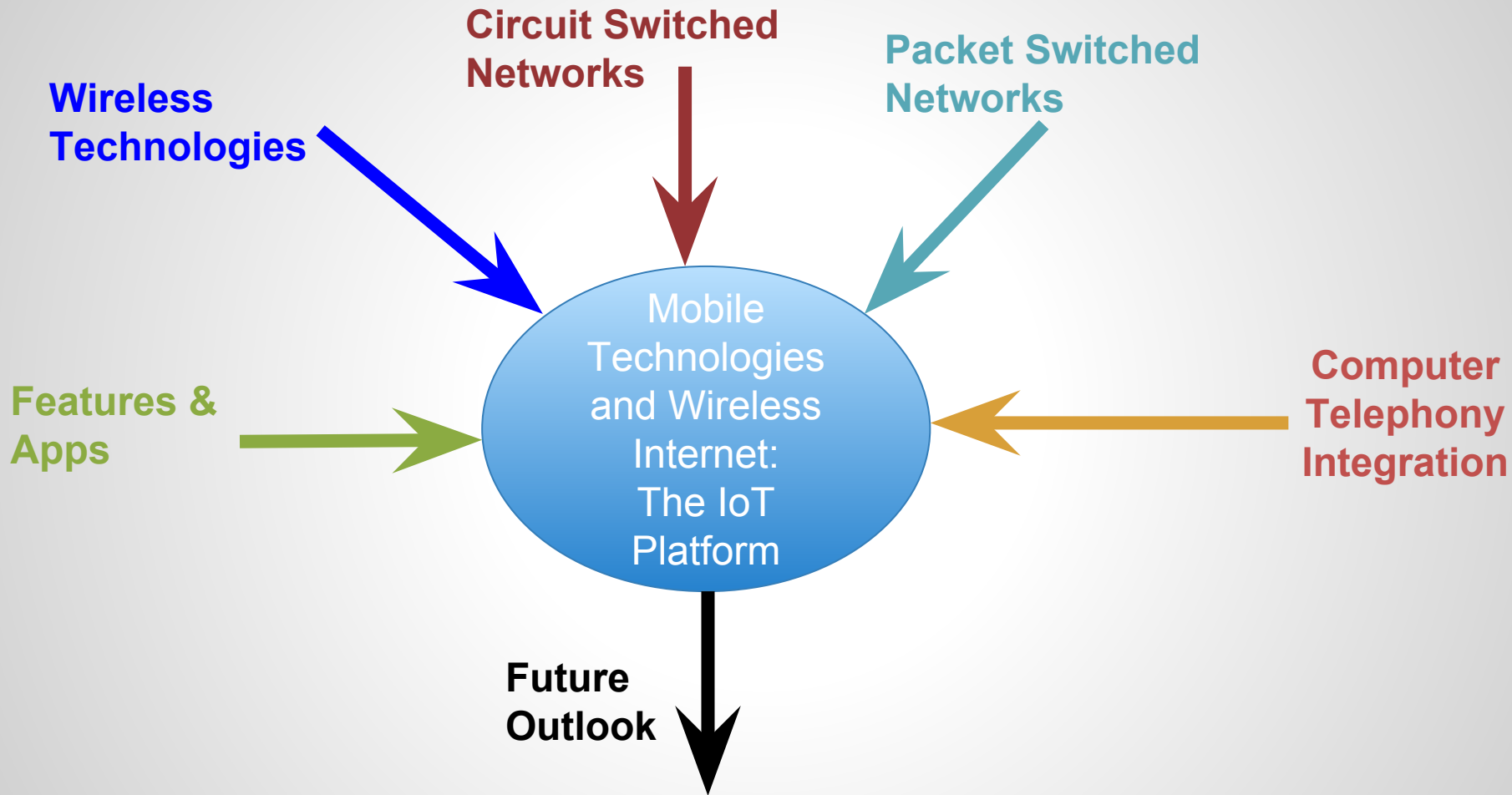
# **Internet of Things:**

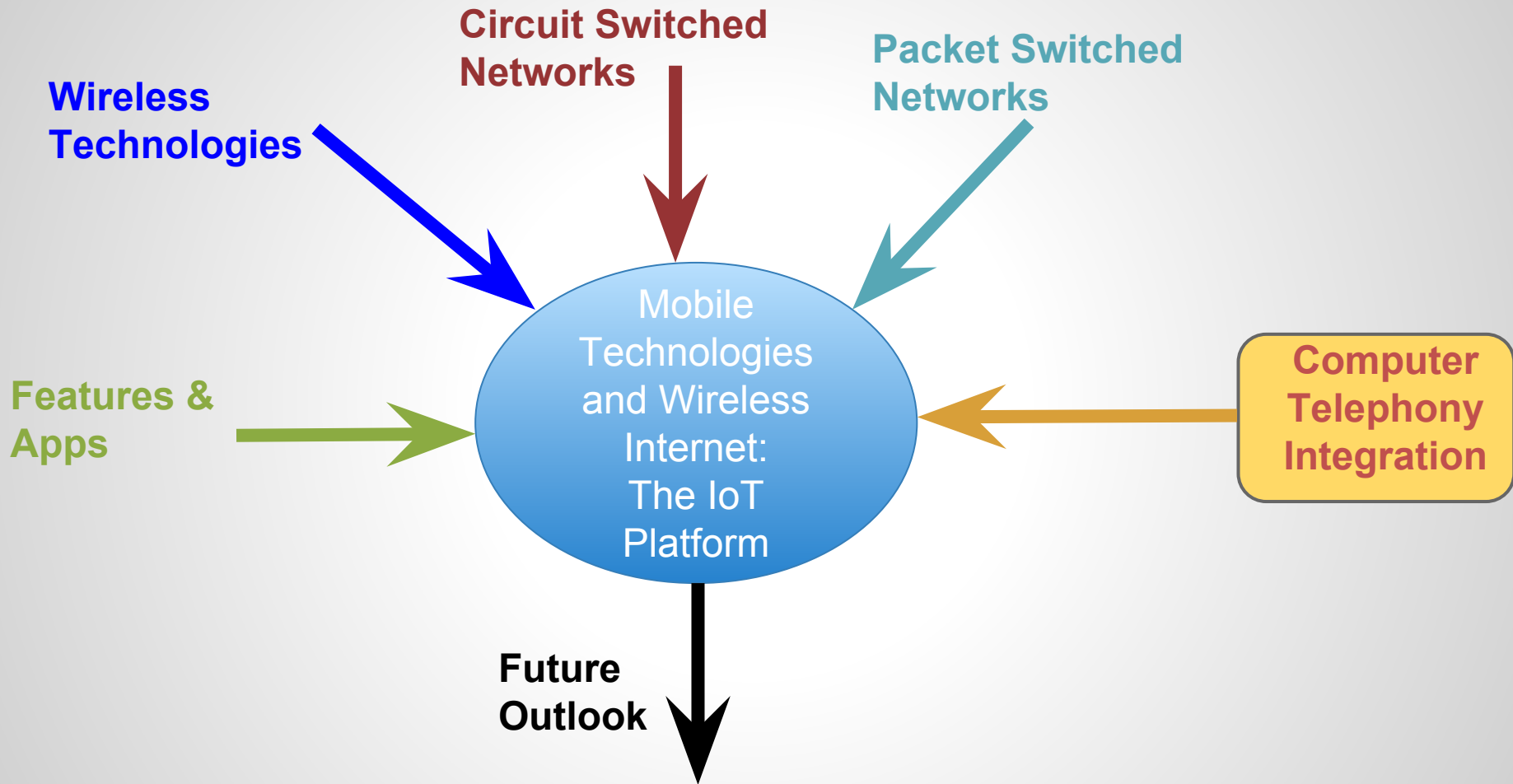
## **Computer Telephony Integration**

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Qualcomm Institute of Calit2  
University of California, San Diego





FROM THE SECRET WORLD OF  
HIGH TECHNOLOGY, THE  
BESTSELLING, TRUE ACCOUNT OF  
A RACE TO CREATE A NEW AND  
REVOLUTIONARY COMPUTER...



# THE SOUL OF A NEW MACHINE



TRACY KIDDER

# Lesson 1

Telephony goes digital

# Lesson 1 | Telephony goes digital

1 - Data Plane



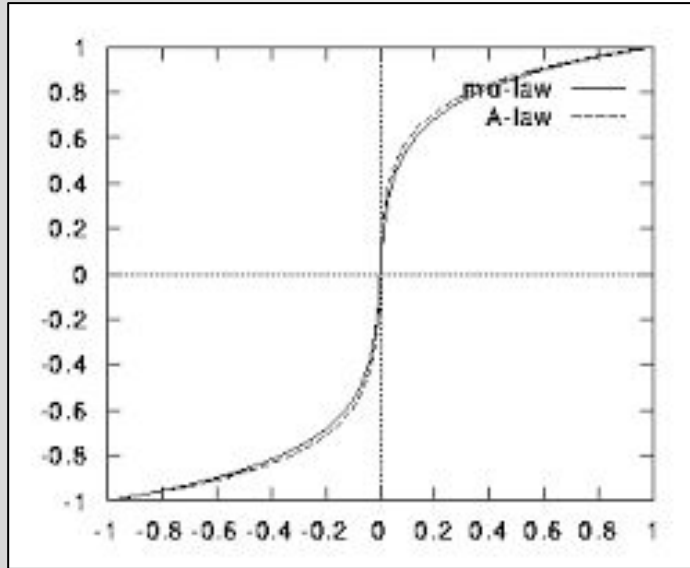
2 - Control Plane



# 1 – Data Plane

# 1 | Data Planes

Log Companding



- **Companding** – Compression/Expansion
- **Toll quality:** 8 bits/sample at 8 kHz  
sampling = 64 kbps
- **Mu Law / A-Law**
- **T1/E1 Lines:** 24/32 voice channels, Time Division Multiplexed



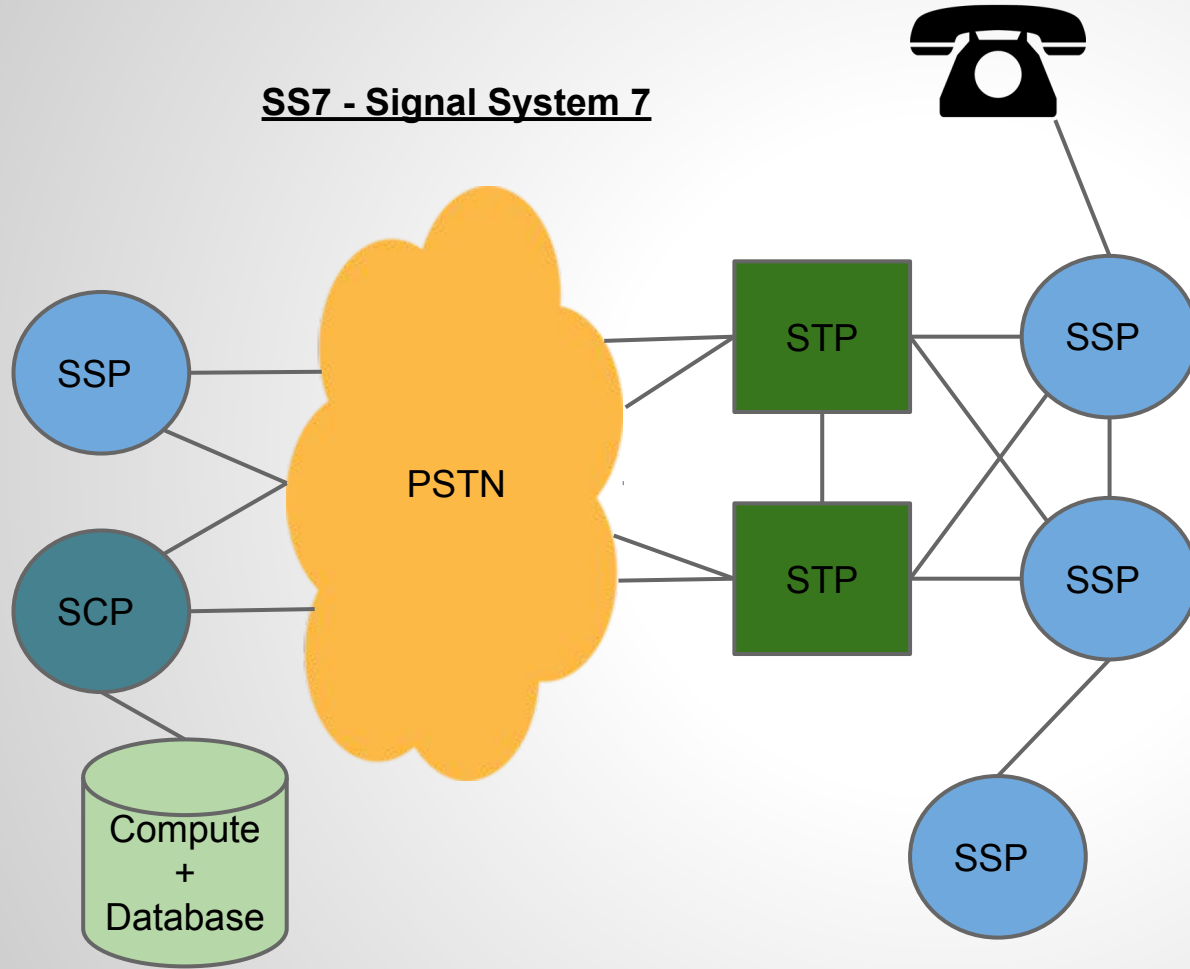
## 2 – Control Plane

## 2 | Control Planes

Dual-Tone Multi-Frequency (DTMF) table of frequency combinations					
"High Group" frequencies [Hz]					
1209 1336 1477 1633					
"Low Group" frequencies [Hz]	697	1	2	3	A (Row 1)
	770	4	5	6	B (Row 2)
	852	7	8	9	C (Row 3)
	941	*	0	#	D (Row 4)
(Column 1) (Column 2) (Column 3) (Column 4)					

## 2 | Control Planes

### SS7 - Signal System 7



- **PSTN:** Public Switched Telephone Network
- **SSP:** Service Switching Point – Phones connect here
- **SCP:** Service Control Point – Computers connect here
- **STP:** Signal Transfer Point – Like a Router

# **Lesson 2**

Shifting Landscapes

# Lesson 2 | Shifting Landscapes

1 - The Big 5

2 - Power Shift



# 1 – The Big 5

# 1 | The Big Switches

**NORTEL**

**SIEMENS**

**ERICSSON** 

**Lucent Technologies**  
Bell Labs Innovations

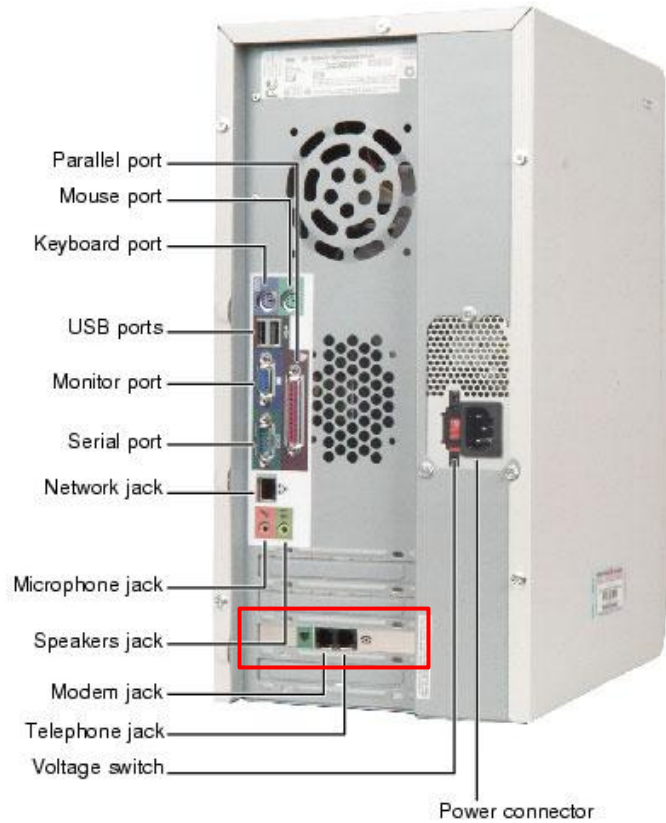
**NTT**



## 2 – Power Shift



## 2 | Power Shift



# **Lesson 3**

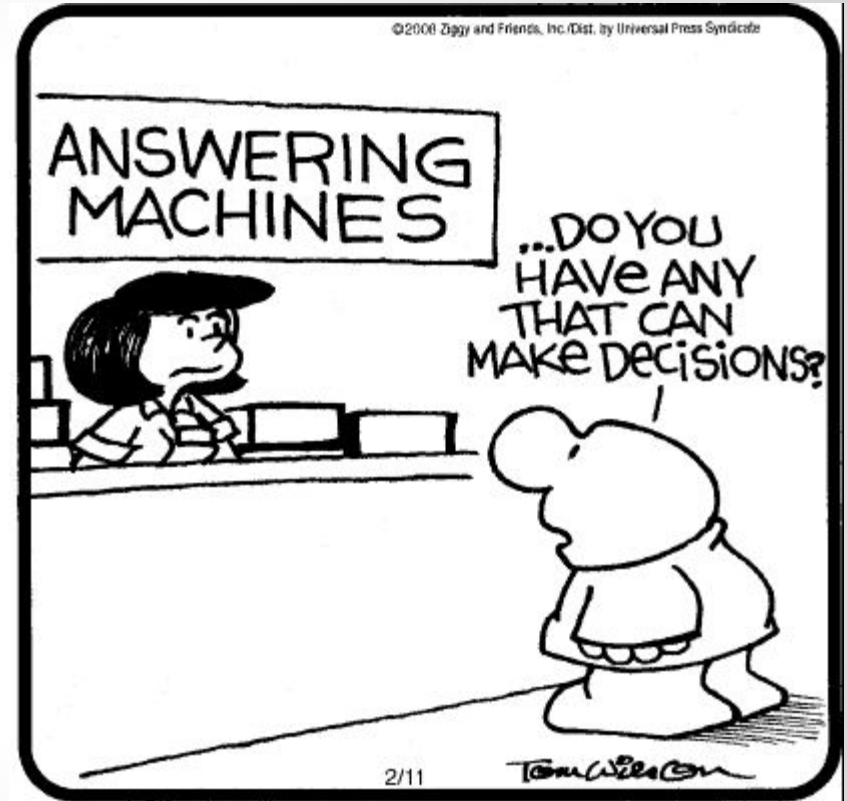
So, What's the Big Deal!

# Lesson 3 | So, What's the Big Deal!

1 - Message Machines

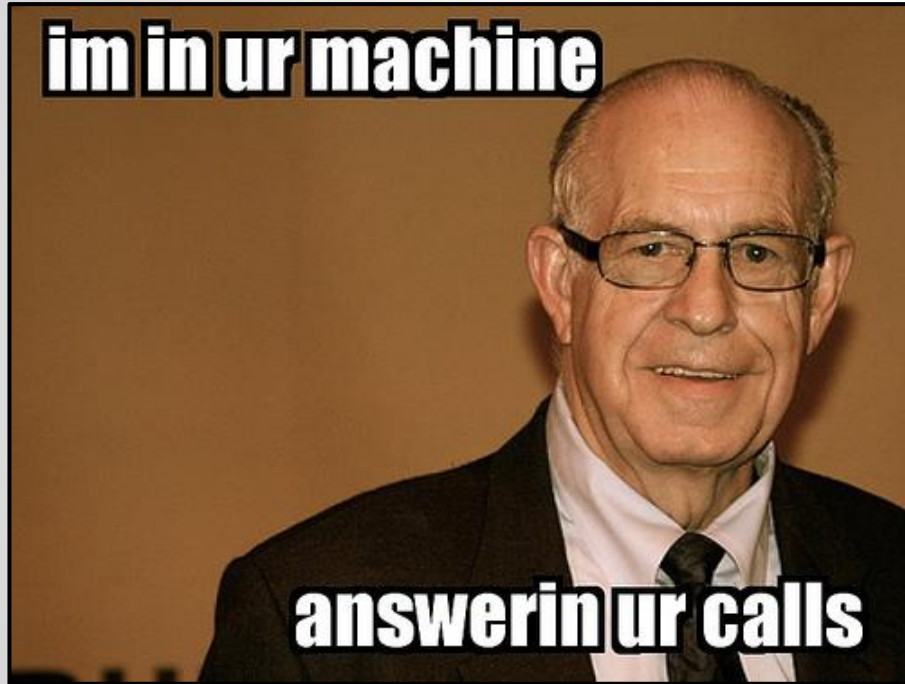
2 - Interactive Voice Response

3 - Call Centers



# 1 – Message Machine

# 1 | Interactive Voice Response





# 1 | Message Machine

## THE OLYMPIA — POST OFFICE APPROVED TELEPHONE ANSWERING MACHINE WITH REMOTE CALL-IN BLEEPER

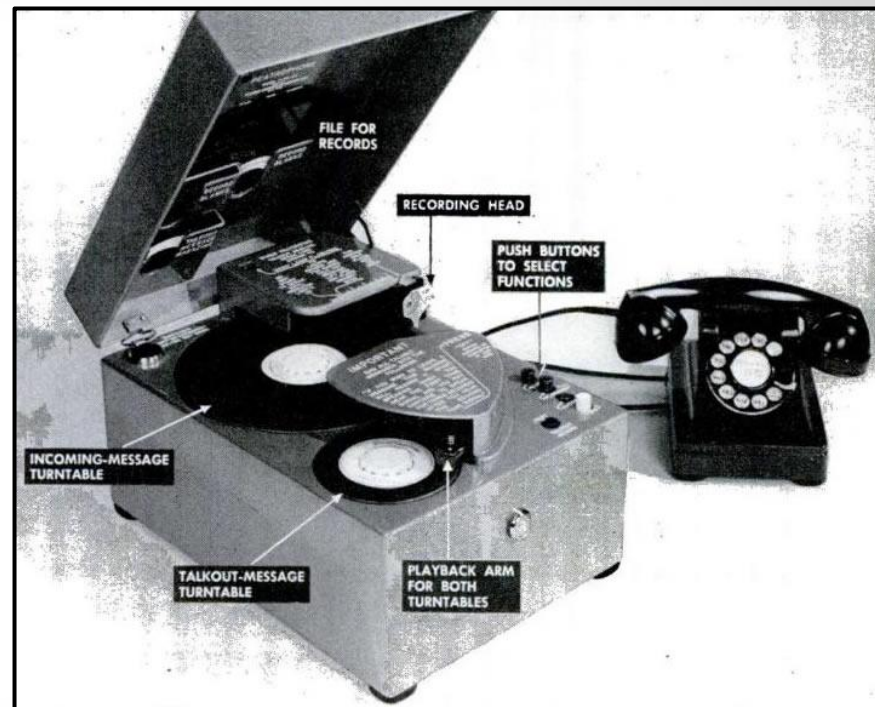
This telephone answering machine is manufactured by Olympia Business Machines, one of the largest Office Equipment manufacturers in the U.K. It is fully POST OFFICE APPROVED and will answer and record messages for 24 hours a day. With your remote call-in bleeper you can receive these messages by telephone wherever you are in the world. The remote call-in bleeper activates the Answer/Record Unit, which will at your command repeat messages, keep or erase them, and is activated from anywhere in the world, or on your return to your home or office. The machine can also be used for message referral, if you have an urgent appointment, but are expecting an important call, simply record the 'phone number' and location where you can be reached. With optional extra

bleepers (£13 each) this facility can be extended to colleagues and members of the family. Using a C90 standard cassette you can record as many as 45 messages. The announcement can be up to 16 seconds long and the incoming message up to 30 seconds long.

The machine is easy to install and comes with full instructions. It is easily wired to your junction box with the spade connectors provided or alternatively a jack plug can be provided to plug into a jack socket. Most important, of course, is the fact that it is fully POST OFFICE APPROVED.

The price of £135 (inc. VAT) includes the machine, an extra-light remote call-in Bleeper, the microphone message tape, A.C. mains adaptor. The unit is 9½" x 6" x 2½" and is fully guaranteed for 12 months. The telephone can be placed directly on the unit — no additional desk space is required.

**£135** inc. VAT



# 1 | Message Machine



## 2 – Interactive Voice Response



## 2 | Interactive Voice Response

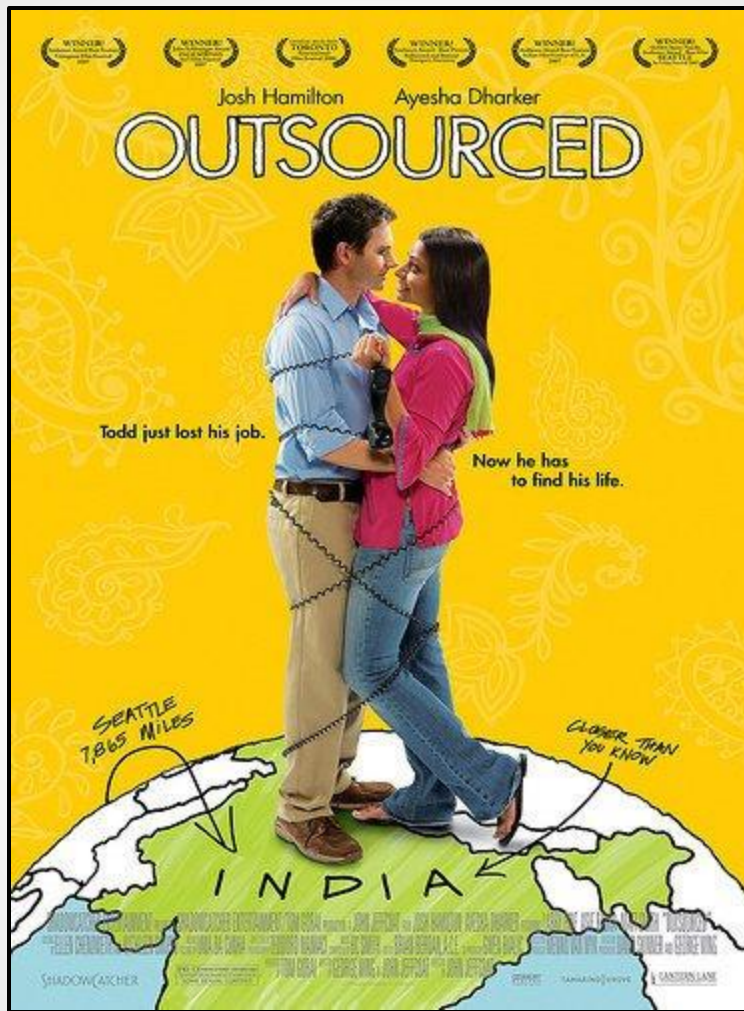


## 3 – Call Centers

### 3 | Call Centers



### 3 | Call Centers

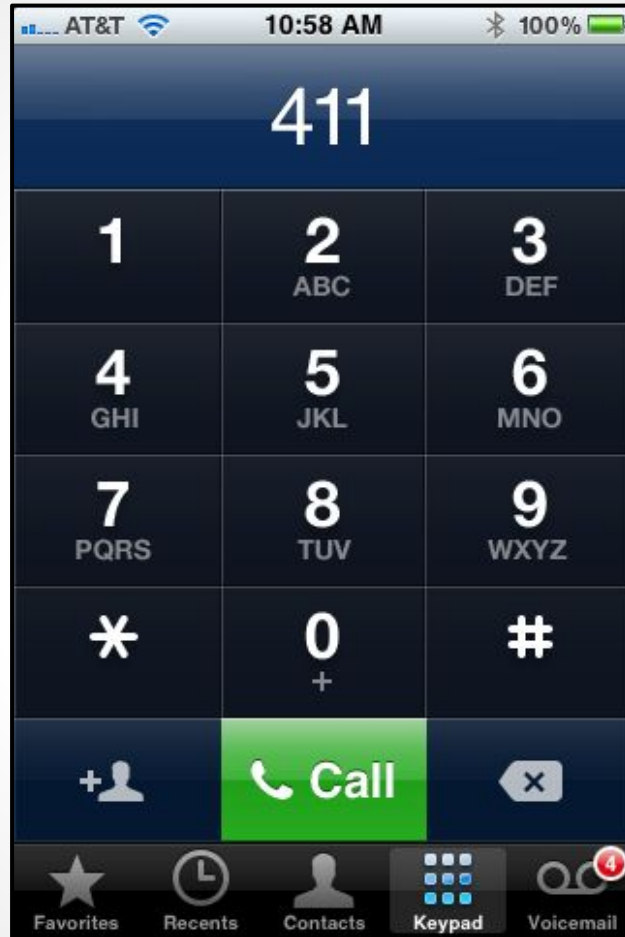




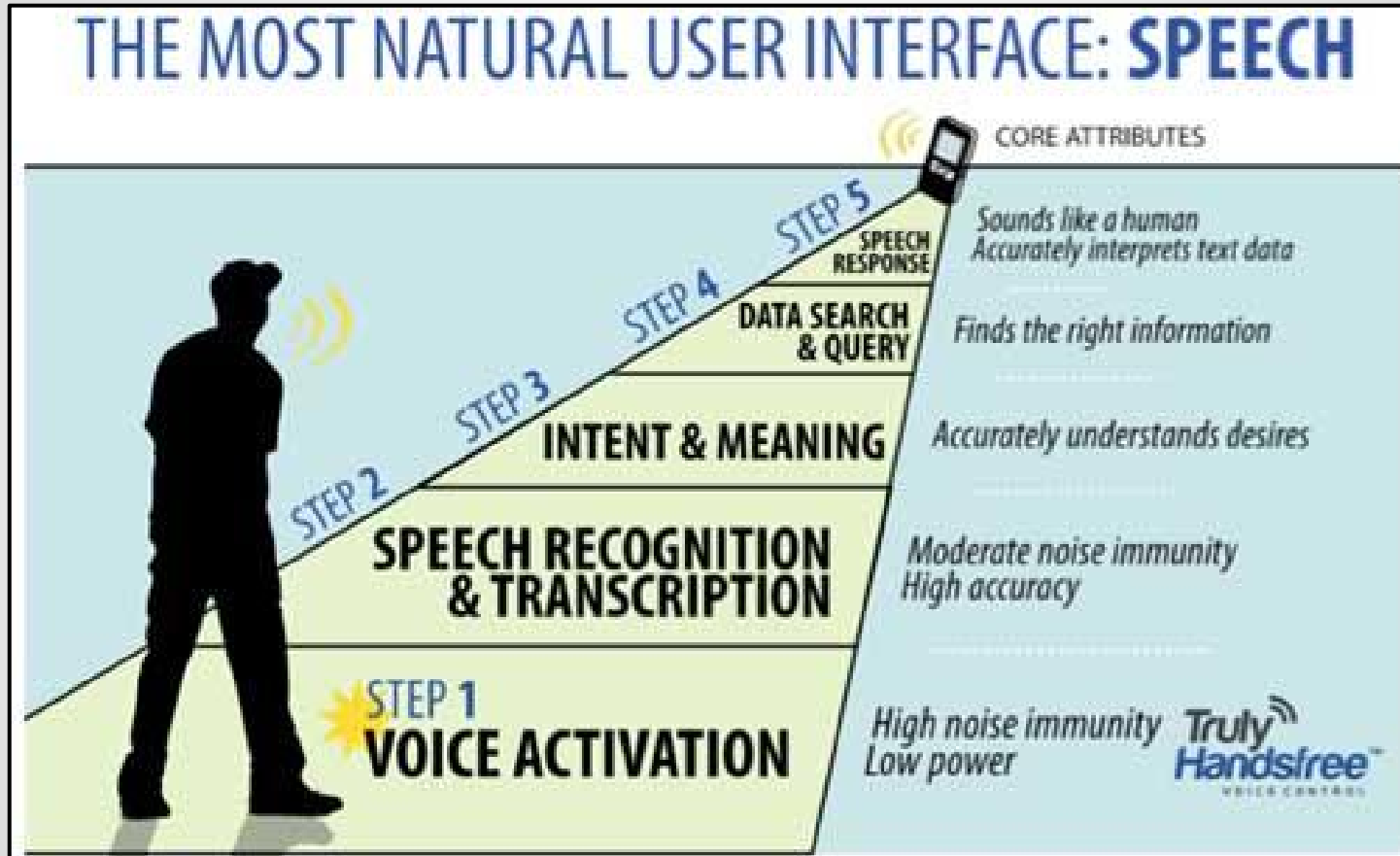
### 3 | Call Centers (Customer Relationship Management)



### 3 | Call Centers



### 3 | Call Centers



# **Lesson 4**

A Word of Caution!



# Lesson 4 | A Word of Caution!

1 - What Happened to the dial tone?

2 - The 911 Fiasco

3 - Hackers get into your phone



1 – What Happened to the dial tone?

# 1 | What Happened to the dial tone



# 1 | What Happened to the dial tone

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## 2 – The 911 Fiasco

## 2 | The 911 Fiasco



**WTNR**  **com**  
INDIANA'S NEWS LEADER

HOME

NEWS

WEATHER

TRAFFIC

**Some Indiana counties lose 911  
call service for several hours**



TECH & SCIENCE

### FCC Report Details Major 911 Outage as America Updates Emergency Services Systems

BY **LAUREN WALKER** 10/20/14 AT 5:40 PM

By **RYAN KNUTSON**

July 17, 2015 6:58 p.m. ET

17 COMMENTS

For three hours last August, almost all **T-Mobile US Inc.**'s about 50 million customers couldn't reach 911.

The nationwide outage, disclosed on Friday, was at least the third major outage by a variety of telecom operators of the 911 call system

## 2 | The 911 Fiasco



## 3 – Hackers get into your phone



### 3 | Hackers get into your phone



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