LE 517
Data Communications and Networks

Week 3:- Communication Media and Codes

By

Dr. Piya Techateerawat

Communication Media and Codes

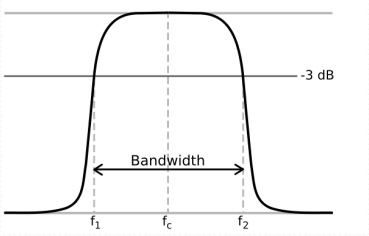
- Communication Media
  - Conductive Metal
  - Optical Fiber
  - Wireless Communications
- Codes
  - ASCII Code
  - EBCDIC Code
  - Baudot, Morse and BCD Codes

Communication Media and Codes

- **Communication Media**
  - Conductive Metal
  - Optical Fiber
  - Wireless Communications
- Codes
  - ASCII Code
  - EBCDIC Code
  - Baudot, Morse and BCD Codes

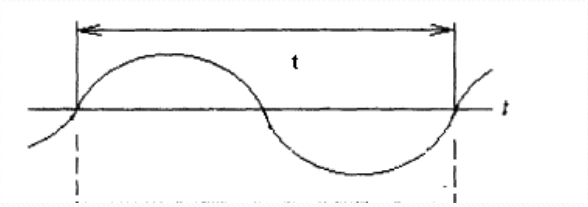
Communications Media

- **Data Rate** :- the number of bits that can be transmitted per unit of time.
- **Bandwidth**:- the difference between the highest and lowest frequencies that may be transmitted.



Communications Media

- **Period:-** the time that is required for signal to complete 1 cycle.



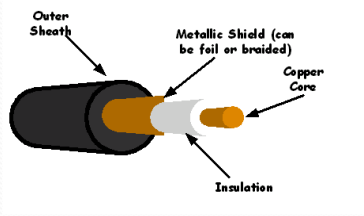
- **Frequency:-** the number of cycles through which the signal can oscillate in a second. The unit is Hertz (Hz) or cycles per second.

Communication Media and Codes

- Communication Media
  - **Conductive Metal**
  - Optical Fiber
  - Wireless Communications
- Codes
  - ASCII Code
  - EBCDIC Code
  - Baudot, Morse and BCD Codes

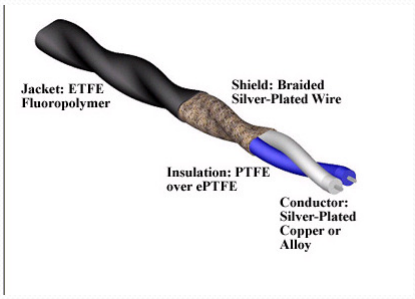
Conductive Metal

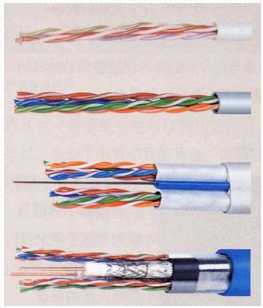
- Coaxial Cable:- Consisting with
  - Inner : made of copper or aluminum
  - Insulation layer: prevention
  - Wire mesh shield: protection from electrical signal
  - Outer cover or Outside Insulation



Conductive Metal

- **Twisted Pair:**- Traditional is copper wire with electricity flows though. Copper is electrical conductive and low resistance and resistant to corrosion.





Communication Media and Codes

- Communication Media
  - Conductive Metal
  - **Optical Fiber**
  - Wireless Communications
- Codes
  - ASCII Code
  - EBCDIC Code
  - Baudot, Morse and BCD Codes

Optical Fiber

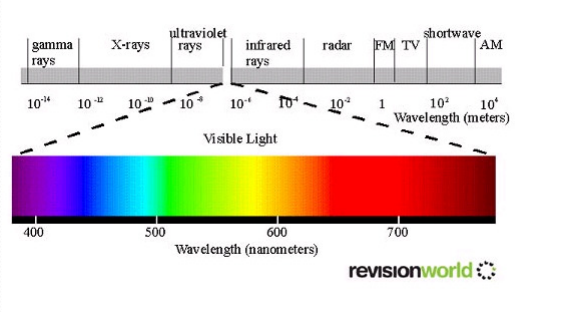
- Optical Fiber:- Using light instead of electricity to transmit information and to avoid interference.

Communication Media and Codes

- Communication Media
  - Conductive Metal
  - Optical Fiber
  - **Wireless Communications**
- Codes
  - ASCII Code
  - EBCDIC Code
  - Baudot, Morse and BCD Codes

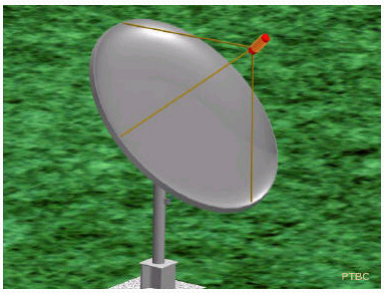
Wireless Communication

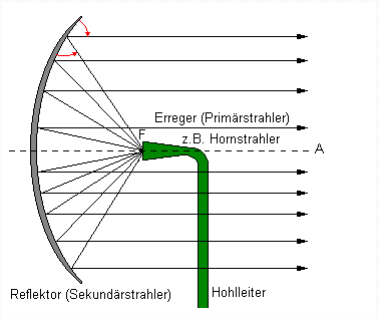
- Wireless Transmission involve electromagnetic waves.
  - VHF (very high frequency) for TV : 30 MHz to 300 MHz
  - UHF (ultra high frequency) for TV: 300 MHz to 3 GHz



Wireless Communication

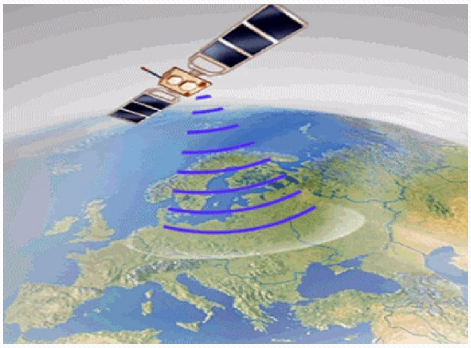
- Microwave Transmission: microwaves travel in a straight line. And normally require parabolic dish reflector.





Wireless Communication

- Satellite Transmission: generally is microwave transmission where satellite orbiting the earth.



Communication Media and Codes

- Communication Media
  - Conductive Metal
  - Optical Fiber
  - Wireless Communications
- **Codes**
  - ASCII Code
  - EBCDIC Code
  - Baudot, Morse and BCD Codes

Codes

- Symbols to represent text, number and other information.
- Purpose: to suit the transmission via medium and peripherals.
- It has been developed as standard for communicate between each parties.

Communication Media and Codes

- Communication Media
  - Conductive Metal
  - Optical Fiber
  - Wireless Communications
- Codes
  - **ASCII Code**
  - EBCDIC Code
  - Baudot, Morse and BCD Codes

ASCII Code

- **ASCII Code** – American Standard Code for Information Interchange (ASCII).
- 7 bit code by mapping a unique combination to every keyboard character with some special function.

Sample of Special key

- ACK – Acknowledgement for previous transmission.
- BEL – Bell signal or sound "beep" in computer.
- VT – Vertical Tab, shift cursor to the next pre-assign print line

ASCII Code

Dec	Hx	Oct	Char	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr	Dec	Hx	Oct	Html	Chr
0	0	000	NUL (null)	32	20	040		Space	64	40	100	@	@	96	60	140	`	`
1	1	001	SOH (start of heading)	33	21	041	!	!	65	41	101	A	A	97	61	141	a	a
2	2	002	STX (start of text)	34	22	042	"	"	66	42	102	B	B	98	62	142	b	b
3	3	003	ETX (end of text)	35	23	043	#	#	67	43	103	C	C	99	63	143	c	c
4	4	004	EOT (end of transmission)	36	24	044	$	$	68	44	104	D	D	100	64	144	d	d
5	5	005	ENQ (enquiry)	37	25	045	%	%	69	45	105	E	E	101	65	145	e	e
6	6	006	ACK (acknowledge)	38	26	046	&	&	70	46	106	F	F	102	66	146	f	f
7	7	007	BEL (bell)	39	27	047	'	'	71	47	107	G	G	103	67	147	g	g
8	8	010	BS (backspace)	40	28	050	(	(	72	48	110	H	H	104	68	150	h	h
9	9	011	TAB (horizontal tab)	41	29	051	)	)	73	49	111	I	I	105	69	151	i	i
10	A	012	LF (NL line feed, new line)	42	2A	052	*	*	74	4A	112	J	J	106	6A	152	j	j
11	B	013	VT (vertical tab)	43	2B	053	+	+	75	4B	113	K	K	107	6B	153	k	k
12	C	014	FF (NP form feed, new page)	44	2C	054	,	,	76	4C	114	L	L	108	6C	154	l	l
13	D	015	CR (carriage return)	45	2D	055	-	-	77	4D	115	M	M	109	6D	155	m	m
14	E	016	SO (shift out)	46	2E	056	.	.	78	4E	116	N	N	110	6E	156	n	n
15	F	017	SI (shift in)	47	2F	057	/	/	79	4F	117	O	O	111	6F	157	o	o
16	10	020	DLE (data link escape)	48	30	060	0	0	80	50	120	P	P	112	70	160	p	p
17	11	021	DC1 (device control 1)	49	31	061	1	1	81	51	121	Q	Q	113	71	161	q	q
18	12	022	DC2 (device control 2)	50	32	062	2	2	82	52	122	R	R	114	72	162	r	r
19	13	023	DC3 (device control 3)	51	33	063	3	3	83	53	123	S	S	115	73	163	s	s
20	14	024	DC4 (device control 4)	52	34	064	4	4	84	54	124	T	T	116	74	164	t	t
21	15	025	NAK (negative acknowledge)	53	35	065	5	5	85	55	125	U	U	117	75	165	u	u
22	16	026	SYN (synchronous idle)	54	36	066	6	6	86	56	126	V	V	118	76	166	v	v
23	17	027	ETB (end of trans. block)	55	37	067	7	7	87	57	127	W	W	119	77	167	w	w
24	18	030	CAN (cancel)	56	38	070	8	8	88	58	130	X	X	120	78	170	x	x
25	19	031	EM (end of medium)	57	39	071	9	9	89	59	131	Y	Y	121	79	171	y	y
26	1A	032	SUB (substitute)	58	3A	072	:	:	90	5A	132	Z	Z	122	7A	172	z	z
27	1B	033	ESC (escape)	59	3B	073	;	;	91	5B	133	[	[	123	7B	173	{	{
28	1C	034	FS (file separator)	60	3C	074	<	<	92	5C	134	\	\	124	7C	174			|
29	1D	035	GS (group separator)	61	3D	075	=	=	93	5D	135	]	]	125	7D	175	}	}
30	1E	036	RS (record separator)	62	3E	076	>	>	94	5E	136	^	^	126	7E	176	~	~
31	1F	037	US (unit separator)	63	3F	077	?	?	95	5F	137	_	_	127	7F	177	&#127;	DEL

Communication Media and Codes

- Communication Media
  - Conductive Metal
  - Optical Fiber
  - Wireless Communications
- Codes
  - ASCII Code
  - **EBCDIC Code**
  - Baudot, Morse and BCD Codes

EBCDIC Code

- EBCDIC – Extended Binary Coded Decimal Interchange Code.
- 8 bit code or up to 256 different characters.

EBCDIC Code

Dec	Hx	Oct	Char		Dec	Hx	Oct	Char	Dec	Hx	Oct	Char	Dec	Hx	Oct	Char
0	0	000	nul	(Null)	65	41	101		130	82	202	b	195	c3	303	C
1	1	001	soh	(Start of Heading)	66	42	102		131	83	203	c	196	c4	304	D
2	2	002	stx	(Start of Text)	67	43	103		132	84	204	d	197	c5	305	E
3	3	003	etx	(End of Text)	68	44	104		133	85	205	e	198	c6	306	F
4	4	004	pf	(Punch Off)	69	45	105		134	86	206	f	199	c7	307	G
5	5	005	ht	(Horizontal Tab)	70	46	106		135	87	207	g	200	c8	310	H
6	6	006	lc	(Lower Case)	71	47	107		136	88	210	h	201	c9	311	I
7	7	007	del	(Delete)	72	48	110		137	89	211	i	202	ca	312	
8	8	010	ge		73	49	111		138	8a	212		203	cb	313	
9	9	011	rlf		74	4a	112	¢	139	8b	213		204	cc	314	
10	a	012	smm	(Start of Manual Message)	75	4b	113	.	140	8c	214		205	cd	315	
11	b	013	vt	(Vertical Tab)	76	4c	114	<	141	8d	215		206	ce	316	
12	c	014	ff	(Form Feed)	77	4d	115	(	142	8e	216		207	cf	317	
13	d	015	cr	(Carriage Return)	78	4e	116	+	143	8f	217		208	d0	320	}
14	e	016	so	(Shift Out)	79	4f	117	|	144	90	220		209	d1	321	J
15	f	017	si	(Shift in)	80	50	120	&	145	91	221	j	210	d2	322	K
16	10	020	dle	(Data Link Escape)	81	51	121		146	92	222	k	211	d3	323	L
17	11	021	dc1	(Device Control 1)	82	52	122		147	93	223	l	212	d4	324	M
18	12	022	dc2	dc2 (Device Control 2)	83	53	123		148	94	224	m	213	d5	325	N
19	13	023	tm	(Tape Mark)	84	54	124		149	95	225	n	214	d6	326	O
20	14	024	res	(Restore)	85	55	125		150	96	226	o	215	d7	327	P
21	15	025	nl	(New Line)	86	56	126		151	97	227	p	216	d8	330	Q
22	16	026	bs	(Backspace)	87	57	127		152	98	230	q	217	d9	331	R
23	17	027	il	(Idle)	88	58	130		153	99	231	r	218	da	332	
24	18	030	can	(Cancel)	89	59	131		154	9a	232		219	db	333	
25	19	031	em	(End of Medium)	90	5a	132	!	155	9b	233		220	dc	334	
26	1a	032	cc	(Cursor Control)	91	5b	133	$	156	9c	234		221	dd	335	
27	1b	033	cu1	(Customer Use 1)	92	5c	134	*	157	9d	235		222	de	336	
28	1c	034	ifs	(Interchange File Separator)	93	5d	135	)	158	9e	236		223	df	337	
29	1d	035	igs	(Interchange Group Separator)	94	5e	136	;	159	9f	237		224	e0	340	\
30	1e	036	irs	(Interchange Record	95	5f	137		160	a0	240		225	e1	341	
31	1f	037	ius	(Interchange Unit Separator)	96	60	140	-	161	a1	241	~	226	e2	342	S
32	20	040	ds	(Digit Select)	97	61	141	/	162	a2	242	s	227	e3	343	T
33	21	041	sos	(Start of Significance)	98	62	142		163	a3	243	t	228	e4	344	U
34	22	042	fs	(Field Separator)	99	63	143		164	a4	244	u	229	e5	345	V
35	23	043			100	64	144		165	a5	245	v	230	e6	346	W

Communication Media and Codes

- Communication Media
  - Conductive Metal
  - Optical Fiber
  - Wireless Communications
- Codes
  - ASCII Code
  - EBCDIC Code
  - **Baudot, Morse and BCD Codes**

Baudot, Morse and BCD Codes

- **Baudot:** 5 bits for each character, original designed for French telegraph.
- **Morse:** one of the oldest code since 1838 used for telegraph communication by combining between dashes and dot.
- **BCD**: Binary coded decimal using in early IBM mainframe. However, it similarly with 6 bits format.

Baudot, Morse and BCD Codes

A	.-	M	--	Y	-.--	6	-....
B	-...	N	-.	Z	--..	7	--...
C	-.-.	O	---	Ä	.-.-	8	---..
D	-..	P	.--.	Ö	---.	9	----.
E	.	Q	--.-	Ü	..--	.	.-.-.-
F	..-.	R	.-.	Ch	----	,	--..--
G	--.	S	...	0	-----	?	..--..
H	....	T	-	1	.----	!	··-·
I	..	U	..-	2	..---	:	---...
J	.---	V	...-	3	...--	“	.-..-.
K	-.-	W	.--	4	....-	‘	.----.
L	.-..	X	-..-	5	.....	=	-...-

MORSE CODE

Q & A