The use of DICOM in Japan

Japan Medical Imaging and Radiological Systems Industries Association (JIRA)
Medical Systems Div. DICOM Committee
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contents

1. DICOM History in Japan.
2. How DICOM keeps growing in Japan.
3. How JIRA contributes DICOM grow.
4. Who else is helping DICOM in Japan.
5. Latest DICOM usage in Japan.

1980-1985: vendor-specific connection

DR11, local Ethernet , RS-232C

1985-1990: ACR/NEMA V1,V2

nice logical concepts

poor physical connections

1990- NOW : DICOM

inherits proven tag structure

utilizes the latest network technology

more objects to cover

> default format for medical objects

DR11: Parallel Interface by Digital

Why DICOM can keep growing ?

 = Why anyone hasn't tried to replace DICOM with others ?

JIRA believes that DICOM is favored because

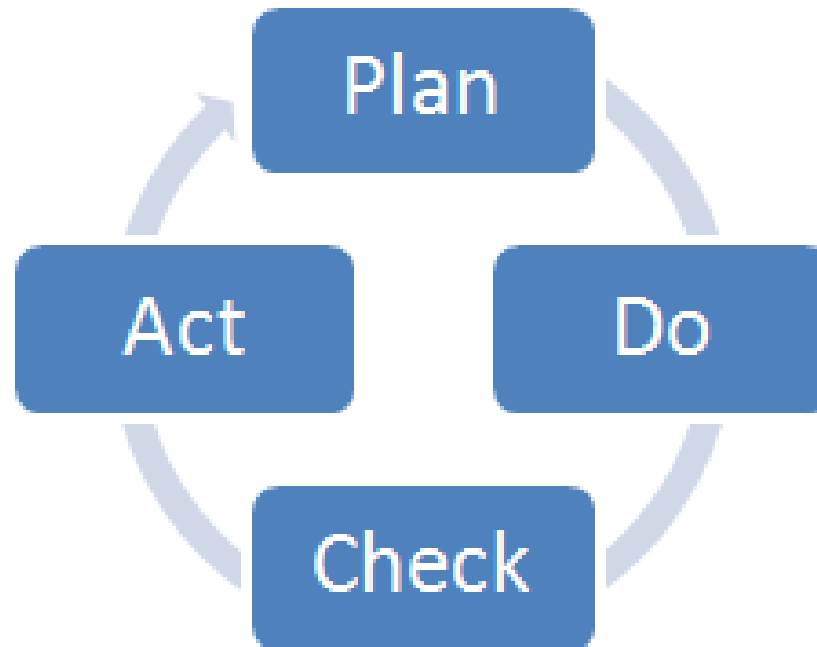1)Open to everyone (user, manufacturer, government)

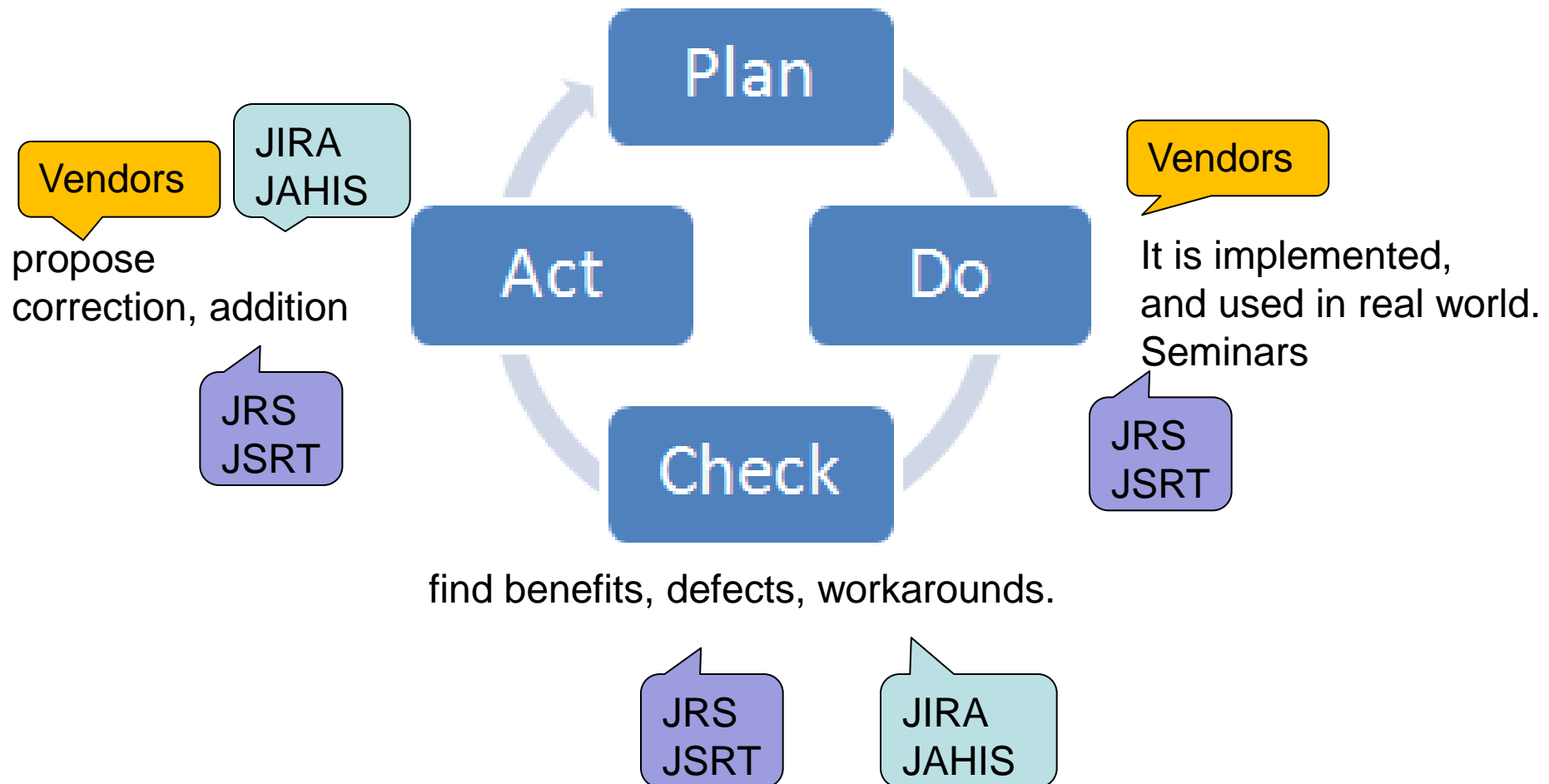2)Quickly responds to new features, revisions, corrections.

3)And it's free.

Besides these nice features of DICOM, many organizations in Japan help DICOM be more popular.

DICOM might be regarded as PDCA object where many organizations contribute to turn the wheel.

2) How DICOM keeps growing in Japan.
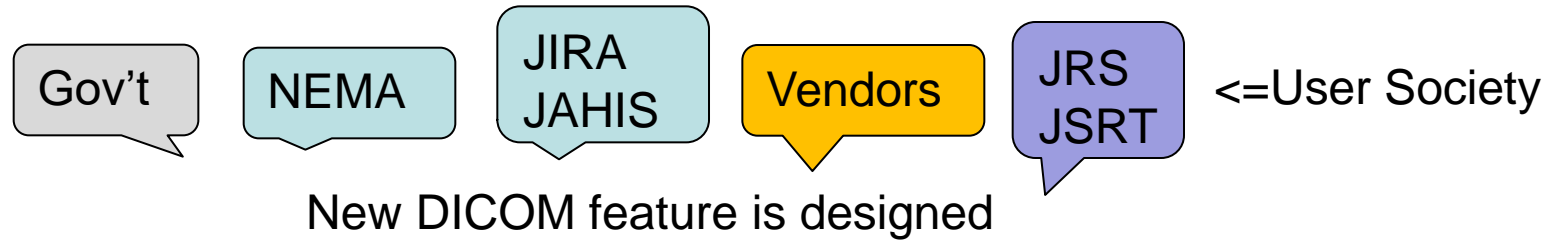
Gov't   NEMA   JIRA JAHIS   Vendors   JRS JSRT   <=User Society

New DICOM feature is designed

Plan

Act

Do

Check

Vendors   JIRA JAHIS   JRS JSRT

propose correction, addition

Vendors   JRS JSRT

It is implemented, and used in real world. Seminars

find benefits, defects, workarounds.

JRS JSRT   JIRA JAHIS

- JIRA :
  - Japan Medical Imaging and Radiological Systems Industries Association (http://www.jira-net.or.jp/index.htm)
    (former Japan Industries assoc. of Radiological Apparatus)
  - All major medical manufacturers join JIRA.
    (CT, MR, X-Ray, Therapy, PACS, ICT, etc)
  - most companies that make DICOM-related products join JIRA DICOM committee.
  - is official association to address with regulations related to medical products safety/efficiency.
  - strongly supports Health Informatics Standardization with NEMA, COCIR.

- ## JIRA DICOM Committee :
  - specialty group in JIRA
  - members include manufacturers, users (MD's and Radiology Tech's(RT))
  - joins NEMA meetings. DSC, WG, conference
  - joins DICOM voting's. Supp and CP
  - proposes DICOM Supp and CP's.

  local activities are:
  - responds to DICOM questions.
  - holds DICOM Seminars for vendors, RT's.
  - manages manufacturers UID.

- DICOM questions :
  - Users, developers ask questions to JIRA H.P
  - Committee makes answers, and post it

- DICOM Seminars :
  - current topic : DICOM BOOK (author: JIRA)
  - deeper and additional information beyond BOOK.
  - 10-20 students from vendors, RT's
  - 2/Year CME (credit) points qualified   ~ $40

CME: continuing medical education

- Manufacturers UID
  - JIRA has its UID 1.2.392.200036.nnnn
  - extension number "nnnn" is assigned to JIRA members upon request.
  - The extension list is shown at JIRA H.P for traceability. http://www.jira-net.or.jp/dicom/file/dicom_osi_20160722.pdf
  - 180 registrations, including vendors, institutions, universities, academic societies.

Besides JIRA, many organizations help DICOM

- JAHIS
  - manufacturers assoc. for Health Info. System and more
  - includes manufacturers of ES, WSI, LAB, PCD, etc
- JSRT
  - Japan Society of Radiology Technologists
  - dispatches members to JIRA DICOM committee.
  - publishes many DICOM-based guidelines.
- JRS
  - Japan Society of Radiologists
  - dispatches member to JIRA DICOM committee

and..

4) Who else is helping DICOM in Japan.

- IHE-J
  - proposes new profiles according to local request
  - publishes translated T.F, build Validation tools
  - holds JP-CAT (Connectathon Japan)
  - holds seminar, publishes books, participate academic societies.

Month	Event	Memo
Feb.	Announcement Connectathon	
Apr.	Workshop #1	For first participant (mainly) General guides and documents
Jun.	Workshop #2	For participant only. Dedicated documents
Jun. – Sep.	Pre-connectathon	Using dedicated tool (not MESA) Verify uploaded logs
Sep.	Connectathon	User validation
Oct.	Connectathon Result meeting	Overall rating
Nov.	Open result matrix (in IHE-J)	Ask IHE International of result in Japan

JRS JSRT

– HELICS

- <u>HE</u>a<u>L</u>th <u>I</u>nformation and <u>C</u>ommunication <u>S</u>tandards Board

- chooses new technology as national guideline candidates, and government <u>acknowledges</u> (some of) them.

- HL7, DICOM, PDI, some IHE profiles are registered as recommended technology by government.

DICOM has proven its usefulness in many data communication situations.

(1)Intra-hospital connection : DICOM ~100%

(such as online Modality – PACS connection)

advantage:

- Most equipments have DICOM, and it works.

- standard connection introduces standard workflow.

- modification is easy. (such as adding new function, replacing equipment, moving data to new storage.)

(2) domain to domain connection

(such as clinic to civic hospital : 1 to 1)

(mainly for consultation : one-way one-time)

(2-1) off-line : PDI   ~ 90% of 1000+ installations

advantage:

- clinic can choose a system that is standardized.

- workflow (operation) is also standardized.

problem:

- CD is not enough for multi-slice CT, 3D creation.

- waste of resources (CD, manpower).

(2-2) on-line : HELICS storage   very few

advantage :

   - government-certified standard storage.

   - image format is DICOM.

problem :

   - few vendors are ready to provide the system.

   - need related standards to be fixed.

   - detail specification is still to go.

(3) Inter domain connection

   (such as many clinics and central archive : n to n)

   (mainly for data-sharing)

(3-1) off-line : no working system :   ~ 0%

   - PDI ?   or "off-line n to n" has no reality ?

(3-2) on-line : no working system :   ~ 0%

   - IHE XDS-i, XCA-i

   - many trial implementations ongoing with using

    HELICS guidelines.

5) Latest DICOM usage in Japan.

(3) Inter domain connection

  (such as many clinics and central archive : n to n)

  (long time archive, referred many times)

advantage :

  - sharing healthcare information leads better care

    with less burden (physical, economical)

problem :

  - who owns central archive under current national

   healthcare system ?

  - privacy , security , patient's consent

  - no nation-wide unique ID for medical use in Japan.

Dose monitoring

- We have enough reasons to think of this.
- Many countries have published DRL as average or recommended exposure of X-ray-related exam.
- J-RIME(Japan Network for Research and Information on Medical exposure) initiated collecting, and compiling the current exposure conditions with interested societies, and major hospitals.
- At data collection phase, JIRA suggested to use RDSR and REM, and supplied some systems such as REM MGR, OCR S/W.

DRL: Diagnostic Reference Level

IHE REM profile

Archive

DRL DATABASE

PACS

Image Manager	Image Archive

Dose Information user

Dose Info Consumer

← RAD-64:Query Dose Information
← RAD-65: Retrieve Dose Information

↑ **RAD-62: Store Dose Information**
↑ **RAD-10: Storage Commitment**

Modality

Acquisition Modality

→ **RAD-62: Store Dose Information**

Dose Information Storage

Dose Information transmission
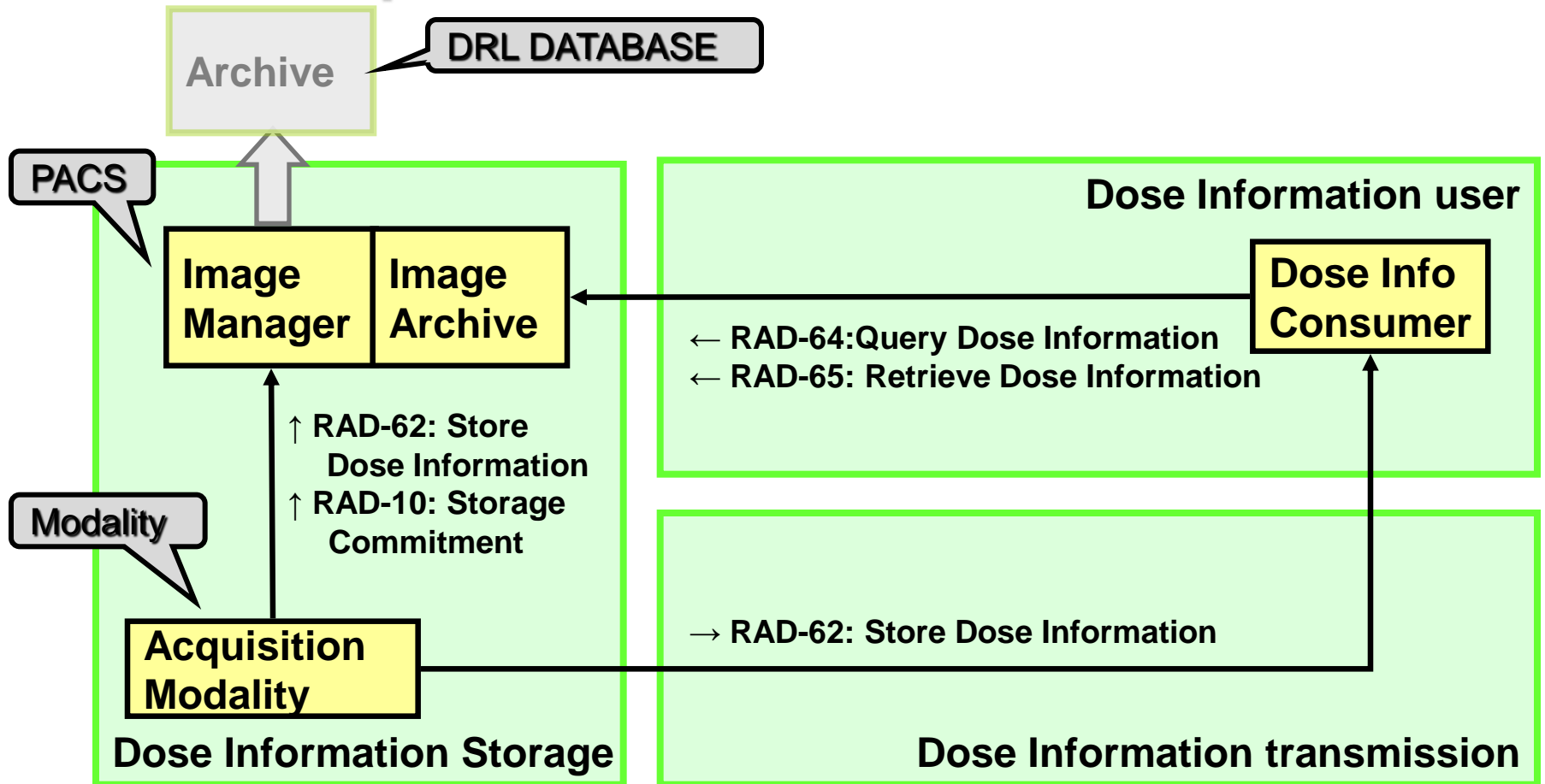
DRL: Diagnostic Reference Level

- The purposes to settle DRL (from RT's eye)
    - recognize scan protocol and conditions I use.
    - compare my conditions with others in various classification.
    - think how to reduce exposure while keeping the image quality.
    - discuss any idea to reduce exposure such as reducing exams or sharing exam results.
    - evaluate my effort by watching new DRL's (and my position against it) for long period.

DRL: Diagnostic Reference Level

Some other points about DICOM in Japan...

1)we use OUR character sets in PERSON NAME.
 - In PN(person name), DICOM allows the use of
   three fields.
     alphabet=ideographic=phonetic
   Then, we use all fields as
     Yamada^Taro=山田^太郎=やまだ^たろう

Yamada^Taro=山田^太郎=やまだ^たろう

Yamada^Taro : IR-6 alphabet : required
山田^太郎 : IR-87 Kanji (ideographic) : optional
やまだ^たろう : IR-87 Hiragana (phonetic): optional

Though this format is defined as DICOM, some (imported) systems may reject this. So, we defined..
 - alphabetic expression is required as common part.
 - IR-87 Japanese character set is optional.
MWM-SCP(RIS Server) has to take care of this.

DICOM defines another Japanese character set…
ヤマダ^タロウ=山田^太郎=やまだ^たろう

ヤマダ^タロウ is one-byte Japanese character (IR-13),
and these characters are mapped in the last half of
ASCII table. (as one-byte character)

	0	10	20	30	40	50	60	70	80	90	A0	B0	C0	D0	E0	F0
0	NL	DE	SP	0	@	P	'	p			SP	ー	タ	ミ		
1	SH	D1	!	1	A	Q	a	q			。	ア	チ	ム		
2	SX	D2	"	2	B	R	b	r			「	イ	ツ	メ		
3	EX	D3	#	3	C	S	c	s			」	ウ	テ	モ		
4	ET	D4	$	4	D	T	d	t			、	エ	ト	ヤ		
5	EQ	NK	%	5	E	U	e	u			・	オ	ナ	ユ		
6	AK	SN	&	6	F	V	f	v			ヲ	カ	ニ	ヨ		
7	BL	EB	'	7	G	W	g	w			ア	キ	ヌ	ラ		
8	BS	CN	(	8	H	X	h	x			イ	ク	ネ	リ		
9	HT	EM	)	9	I	Y	i	y			ウ	ケ	ノ	ル		
0A	LF	SB	*	:	J	Z	j	z			エ	コ	ハ	レ		
0B	HM	EC	+	;	K	[	k	{			オ	サ	ヒ	ロ		
0C	CL	→	,	<	L	¥	l					ヤ	シ	フ	ワ		
0D	CR	←	−	=	M	]	m	}			ユ	ス	ヘ	ン		
0E	SO	↑	.	>	N	^	n	‾			ヨ	セ	ホ	゛		
0F	SI	↓	／	?	O	_	o	DL			ッ	ソ	マ	゜		

IR-13 <u>was</u> widely used in Hospital Information System (HIS: Information System of whole hospital) in Japan, but it has a big possibility that it can be replaced with other character (ex. UNICODE) in other countries.

So, IHE-J and many other groups including JIRA prohibit the use of IR-13.

Left: Japanese extension

	80	90	A0	B0	C0	D0	E0	F0
0			SP	ー	タ	ミ		
1			。	ア	チ	ム		
2			「	イ	ツ	メ		
3			」	ウ	テ	モ		
4			、	エ	ト	ヤ		
5			・	オ	ナ	ユ		
6			ヲ	カ	ニ	ヨ		
7			ァ	キ	ヌ	ラ		
8			ィ	ク	ネ	リ		
9			ゥ	ケ	ノ	ル		
0A			ェ	コ	ハ	レ		
0B			ォ	サ	ヒ	ロ		
0C			ャ	シ	フ	ワ		
0D			ュ	ス	ヘ	ン		
0E			ョ	セ	ホ	゛		
0F			ッ	ソ	マ	゜		

extended ASCII Table. (part)

Right: European extension

	80	90	A0	B0	C0	D0	E0	F0
0	€		SP	°	À	Ð	à	ï
1		'	¡	±	Á	Ñ	á	ð
2	,	'	¢	²	Â	Ò	â	ñ
3	ƒ	"	£	³	Ã	Ó	ã	ò
4	„	"	¤	´	Ä	Ô	ä	ó
5	…	•	¥	µ	Å	Õ	å	õ
6	†	–	§	¶	Æ	Ö	æ	õ
7	‡	—	§	·	Ç	×	ç	ö
8	ˆ	˜	¨	¸	È	Ø	ç	÷
9	‰	™	©	¹	É	Ù	è	ø
0A	Š	š	ª	º	Ê	Ú	é	ù
0B	‹	›	«	»	Ë	Û	ê	ú
0C	Œ	œ	¬	¼	Ì	Ü	ë	û
0D			-	½	Í	Ý	ì	ü
0E	Ž	ž	®	¾	Î	Þ	í	ý
0F		Ÿ	¯	¿	Ï	ß	î	þ

● DICOM has grown and gained vey good reputation world-wide.

● but, DICOM is very large so it can be challenging for users to understand.

● We help user understand and navigate to the specific small part they need; we show

- ● common basic concept of DICOM
- ● how to locate the part of the Standard to read
- ● how services and objects are defined, divided
- ● how to solve questions

summary

- JIRA and other groups are promoting the standardization of healthcare informatics, and DICOM is one of the very successful standard in this field.

- Medical information is already moving between countries, so world-wide standard is really important.
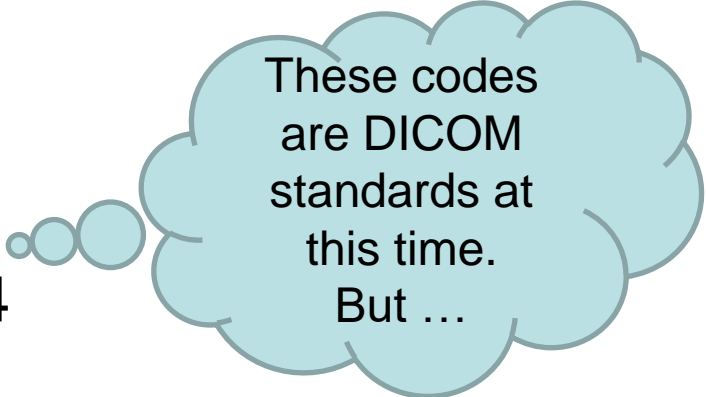
Thank you

Any Question ?

4. IHE Japan

- Card(11)
  - CATH(15), ECG(6), ECHO(26), ED-CARD(11), IVI(8)   …based on SWF.b
- Endoscopy (3)
  - EWF (3)
- IT-Infrastructure (49)
  - ATNA (12), CT(39), PAM(56), PDQ(16), PDQV3(9), PIX(3), PIXV3(12), XCA(12), XDR(1), XDS.b(24)
- Laboratory (15)
  - LAW(5), LBL(11), LDA(4), LPOCT(3), LTW(18), LTW-MB(18)
- Patient Care Device (10)
  - ACM(4), DEC(5), PDVQ(6)
- Radiology (40)
  - ARI(18),CPI(15), ED(3), IRWF(9), KIN(11), MAMMO(10), PDI(39), PIR(10), REM(7), SWF.b(59), XCA-I(10), XDS-I.b(10)
- Radiation Oncology (4)
  - BRTO2(3), BRTO(2), REG(2)

(xx) : number of system

About Specific Character set

- Option name: DICOM Japanese Character Set

- Mandatory: ISO 2022 IR 87

- Not recommend: ISO 2022 IR 159

- Prohibit: ISO 2022 IR 13 and IR 14

These codes are DICOM standards at this time. But …

- (0008,0005) Default Character set

- ISO 2022 IR 6\ISO 2022 IR 87

- (0010,0010) Patient's name

- Kanda^Jirou=神田^次郎=カンダ^ジロウ