

Digital Imaging and Communications in Medicine (DICOM). Part II: Networking

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Přehled I

Úvod

Jak to vypadá?
Metainformace (v souboru)
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Normalizované N-
PDU

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C-STORE: Logem nelogem

DICOM Hexdump

```

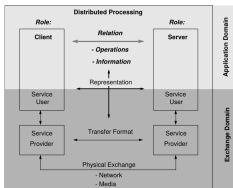
00000000 52 75 62 6f 20 44 49 43 4f 4d 20 56 69 65 77 65 |Rubo DICOM View|
00000010 72 20 64 65 6d 6f 2e 20 57 57 57 2e 52 55 42 4f |r demo. WWW.RUBO|
00000020 4d 45 44 2e 43 4f 4d 00 00 00 00 00 00 00 00 |MED.COM.....|
00000030 00 00 00 00 00 00 00 00 00 00 00 00 00 00 |.....|
*
00000080 44 49 43 4d 02 00 00 00 55 4c 04 00 a6 00 00 00 |DICM....UL.....|
00000090 02 00 01 00 4f 42 00 00 02 00 00 00 00 01 02 00 |...OB.....|
000000a0 02 00 55 49 1a 00 31 2e 32 2e 38 34 30 2e 31 30 |..UI..1.2.840.10|
000000b0 30 30 38 2e 35 2e 31 2e 34 2e 31 2e 31 2e 34 00 |008.5.1.4.1.1.4.|
000000c0 02 00 03 00 55 49 26 00 31 2e 33 2e 34 36 2e 36 |...UI&1.3.46.6|
000000d0 37 30 35 38 39 2e 31 31 2e 30 2e 34 2e 31 39 39 |70589.11.0.4.199|
000000e0 36 30 38 32 33 30 37 33 38 30 30 30 36 00 02 00 |6082307380006...|
000000f0 10 00 55 49 14 00 31 2e 32 2e 38 34 30 2e 31 30 |..UI..1.2.840.10|
00000100 30 30 38 2e 31 2e 32 2e 31 00 02 00 12 00 55 49 |008.1.2.1.....UI|
00000110 10 00 31 2e 33 2e 34 36 2e 36 37 30 35 38 39 2e |..1.3.46.670589.|
00000120 31 37 02 00 13 00 53 48 0c 00 41 52 43 5f 43 4f |17....SH..ARC_CO|
00000130 4e 56 45 52 54 20 08 00 05 00 43 53 0a 00 49 53 |NVERT ....CS..IS|
00000140 4f 5f 49 52 20 31 30 30 08 00 08 00 43 53 1c 00 |O_IR 100....CS..|
00000150 4f 52 49 47 49 4e 41 4c 5c 50 52 49 4d 41 52 59 |ORIGINAL\PRIMARY|
00000160 5c 4f 54 48 45 52 5c 52 5c 49 52 20 08 00 12 00 |\OTHER\R\IR ....|
00000170 44 41 08 00 31 39 39 36 30 38 32 33 08 00 13 00 |DA..19960823....|
00000180 54 4d 06 00 30 39 33 38 30 31 08 00 14 00 55 49 |TM..093801....UI|
00000190 14 00 31 2e 33 2e 34 36 2e 36 37 30 35 38 39 2e |..1.3.46.670589.|
000001a0 31 31 2e 30 2e 35 08 00 16 00 55 49 1a 00 31 2e |11.0.5....UI..1.|
000001b0 32 2e 38 34 30 2e 31 30 30 30 38 2e 35 2e 31 2e |2.840.10008.5.1.|
000001c0 34 2e 31 2e 31 2e 34 00 08 00 18 00 55 49 26 00 |4.1.1.4.....UI&.|
000001d0 31 2e 33 2e 34 36 2e 36 37 30 35 38 39 2e 31 31 |1.3.46.670589.11|
000001e0 2e 30 2e 34 2e 31 39 39 36 30 38 32 33 30 37 33 |.0.4.19960823073|
    
```

Příklad zobrazení



Obrázek: DICOM Ukázka zobrazení

Distribuovaný proces

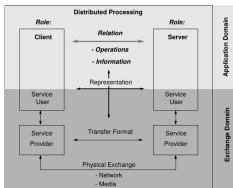


Obrázek: Model distribuovaného procesu

Application domain:

- ▶ Nutné definovat *role*: Klient/server
- ▶ Nutné definovat *rámec informací*, kt. jsou vyměřovány. Důležitá je sémantika, nikoliv syntaxe. Důležitý je *kontext*.
- ▶ Nutné definovat *operace*. Např. ukládání, vrácení výsledku, apod.

Distribuovaný proces



Obrázek: Model distribuovaného procesu

Exchange domain (skrytá pro uživatele)

- ▶ Service user, Service provider: Mohou mít různou (vnitřní) implementaci, musí používat stejné komunikační protokoly a rozhraní (request format).
- ▶ Definice dat. reprezentace (ABI). Používá se *serializace*
- ▶ Fyzická výměna, např. síť, paměťové médium.

Serializace objektů DICOM

- ▶ Serializace objektů DICOM je řízena pomocí *Transfer Syntax UID*, který nastavuje:
 - ▶ Pořadí byte (LE/BE)
 - ▶ Serializaci VR (explicitní, implicitní)
 - ▶ Kompresi obrazových dat (pokud jsou komprimovaná, tak Transfer Syntax je LE Explicit)

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- 1. Při síťovém přenosu je Transfer Syntax vybrán dle typu objektu (SOP Class) při vyjednávání (negotiation phase)

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Doporučení:

- ▶ Vždy podporovat a nabízet všechny 3 zákl. syntaxe: LEI, LEE a BEE
- ▶ Pokud možno, vždy preferovat LEE jako výchozí

DICOM File Meta Information: Tab 7.1-1 Selection

- ▶ Skupina 0002 je vždy Little Endian Explicit (pouze pro soubory). Je určena pouze pro soubory. Při posílání objektuů po síti je nutné ji odstranit.
- ▶ *Transfer Syntax UID* (0002, 0010) je použito pro všechny další elementy (mimo skupinu 0002) a určuje:
 - ▶ Explicit/Implicit VR
 - ▶ Pořadí bytes (BE/LE)
 - ▶ Kompresi pixelů a použitý algoritmus (v tom případě vždy Explicit VR Little Endian)

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 - ▶ Explicit/Implicit VR
 - ▶ Pořadí bytes (BE/LE)
 - ▶ Kompresi pixelů a použitý algoritmus (v tom případě vždy Explicit VR Little Endian)

Na síti tato skupina nemá co dělat(!)

DICOM Networking

- ▶ V síti DICOM jsou uzly nazývány AE (*Application Entity*), jsou identifikovány *AE Title*, *AET* (case sensitive)
- ▶ Komunikace DICOM probíhá peer-to-peer (tj. vždy mezi dvěma AE)
- ▶ Relace (session) DICOM se nazývá *Association*
- ▶ Asociace má dvě fáze:

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- ▶ Asociace má dvě fáze:
 1. Association Negotiation.
Žádající AE zašle seznam prezentačních kontextů, určujících služby DICOM, které chce používat.
Druhá strana zašle zpět stejný seznam, ve kterém označí, které služby akceptuje (lze použít), a které nikoliv (nebudou použity).
 2. Výměna příkazů DICOM

DICOM Networking, základní služby

- ▶ Služba ověření (Verification service) je služba aplikační vrstvy. Slouží k ověření komunikace (C-ECHO)

DICOM Networking, základní služby

- ▶ Služba ověření (Verification service) je služba aplikační vrstvy. Slouží k ověření komunikace (C-ECHO)
- ▶ Služba ukládání (Storage Service, C-STORE) je určena pro přenos objektů DICOM mezi dvěma AE. Tato služba je vyjednána zvlášť pro každou třídu SOP. Aplikace tak např. může povolit ukládání CT obrázků a zakázat ukládání MR obrázků (bad practice!).

Transfer Syntax UID

Native:

Transfer Syntax UID	Description
1.2.840.10008.1.2	Implicit VR, Little Endian
1.2.840.10008.1.2.1	Explicit VR, Little Endian
1.2.840.10008.1.2.2	Explicit VR, Big Endian

SOP UID

SOP UID	SOP name
1.2.840.10008.1.1	Verification SOP Class
1.2.840.10008.1.20.1	Storage Commitment Push Model SOP Class
1.2.840.10008.1.20.2	Storage Commitment Pull Model SOP Class Retired
1.2.840.10008.1.3.10	Media Storage Directory Storage
1.2.840.10008.1.40	Procedural Event Logging SOP Class
1.2.840.10008.5.1.4.1.1.7	Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.1	Multiframe Single Bit Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.2	Multiframe Grayscale Byte Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.3	Multiframe Grayscale Word Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.1.7.4	Multiframe True Color Secondary Capture Image Storage
1.2.840.10008.5.1.4.1.2.1.1	Patient Root Query/Retrieve Information Model – FIND
1.2.840.10008.5.1.4.1.2.1.2	Patient Root Query/Retrieve Information Model – MOVE
1.2.840.10008.5.1.4.1.2.1.3	Patient Root Query/Retrieve Information Model – GET
1.2.840.10008.5.1.4.1.2.2.1	Study Root Query/Retrieve Information Model – FIND
1.2.840.10008.5.1.4.1.2.2.2	Study Root Query/Retrieve Information Model – MOVE
1.2.840.10008.5.1.4.1.2.2.3	Study Root Query/Retrieve Information Model – GET
1.2.840.10008.5.1.4.31	Modality Worklist Information Model – FIND
1.2.840.10008.5.1.4.32.1	General Purpose Worklist Information Model – FIND

Viz <http://www.dicomlibrary.com/dicom/sop/>

Základní příkazy

- ▶ C-ECHO
- ▶ C-FIND
- ▶ C-STORE
- ▶ C-MOVE
- ▶ C-GET

C-ECHO

- ▶ DICOM Ping
- ▶ Pozor, není ICMP ping(!)
- ▶ Používá úplné vyjednávání (negotiation)
(testuje tedy více, než konektivitu IP)
- ▶ Každá AE, která podporuje asociace, musí C-ECHO podporovat.

C-FIND

- ▶ Součást služby *Query/Retrieve*
- ▶ Připodobňuje se SQL:
 - ▶ *Matching part*: SQL WHERE (nutné vyplnit)
 - ▶ *To be returned part*: SQL SELECT (prázdná pole)
- ▶ SCP Response: vyhovující datasety. Nakonec pošle potvrzení.

C-STORE

- ▶ DICOM Push
- ▶ SCU odesílá kompozitní instanci do SCP
- ▶ Slouží k odesílání obrázků z modality do úložiště PACS, nebo pro vytvoření doručovacího (delivery) mechanismu pro C-MOVE

C-MOVE

- ▶ Vyžaduje, aby SCP fungoval jako C-STORE SCU. Kopíruje kompozitní instance do zvoleného AET (v 99 % do původního C-MOVE SCU)

¹Picture Archiving and Communication System

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- ▶ Vyžaduje, aby SCP fungoval jako C-STORE SCU. Kopíruje kompozitní instance do zvoleného AET (v 99 % do původního C-MOVE SCU)
- ▶ Nevýhoda: V požadavku lze zadat pouze AET (nikoliv IP/port). SCP tak musí mít tyto informace hardcoded v datových tabulkách (přidání často zpoplatněno).

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- ▶ Nevýhoda: C-MOVE SCP musí vytvořit TCP spojení (k C-MOVE SCU), ale:
 - ▶ Pokud má SCU dynamickou IP (např. DHCP), je serveru *neznámá*.
 - ▶ Problémy s firewally
 - ▶ Problémy s NAT

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 - ▶ Pokud má SCU dynamickou IP (např. DHCP), je serveru *neznámá*.
 - ▶ Problémy s firewally
 - ▶ Problémy s NAT
- ▶ I tak bývá C-MOVE jediný protokol, nabízený většinou PACS¹

¹Picture Archiving and Communication System

C-GET

- ▶ Podobný C-MOVE, ale využívá původní asociaci
- ▶ Nevýhoda: SCU musí dopředu znát třídy SOP, které bude přijímat (musí vyjednat vhodné prezentační kontexty). Tyto informace lze (většinou) zjistit pomocí C-FIND.
- ▶ Nevýhoda: Málo podporovaný dodavateli řešení PACS

Normalizované operace

Jednoduché databázové operace. Slouží jako základní blok pro složitější služby, např. tiskové služby.

- ▶ N-CREATE
- ▶ N-GET
- ▶ N-SET
- ▶ N-ACTION
- ▶ N-DELETE
- ▶ N-EVENT-REPORT

N-CREATE

- ▶ V rámci SCP vytvoří dataset pro další použití.
- ▶ *Instance UID* může být specifikováno SCU. Je-li prázdné, přiřadí jej SCP.

N-GET

- ▶ Žádost o jednoduchý dataset.
- ▶ Vyžaduje *Instance UID*. Může se jednat o tzv. *Well Known UIDs*:

N-GET

- ▶ Žádost o jednoduchý dataset.
- ▶ Vyžaduje *Instance UID*. Může se jednat o tzv. *Well Known UIDs*:
 - ▶ Instance_StorageCommitmentPush 1.2.840.10008.1.20.1.1
 - ▶ Instance_Printer 1.2.840.10008.5.1.1.17
 - ▶ ... a další (méně používané)

N-SET

- ▶ Aktualizace jednoduchého datasetu.
- ▶ Vyžaduje *Instance UID*.
- ▶ Nejčastěji k umístění obrázku pro tisk na určitou část filmu.
- ▶ Slouží k aktualizaci stavu vyšetření (Modality Performed Procedure Step Service)

N-ACTION

- ▶ Žádost k SCP o blíže neurčenou akci.
- ▶ Nejčastěji tisk filmu, kontrola stavu uložení (část Storage Commitment²)

²Ověření, že byl obrázek opravdu přijat úložištěm. Některá úložiště totiž přijmou soubor (a potvrdí příjem) a až později zpracují záhlaví (např. při použití fronty). A to nemusí projít.

N-DELETE

- ▶ Žádost k SCP o smazání určitého objektu.

N-EVENT-REPORT

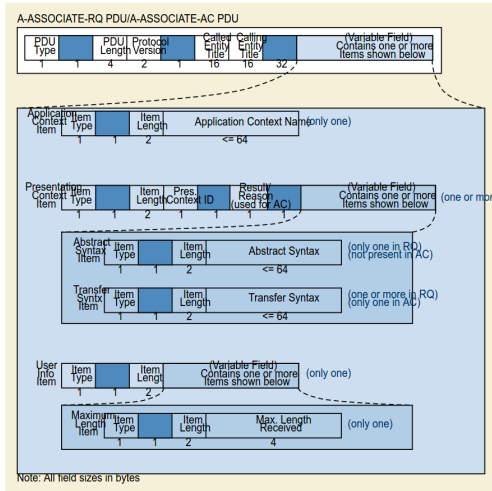
- ▶ Pozor, neobvykle posílána od SCP k SCU.
- ▶ Dříve používána pro aktualizaci stavu tiskárny (alert k SCU o film jam).
- ▶ Dále používána pro Storage Commitment

DICOM PDU: Typy

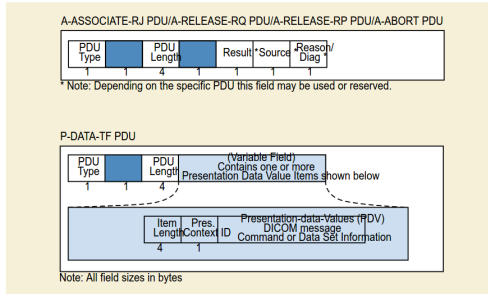
Code	PDU Type Symbol	Description
01	:A-Associate-RQ	Association request (from client)
02	:A-Associate-AC	Association accept (from server)
03	:A-Associate-RJ	Association reject (from server)
04	:P-Data-TF	Message containing command(s) and/or data
05	:A-Release-RQ	Association release request
06	:A-Release-RSP	Association release response
07	:A-Abort	Association abort notification

A: Association, P:Presentation, TF: Technical Framework
PDU: Protocol Data Unit

PDU Structure and encoding



PDU Structure and encoding



Obrázek: PDU Structure and encoding

Aneb po stopách C-ECHO

(Packet sniffing)

- ▶ `$ echoscu -aet ORTHANC -d 172.17.0.1 4242`

Aneb po stopách C-ECHO

(Packet sniffing)

- ▶ `$ echoscu -aet ORTHANC -d 172.17.0.1 4242`
- ▶ A-ASSOCIATE-RQ → PDU

Aneb po stopách C-ECHO

(Packet sniffing)

- ▶ `$ echoscu -aet ORTHANC -d 172.17.0.1 4242`
- ▶ A-ASSOCIATE-RQ → PDU
- ▶ PDU → A-ASSOCIATE-AC

C-ECHO Part I

```
$ echoscu -aet ORTHANC -d 172.17.0.1 4242
```

```
D: $dcmtk: echoscu v3.6.0 2011-01-06 $
D:
D: Request Parameters:
D: ===== BEGIN A-ASSOCIATE-RQ =====
D: Our Implementation Class UID:      1.2.276.0.7230010.3.0.3.6.0
D: Our Implementation Version Name:   OFFIS_DCMTK_360
D: Their Implementation Class UID:
D: Their Implementation Version Name:
D: Application Context Name:          1.2.840.10008.3.1.1.1
D: Calling Application Name:          ORTHANC
D: Called Application Name:           ANY-SCP
D: Responding Application Name:       resp. AP Title
D: Our Max PDU Receive Size:         16384
D: Their Max PDU Receive Size:       0
D: Presentation Contexts:
D:   Context ID:                      1 (Proposed)
D:   Abstract Syntax: =VerificationSOPClass
D:   Proposed SCP/SCU Role: Default
D:   Proposed Transfer Syntax(es):
D:   =LittleEndianImplicit
D: Requested Extended Negotiation: none
D: Accepted Extended Negotiation: none
D: Requested User Identity Negotiation: none
D: User Identity Negotiation Response: none
D: ===== END A-ASSOCIATE-RQ =====
...
```

ASSOCIATE-RQ

PDU bytes	Field name	Description of field
1	PDU-type	01H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-6	PDU-length	This PDU-length shall be the number of bytes from the first byte of the following field to the last byte of the variable field. It shall be encoded as an unsigned binary number
7-8	Protocol-version	This two byte field shall use one bit to identify each version of the DICOM UL protocol supported by the calling end-system. This is Version 1 and shall be identified with bit 0 set. A receiver of this PDU implementing only this version of the DICOM UL protocol shall only test that bit 0 is set.
9-10	Reserved	This reserved field shall be sent with a value 0000H but not tested to this value when received.
11-26	Called-AE-title	Destination DICOM Application Name. It shall be encoded as 16 characters as defined by the ISO 646:1990-Basic G0 Set with leading and trailing spaces (20H) being non-significant. The value made of 16 spaces (20H) meaning "no Application Name specified" shall not be used. For a complete description of the use of this field, see Section 7.1.1.4 .
27-42	Calling-AE-title	Source DICOM Application Name. It shall be encoded as 16 characters as defined by the ISO 646:1990-Basic G0 Set with leading and trailing spaces (20H) being non-significant. The value made of 16 spaces (20H) meaning "no Application Name specified" shall not be used. For a complete description of the use of this field, see Section 7.1.1.3 .
43-74	Reserved	This reserved field shall be sent with a value 00H for all bytes but not tested to this value when received
75-xxx	Variable items	This variable field shall contain the following items: one Application Context Item, one or more Presentation Context Items and one User Information Item. For a complete description of the use of these items see Section 7.1.1.2 , Section 7.1.1.13 , and Section 7.1.1.6 .

Obrázek: PDU: ASSOCIATE-RQ Fields, Tab. 9-11

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d 01 ..... ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 20 4f 52 54 48 SCP ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00 ANC ....
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0080 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 .....
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1. ....0..
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840.10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1.2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ...:0...
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 ,@.R...1.2.276.0
00f0 2e 37 32 33 30 30 31 30 2e 33 2e 30 2e 33 2e 36 ,7230010.3.0.3.6
0100 2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54 .0U...0F FIS DCMT
0110 4b 5f 33 36 30 K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d	0*	..... ANY-
0050	53 43 50 20 20 20 20 20 20 20 20 20 4f 52 54 48	SCP	ORTH
0060	41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00	ANC	....
0070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00		.....
0080	00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15		.....
0090	31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e		1.2.840.10008.3.
00a0	31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00		1.1.1. ....0..
00b0	11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31		.1.2.840.10008.1
00c0	2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30		.10...1. 2.840.10
00d0	30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00		008.1.2P ...:0....
00e0	00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30		.0.R...1 .2.276.0
00f0	2e 37 32 33 30 30 31 30 2e 33 2e 30 2e 33 2e 36		.7230010 .3.0.3.6
0100	2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54		.0U...0F F15 DCMT
0110	4b 5f 33 36 30		K 360

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: PDU Type: 0x01, 2.: 0x00, 3.–6.: Len (0xCD=205),
Endianness?!

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd	00 01 00 00 41 4e 59 2d	0*	..... ANY-
0050	53 43 50 20 20 20 20 20	20 20 20 20 4f 52 54 48	SCP	ORTH
0060	41 4e 43 20 20 20 20 20	20 20 20 20 00 00 00 00	ANC	....
0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00		.....
0080	00 00 00 00 00 00 00 00	00 00 00 00 10 00 00 15		.....
0090	31 2e 32 2e 38 34 30 2e	31 30 30 30 38 2e 33 2e		1.2.840.10008.3.
00a0	31 2e 31 2e 31 20 00 00	2e 01 00 ff 00 30 00 00		1.1.1. ....0.
00b0	11 31 2e 32 2e 38 34 30	2e 31 30 30 30 38 2e 31		1.2.840.10008.1
00c0	2e 31 40 00 00 11 31 2e	32 2e 38 34 30 2e 31 30		.10...1. 2.840.10
00d0	30 30 38 2e 31 2e 32 50	00 00 3a 51 00 00 04 00		008.1.2P ...:0....
00e0	00 40 00 52 00 00 1b 31	2e 32 2e 32 37 36 2e 30		.0.R...1 .2.276.0
00f0	2e 37 32 33 30 30 31 30	2e 33 2e 30 2e 33 2e 36		.7230010 .3.0.3.6
0100	2e 30 55 00 00 0f 4f 46	46 49 53 5f 44 43 4d 54		.0U...0F FIS DCMT
0110	4b 5f 33 36 30		K 360	

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: PDU Type: 0x01, 2.: 0x00, 3.–6.: Len (0xCD=205),
Endianness?!

Note: Ref part 08, sec. 9.3.1:

The Big Endian byte ordering has been chosen for consistency with the OSI and TCP/IP environment. This pertains to the DICOM UL PDU headers only. The encoding of the PDV message fragments is defined by the Transfer Syntax negotiated at association establishment.

ASSOCIATE-RQ

PDU bytes	Field name	Description of field
1	PDU-type	01H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-6	PDU-length	This PDU-length shall be the number of bytes from the first byte of the following field to the last byte of the variable field. It shall be encoded as an unsigned binary number
7-8	Protocol-version	This two byte field shall use one bit to identify each version of the DICOM UL protocol supported by the calling end-system. This is Version 1 and shall be identified with bit 0 set. A receiver of this PDU implementing only this version of the DICOM UL protocol shall only test that bit 0 is set.
9-10	Reserved	This reserved field shall be sent with a value 0000H but not tested to this value when received.
11-26	Called-AE-title	Destination DICOM Application Name. It shall be encoded as 16 characters as defined by the ISO 646:1990-Basic G0 Set with leading and trailing spaces (20H) being non-significant. The value made of 16 spaces (20H) meaning "no Application Name specified" shall not be used. For a complete description of the use of this field, see Section 7.1.1.4 .
27-42	Calling-AE-title	Source DICOM Application Name. It shall be encoded as 16 characters as defined by the ISO 646:1990-Basic G0 Set with leading and trailing spaces (20H) being non-significant. The value made of 16 spaces (20H) meaning "no Application Name specified" shall not be used. For a complete description of the use of this field, see Section 7.1.1.3 .
43-74	Reserved	This reserved field shall be sent with a value 00H for all bytes but not tested to this value when received
75-xxx	Variable items	This variable field shall contain the following items: one Application Context Item, one or more Presentation Context Items and one User Information Item. For a complete description of the use of these items see Section 7.1.1.2 , Section 7.1.1.13 , and Section 7.1.1.6 .

Obrázek: PDU: ASSOCIATE-RQ Fields, Tab. 9-11

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd	00 01 00 00 41 4e 59 2d	0+	.....ANY-
0050	53 43 50 20 20 20 20 20	20 20 20 20 4f 52 54 48	SCP	.....ORTH
0060	41 4e 43 20 20 20 20 20	20 20 20 20 00 00 00 00	ANC	.....
0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00		.....
0080	00 00 00 00 00 00 00 00	00 00 00 00 10 00 00 15		.....
0090	31 2e 32 2e 38 34 30 2e	31 30 30 30 38 2e 33 2e	1.2.840.10008.3.	
00a0	31 2e 31 2e 31 20 00 00	2e 01 00 ff 00 30 00 00	1.1.1.....0..	
00b0	11 31 2e 32 2e 38 34 30	2e 31 30 30 30 38 2e 31	1.2.840.10008.1	
00c0	2e 31 40 00 00 11 31 2e	32 2e 38 34 30 2e 31 30	10...1.2.840.10	
00d0	30 30 38 2e 31 2e 32 50	00 00 3a 51 00 00 04 00	008.1.2P...:0...	
00e0	00 40 00 52 00 00 1b 31	2e 32 2e 32 37 36 2e 30	.0.R...1.2.276.0	
00f0	2e 37 32 33 30 30 31 30	2e 33 2e 30 2e 33 2e 36	.7230010.3.0.3.6	
0100	2e 30 55 00 00 0f 4f 46	46 49 53 5f 44 43 4d 54	.0U...OF FTS DCMT	
0110	4b 5f 33 36 30		K 360	

Obrázek: PDU: ASSOCIATE-RQ Fields

7.–8.: Proto ver., 9.–10.: 0x00,
 11.–26.: Called AET, 27.–42.: Calling AET,
 43.–74.: Reserved

ASSOCIATE-RQ

PDU bytes	Field name	Description of field
1	PDU-type	01H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-6	PDU-length	This PDU-length shall be the number of bytes from the first byte of the following field to the last byte of the variable field. It shall be encoded as an unsigned binary number
7-8	Protocol-version	This two byte field shall use one bit to identify each version of the DICOM UL protocol supported by the calling end-system. This is Version 1 and shall be identified with bit 0 set. A receiver of this PDU implementing only this version of the DICOM UL protocol shall only test that bit 0 is set.
9-10	Reserved	This reserved field shall be sent with a value 0000H but not tested to this value when received.
11-26	Called-AE-title	Destination DICOM Application Name. It shall be encoded as 16 characters as defined by the ISO 646:1990-Basic G0 Set with leading and trailing spaces (20H) being non-significant. The value made of 16 spaces (20H) meaning "no Application Name specified" shall not be used. For a complete description of the use of this field, see Section 7.1.1.4 .
27-42	Calling-AE-title	Source DICOM Application Name. It shall be encoded as 16 characters as defined by the ISO 646:1990-Basic G0 Set with leading and trailing spaces (20H) being non-significant. The value made of 16 spaces (20H) meaning "no Application Name specified" shall not be used. For a complete description of the use of this field, see Section 7.1.1.3 .
43-74	Reserved	This reserved field shall be sent with a value 00H for all bytes but not tested to this value when received
75-xxx	Variable items	This variable field shall contain the following items: one Application Context Item, one or more Presentation Context Items and one User Information Item. For a complete description of the use of these items see Section 7.1.1.2 , Section 7.1.1.13 , and Section 7.1.1.6 .

Obrázek: PDU: ASSOCIATE-RQ Fields, Tab. 9-11

ASSOCIATE-RQ

Item bytes	Field name	Description of field
1	Item-type	10H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-4	Item-length	This Item-length shall be the number of bytes from the first byte of the following field to the last byte of the Application-context-name field. It shall be encoded as an unsigned binary number.
5-xxx	Application-context-name	A valid Application-context-name shall be encoded as defined in Annex F . For a description of the use of this field see Section 7.1.1.2 . Application-context-names are structured as UIDs as defined in PS3.5 (see Annex A for an overview of this concept). DICOM Application-context-names are registered in PS3.7 .

Obrázek: PDU: ASSOCIATE-RQ Application Context, Tab. 9-12

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd	00 01 00 00 41 4e 59 2d	0+1..... ANY-
0050	53 43 50 20 20 20 20 20	20 20 20 20 4f 52 54 48	SCP ORTH
0060	41 4e 43 20 20 20 20 20	20 20 20 20 00 00 00 00	ANC
0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....
0080	00 00 00 00 00 00 00 00	00 00 00 00 10 00 00 15	.....
0090	31 2e 32 2e 38 34 30 2e	31 30 30 30 38 2e 33 2e	1.2.840.10008.3.
00a0	31 2e 31 2e 31 20 00 00	2e 01 00 ff 00 30 00 00	1.1.1.....0..
00b0	11 31 2e 32 2e 38 34 30	2e 31 30 30 30 38 2e 31	1.2.840.10008.1
00c0	2e 31 40 00 00 11 31 2e	32 2e 38 34 30 2e 31 30	10...1. 2.840.10
00d0	30 30 38 2e 31 2e 32 50	00 00 3a 51 00 00 04 00	008.1.2P ...:0....
00e0	00 40 00 52 00 00 1b 31	2e 32 2e 32 37 36 2e 30	.0.R...1 .2.276.0
00f0	2e 37 32 33 30 31 30	2e 33 2e 30 2e 33 2e 36	.7230010 .3.0.3.6
0100	2e 30 55 00 00 0f 4f 46	46 49 53 5f 44 43 4d 54	.0U...OF FIS DCMT
0110	4b 5f 33 36 3e		K 360

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x10, 2.: 0x00, 3.–4.: Len (0x15=21), *Endianness?!*,
 5+: App Ctx Name (ref: Part07, A.2.1):

*A single DICOM Application Context Name is defined
 for this version of this Standard. This name is
 "1.2.840.10008.3.1.1.1"*

ASSOCIATE-RQ

Item bytes	Field name	Description of field
1	Item-type	20H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-4	Item-length	This Item-length shall be the number of bytes from the first byte of the following field to the last byte of the last Transfer Syntax Item. It shall be encoded as an unsigned binary number.
5	Presentation-context-ID	Presentation-context-ID values shall be odd integers between 1 and 255, encoded as an unsigned binary number. For a complete description of the use of this field see Section 7.1.1.13 .
6	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
7	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
8	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
9-xxx	Abstract/Transfer Syntax Sub-Items	This variable field shall contain the following sub-items: one Abstract Syntax and one or more Transfer Syntax(es). For a complete description of the use and encoding of these sub-items see Section 9.3.2.2.1 and Section 9.3.2.2.2 .

Obrázek: PDU: ASSOCIATE-RQ Fields, Presentation Context, Tab. 9-13

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d 0* ..... ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 20 4f 52 54 48 SCP ..... ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00 ANC .....
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0080 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 .....
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1. ....0..
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840.10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1. 2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ..:0...
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 .0.R...1 .2.276.0
00f0 2e 37 32 33 30 31 30 2e 33 2e 30 2e 33 2e 36 .7230010 .3.0.3.6
0100 2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54 .0U...0F FIS DCMT
0110 4b 5f 33 36 30 K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x20, 2.: 0x00, 3.–4.: Len (0x2E=46),
Endianness?!, 5.: PresentatinContext ID (odd, 1–255),
 6.–8.: Reserved, 9+: Abstract Syntax, Transfer syntax(es)

ASSOCIATE-RQ

Item bytes	Field name	Description of field
1	Item-type	30H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-4	Item-length	This Item-length shall be the number of bytes from the first byte of the following field to the last byte of the Abstract-syntax-name field. It shall be encoded as an unsigned binary number.
5-xxx	Abstract-syntax-name	This variable field shall contain the Abstract-syntax-name related to the proposed presentation context. A valid Abstract-syntax-name shall be encoded as defined in Annex E . For a description of the use of this field see Section 7.1.1.13 . Abstract-syntax-names are structured as UIDs as defined in PS3.5 (see Annex B for an overview of this concept). DICOM Abstract-syntax-names are registered in PS3.4 .

Obrázek: PDU: ASSOCIATE-RQ Fields, Presentation Context, Abstract Syntax, Tab. 9-14

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd	00 01 00 00 41 4e 59 2d	0+	..... ANY-
0050	53 43 50 20 20 20 20 20	20 20 20 20 4f 52 54 48	SCP	ORTH
0060	41 4e 43 20 20 20 20 20	20 20 20 20 00 00 00 00	ANC	....
0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00		.....
0080	00 00 00 00 00 00 00 00	00 00 00 00 10 00 00 15		.....
0090	31 2e 32 2e 38 34 30 2e	31 30 30 30 38 2e 33 2e		1.2.840.10008.3.
00a0	31 2e 31 2e 31 20 00 00	2e 01 00 ff 00 30 00 00		1.1.1
00b0	11 31 2e 32 2e 38 34 30	2e 31 30 30 30 38 2e 31		1.2.840.10008.1
00c0	2e 31 40 00 00 11 31 2e	32 2e 38 34 30 2e 31 30		10...1.2.840.10
00d0	30 30 38 2e 31 2e 32 50	00 00 3a 51 00 00 04 00		008.1.2P ...0...
00e0	00 40 00 52 00 00 1b 31	2e 32 2e 32 37 36 2e 30		.0.R...1.2.276.0
00f0	2e 37 32 33 30 30 31 30	2e 33 2e 30 2e 33 2e 36		.7230010.3.0.3.6
0100	2e 30 55 00 00 0f 4f 46	46 49 53 5f 44 43 4d 54		.0U...OF FTS DCMT
0110	4b 5f 33 36 30		K 360	

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x30, 2.: 0x00, 3.–4.: Len (0x11=17), *Endianness?!*,
 5+: Abstract Syntax Name

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd	00 01 00 00 41 4e 59 2d	0+	.....ANY-
0050	53 43 50 20 20 20 20 20	20 20 20 20 4f 52 54 48	SCP	.....ORTH
0060	41 4e 43 20 20 20 20 20	20 20 20 20 00 00 00 00	ANC	.....
0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00		.....
0080	00 00 00 00 00 00 00 00	00 00 00 00 10 00 00 15		.....
0090	31 2e 32 2e 38 34 30 2e	31 30 30 30 38 2e 33 2e		1.2.840.10008.3.
00a0	31 2e 31 2e 31 20 00 00	2e 01 00 ff 00 30 00 00		1.1.1.....0..
00b0	11 31 2e 32 2e 38 34 30	2e 31 30 30 30 38 2e 31		1.2.840.10008.1
00c0	2e 31 40 00 00 11 31 2e	32 2e 38 34 30 2e 31 30		10...1.2.840.10
00d0	30 30 38 2e 31 2e 32 50	00 00 3a 51 00 00 04 00		008.1.2P...:0...
00e0	00 40 00 52 00 00 1b 31	2e 32 2e 32 37 36 2e 30		.0.R...1.2.276.0
00f0	2e 37 32 33 30 30 31 30	2e 33 2e 30 2e 33 2e 36		.7230010.3.0.3.6
0100	2e 30 55 00 00 0f 4f 46	46 49 53 5f 44 43 4d 54		.0U...OF FTS DCMT
0110	4b 5f 33 36 30		K 360	

Obrázek: PDU: ASSOCIATE-RQ Fields

- 1.: Item Type: 0x30, 2.: 0x00, 3.–4.: Len (0x11=17), *Endianness?!*,
- 5+: Abstract Syntax Name
- 1.2.840.10008.1.1: Verification SOP Class

ASSOCIATE-RQ

Item bytes	Field name	Description of field
1	Item-type	40H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-4	Item-length	This Item-length shall be the number of bytes from the first byte of the following field to the last byte of the Transfer-syntax-name field(s). It shall be encoded as an unsigned binary numbers
5-xxx	Transfer-syntax-name(s)	This variable field shall contain the Transfer-syntax-name proposed for this presentation context. A valid Transfer-syntax-name shall be encoded as defined in Annex E . For a description of the use of this field see Section 7.1.1.13 . Transfer-syntax-names are structured as UIDs as defined in PS3.5 (see Annex B for an overview of this concept). DICOM Transfer-syntax-names are registered in PS3.5 .

Obrázek: PDU: ASSOCIATE-RQ Fields, Presentation Context, Transfer Syntax, Tab. 9-15

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 cd 00 01 00 00 41 4e 59 2d 0* ..... ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 4f 52 54 48 SCP ..... ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 00 00 00 00 ANC .....
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0080 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 .....
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1. ....0..
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840.10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1.2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ..:0...
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 .0.R...1.2.276.0
00f0 2e 37 32 33 30 31 30 2e 33 2e 30 2e 33 2e 36 .7230010.3.0.3.6
0100 2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54 .0U...0F FIS DCMT
0110 4b 5f 33 36 30 K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x40, 2.: 0x00, 3.–4.: Len (0x11=17), *Endianness?!*,
 5+: Transfer Syntax Name(s)

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 cd 00 01 00 00 41 4e 59 2d 0* ..... ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 4f 52 54 48 SCP ..... ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 00 00 00 00 ANC .....
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0080 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 .....
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1. ....0..
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840.10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1.2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ..:0...
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 .0.R...1.2.276.0
00f0 2e 37 32 33 30 31 30 2e 33 2e 30 2e 33 2e 36 .7230010.3.0.3.6
0100 2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54 .0U...0F FIS DCMT
0110 4b 5f 33 36 30 K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ Fields

- 1.: Item Type: 0x40, 2.: 0x00, 3.–4.: Len (0x11=17), *Endianness?!*,
- 5+: Transfer Syntax Name(s)
- 1.2.840.10008.1.2: Neviděli jsme to někde?

Transfer Syntax UID

Native:

Transfer Syntax UID	Description
1.2.840.10008.1.2	Implicit VR, Little Endian
1.2.840.10008.1.2.1	Explicit VR, Little Endian
1.2.840.10008.1.2.2	Explicit VR, Big Endian

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d 0+ . . . . . ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 20 20 4f 52 54 48 SCP . . . . . ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00 ANC . . . . .
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 . . . . .
0080 00 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 . . . . .
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1 . . . . .0.
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840.10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1. 2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ..:0....
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 .0.R...1 2.276.0
00f0 2e 37 32 33 30 31 30 2e 33 2e 30 2e 33 2e 36 .7230010 3.0.3.6
0100 2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54 .0U...0F FIS DCMT
0110 4b 5f 33 36 30 K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ Fields

- 1.: Item Type: 0x40, 2.: 0x00, 3.–4.: Len (0x11=17), *Endianness?!*,
- 5+: Transfer Syntax Name(s)
- 1.2.840.10008.1.2: Implicit VR, LE

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d 0+ . . . . . ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 20 20 4f 52 54 48 SCP . . . . . ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00 ANC . . . . .
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 . . . . .
0080 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 . . . . .
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1 . . . . .0.
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840.10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1. 2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ..:0....
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 .0.R...1 2.276.0
00f0 2e 37 32 33 30 31 30 2e 33 2e 30 2e 33 2e 36 .7230010 3.0.3.6
0100 2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54 .0U...0F FIS DCMT
0110 4b 5f 33 36 30 .K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ Fields

- 1.: Item Type: 0x40, 2.: 0x00, 3.–4.: Len (0x11=17), *Endianness?!*,
- 5+: Transfer Syntax Name(s)
- 1.2.840.10008.1.2: Implicit VR, LE
- Tím jsme skončili *Presentation Context*

ASSOCIATE-RQ

Souhrn:

- ▶ Protocol version: Version 1
- ▶ Called AET: ANY-SCP
- ▶ Calling AET: ORTHANC

ASSOCIATE-RQ

Souhrn:

- ▶ Protocol version: Version 1
- ▶ Called AET: ANY-SCP
- ▶ Calling AET: ORTHANC
- ▶ App.Ctx: 1.2.840.10008.3.1.1.1: DICOM App Context Name

ASSOCIATE-RQ

Souhrn:

- ▶ Protocol version: Version 1
- ▶ Called AET: ANY-SCP
- ▶ Calling AET: ORTHANC
- ▶ App.Ctx: 1.2.840.10008.3.1.1.1: DICOM App Context Name
- ▶ Pres.Ctx:
 - ▶ Abstract Syntax: 1.2.840.10008.1.1: VerificationSOPClass
 - ▶ Transfer Syntax: 1.2.840.10008.1.2: Implicit VR, LE

ASSOCIATE-RQ

Souhrn:

- ▶ Protocol version: Version 1
- ▶ Called AET: ANY-SCP
- ▶ Calling AET: ORTHANC
- ▶ App.Ctx: 1.2.840.10008.3.1.1.1: DICOM App Context Name
- ▶ Pres.Ctx:
 - ▶ Abstract Syntax: 1.2.840.10008.1.1: VerificationSOPClass
 - ▶ Transfer Syntax: 1.2.840.10008.1.2: Implicit VR, LE
- ▶ User Info: TBD

ASSOCIATE-RQ

Souhrn:

- ▶ Protocol version: Version 1
- ▶ Called AET: ANY-SCP
- ▶ Calling AET: ORTHANC
- ▶ App.Ctx: 1.2.840.10008.3.1.1.1: DICOM App Context Name
- ▶ Pres.Ctx:
 - ▶ Abstract Syntax: 1.2.840.10008.1.1: VerificationSOPClass
 - ▶ Transfer Syntax: 1.2.840.10008.1.2: Implicit VR, LE
- ▶ User Info: TBD

Q: Co je vlastně *1.2.840.10008*?

ASSOCIATE-RQ

Souhrn:

- ▶ Protocol version: Version 1
- ▶ Called AET: ANY-SCP
- ▶ Calling AET: ORTHANC
- ▶ App.Ctx: 1.2.840.10008.3.1.1.1: DICOM App Context Name
- ▶ Pres.Ctx:
 - ▶ Abstract Syntax: 1.2.840.10008.1.1: VerificationSOPClass
 - ▶ Transfer Syntax: 1.2.840.10008.1.2: Implicit VR, LE
- ▶ User Info: TBD

Q: Co je vlastně *1.2.840.10008*?

A: NEMA registered root ID from ANSI (has 1.2.840 root).

ASSOCIATE-RQ

Item bytes	Field name	Description of field
1	Item-type	50H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-4	Item-length	This Item-length shall be the number of bytes from the first byte of the following field to the last byte of the User-data field(s). It shall be encoded as an unsigned binary number.
5-xxx	User-data	This variable field shall contain User-data sub-items as defined by the DICOM Application Entity. The structure and content of these sub-items is defined in Annex D .

Obrázek: PDU: ASSOCIATE-RQ Fields, User Information, Tab. 9-16

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 cd 00 01 00 00 41 4e 59 2d 0* ..... ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 4f 52 54 48 SCP ..... ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 00 00 00 00 ANC .....
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0080 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 .....
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1. ....0..
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840.10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1. 2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ..:0...
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 .0.R...1 .2.276.0
00f0 2e 37 32 33 30 31 30 2e 33 2e 30 2e 33 2e 36 .7230010 .3.0.3.6
0100 2e 30 55 00 0f 4f 46 46 49 53 5f 44 43 4d 54 .0U...0F FIS DCMT
0110 4b 5f 33 36 3e K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x50, 2.: 0x00, 3.–4.: Len (0x3A=58), *Endianity!*,
 5+: User-data (def. by DICOM AE)

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d	0*	..... ANY-
0050	53 43 50 20 20 20 20 20 20 20 20 20 4f 52 54 48	SCP	ORTh
0060	41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00	ANC	....
0070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00		.....
0080	00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15		.....
0090	31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e		1.2.840.10008.3.
00a0	31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00		1.1.10..
00b0	11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31		.1.2.840 .10008.1
00c0	2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30		.10...1. 2.840.10
00d0	30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00		008.1.2P .:0....
00e0	00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30		.@.R...1 .2.276.0
00f0	2e 37 32 33 30 31 30 2e 33 2e 30 2e 33 2e 36		.7230010 .3.0.3.6
0100	2e 30 55 00 0f 4f 46 46 49 53 5f 44 43 4d 54		.0U...0F FIS DCMT
0110	4b 5f 33 36 3e	K 360	

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x50, 2.: 0x00, 3.–4.: Len (0x3A=58), *Endianity!*,
 5+: User-data (def. by DICOM AE)
 Ale co to zase je...?

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 cd 00 01 00 00 41 4e 59 2d 0* ..... ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 4f 52 54 48 SCP ..... ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 00 00 00 00 ANC .....
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0080 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 .....
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1. ....0..
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840.10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1. 2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ..:0...
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 .0.R...1 .2.276.0
00f0 2e 37 32 33 30 31 30 2e 33 2e 30 2e 33 2e 36 .7230010 .3.0.3.6
0100 2e 30 55 00 0f 4f 46 46 49 53 5f 44 43 4d 54 .0U...0F FIS DCMT
0110 4b 5f 33 36 3e K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x50, 2.: 0x00, 3.–4.: Len (0x3A=58), *Endianness!*,
 5+: User-data (def. by DICOM AE)
 Ale co to zase je...? Začíná to 0x51...

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd	00 01 00 00 41 4e 59 2d	0*	..... ANY-
0050	53 43 50 20 20 20 20 20	20 20 20 20 4f 52 54 48	SCP	ORTH
0060	41 4e 43 20 20 20 20 20	20 20 20 20 00 00 00 00	ANC	....
0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....	.....
0080	00 00 00 00 00 00 00 00	00 00 00 00 10 00 00 15	.....	.....
0090	31 2e 32 2e 38 34 30 2e	31 30 30 30 38 2e 33 2e	1.2.840.10008.3.	
00a0	31 2e 31 2e 31 20 00 00	2e 01 00 ff 00 30 00 00	1.1.10..	
00b0	11 31 2e 32 2e 38 34 30	2e 31 30 30 30 38 2e 31	.1.2.840.10008.1	
00c0	2e 31 40 00 00 11 31 2e	32 2e 38 34 30 2e 31 30	.10...1. 2.840.10	
00d0	30 30 38 2e 31 2e 32 50	00 00 3a 51 00 00 04 00	008.1.2P .:0....	
00e0	00 40 00 52 00 00 1b 31	2e 32 2e 32 37 36 2e 30	.@.R...1 .2.276.0	
00f0	2e 37 32 33 30 31 30	2e 33 2e 30 2e 33 2e 36	.7230010 .3.0.3.6	
0100	2e 30 55 00 0f 4f 46	46 49 53 5f 44 43 4d 54	.0U...0F FIS DCMT	
0110	4b 5f 33 36 3e		K 360	

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x50, 2.: 0x00, 3.–4.: Len (0x3A=58), *Endianness!*,
 5+: User-data (def. by DICOM AE)
 Ale co to zase je...? Začíná to 0x51... Ale vypadá to známě...?

ASSOCIATE-RQ

Item bytes	Field name	Description of field
1	Item-type	51H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-4	Item-length	This Item-length shall be the number of bytes from the first byte of the following field to the last byte of the Maximum-length-received field. In the case of this Item, it shall have the fixed value of 00000004H encoded as an unsigned binary number.
5-8	Maximum-length-received	This parameter allows the association-requestor to restrict the maximum length of the variable field of the P-DATA-TF PDUs sent by the acceptor on the association once established. This length value is indicated as a number of bytes encoded as an unsigned binary number. The value of (0) indicates that no maximum length is specified. This maximum length value shall never be exceeded by the PDU length values used in the PDU-length field of the P-DATA-TF PDUs received by the association-requestor. Otherwise, it shall be a protocol error.

Obrázek: PDU: ASSOCIATE-RQ Fields, User Information, Max Length, Sub-Item, Tab. D.1.1

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d 0+..... ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 20 20 4f 52 54 48 SCP      ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 20 20 00 00 00 00 ANC      ....
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0080 00 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 .....
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1 . . . . .0..
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840 .10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1. 2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ..:0....
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 .0.R...1 .2.276.0
00f0 2e 37 32 33 30 30 31 30 2e 33 2e 30 2e 33 2e 36 .7230010 .3.0.3.6
0100 2e 30 55 00 00 4f 4f 46 46 49 53 5f 44 43 4d 54 .0U...OF FIS DCMT
0110 4b 5f 33 36 30 K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x51, 2.: 0x00, 3.–4.: Len (0x04=4), *Endianity!*,
 5.–8.: Max. len. of P-DATA-TF PDU (0 means no limit):
 0x4000=16KiB.

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d	0+..... ANY-
0050	53 43 50 20 20 20 20 20 20 20 20 20 4f 52 54 48	SCP ORTH
0060	41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00	ANC
0070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0080	00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15	.....
0090	31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e	1.2.840.10008.3.
00a0	31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00	1.1.10. .
00b0	11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31	1.2.840 .10008.1
00c0	2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30	1.102.840.10
00d0	30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00	008.1.2P .:0. . . .
00e0	00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30	.0.R.2.276.0
00f0	2e 37 32 33 30 30 31 30 2e 33 2e 30 2e 33 2e 36	.7230010 3.0.3.6
0100	2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54	.0U.OF FIS DCMT
0110	4b 5f 33 36 30	K 360

Obrázek: PDU: ASSOCIATE-RQ Fields

- 1.: Item Type: 0x51, 2.: 0x00, 3.–4.: Len (0x04=4), *Endianity!*,
 5.–8.: Max. len. of P-DATA-TF PDU (0 means no limit):
 0x4000=16KiB.
 A další část (User Info) začíná 0x52...

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 cd 00 01 00 00 41 4e 59 2d	0+ ANY-
0050	53 43 50 20 20 20 20 20 20 20 20 20 4f 52 54 48	SCP ORTH
0060	41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00	ANC
0070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	. . . . .
0080	00 00 00 00 00 00 00 00 00 00 00 00 00 00 15	. . . . .
0090	31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e	1.2.840.10008.3.
00a0	31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00	1.1.1 0...
00b0	11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31	1.2.840 .10008.1
00c0	2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30	.10...1. 2.840.10
00d0	30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00	008.1.2P .:0....
00e0	00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30	.0.R...1 2.276.0
00f0	2e 37 32 33 30 30 31 30 2e 33 2e 30 2e 33 2e 36	.7230010 3.0.3.6
0100	2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54	.0U...0F FIS DCMT
0110	4b 5f 33 36 30	K 360

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x51, 2.: 0x00, 3.–4.: Len (0x04=4), *Endianness!*,
 5.–8.: Max. len. of P-DATA-TF PDU (0 means no limit):
 0x4000=16KiB.

A další část (User Info) začíná 0x52... Tak pojďme do Part07,
 Sec. D.3: Sub-items

ASSOCIATE-RQ

Item Bytes	Field Name	Description of Field
1	Item-type	52H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3 - 4	Item-length	This Item-length shall be the number of bytes from the first byte of the following field to the last byte of the Implementation-class-uid field. It shall be encoded as an unsigned binary number.
5 - xxx	Implementation-class-uid	This variable field shall contain the Implementation-class-uid of the Association-requester as defined in Section D.3.3.2 . The Implementation-class-uid field is structured as a UID as defined in PS3.5 .

Obrázek: PDU: ASSOCIATE-RQ Fields, User Information, Implementation UID, Sub-Item, Tab. D.1.1

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd	00 01 00 00 41 4e 59 2d	0+	..... ANY-
0050	53 43 50 20 20 20 20 20	20 20 20 20 4f 52 54 48	SCP	ORTH
0060	41 4e 43 20 20 20 20 20	20 20 20 20 00 00 00 00	ANC	....
0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....	.....
0080	00 00 00 00 00 00 00 00	00 00 00 00 10 00 00 15	.....	.....
0090	31 2e 32 2e 38 34 30 2e	31 30 30 30 38 2e 33 2e	1.2.840.10008.3.	
00a0	31 2e 31 2e 31 20 00 00	2e 01 00 ff 00 30 00 00	1.1.1 .. .. .0..	
00b0	11 31 2e 32 2e 38 34 30	2e 31 30 30 30 38 2e 31	1.2.840.10008.1	
00c0	2e 31 40 00 00 11 31 2e	32 2e 38 34 30 2e 31 30	1@...1. 2.840.10	
00d0	30 30 38 2e 31 2e 32 50	00 00 3a 51 00 00 04 00	008.1.2P .. :0....	
00e0	00 40 00 52 00 00 1b 31	2e 32 2e 32 37 36 2e 30	.@.R...1 .2.276.0	
00f0	2e 37 32 33 30 30 31 30	2e 33 2e 30 2e 33 2e 36	.7230010 .3.0.3.6	
0100	2e 30 55 00 00 0f 4f 46	46 49 53 5f 44 43 4d 54	.0U...OF FIS DCMT	
0110	4b 5f 33 36 36		K 360	

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x51, 2.: 0x00, 3.–4.: Len (0x1b=27), *Endianness!*,
 5.+ : Implementation Class UID

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd	00 01 00 00 41 4e 59 2d	0+	..... ANY-
0050	53 43 50 20 20 20 20 20	20 20 20 20 4f 52 54 48	SCP	ORTH
0060	41 4e 43 20 20 20 20 20	20 20 20 20 00 00 00 00	ANC	....
0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....	.....
0080	00 00 00 00 00 00 00 00	00 00 00 00 10 00 00 15	.....	.....
0090	31 2e 32 2e 38 34 30 2e	31 30 30 30 38 2e 33 2e	1.2.840.10008.3.	
00a0	31 2e 31 2e 31 20 00 00	2e 01 00 ff 00 30 00 00	1.1.1 .. .. .0..	
00b0	11 31 2e 32 2e 38 34 30	2e 31 30 30 30 38 2e 31	1.2.840.10008.1	
00c0	2e 31 40 00 00 11 31 2e	32 2e 38 34 30 2e 31 30	1@...1. 2.840.10	
00d0	30 30 38 2e 31 2e 32 50	00 00 3a 51 00 00 04 00	008.1.2P .. :0....	
00e0	00 40 00 52 00 00 1b 31	2e 32 2e 32 37 36 2e 30	.@.R...1 .2.276.0	
00f0	2e 37 32 33 30 30 31 30	2e 33 2e 30 2e 33 2e 36	.7230010 .3.0.3.6	
0100	2e 30 55 00 00 0f 4f 46	46 49 53 5f 44 43 4d 54	.0U...OF FIS DCMT	
0110	4b 5f 33 36 36		K 360	

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x51, 2.: 0x00, 3.–4.: Len (0x1b=27), *Endianity!*,
 5.+ : Implementation Class UID
 1.2.276.0.7230010.3.0.3.6.0

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd	00 01 00 00 41 4e 59 2d	0+	..... ANY-
0050	53 43 50 20 20 20 20 20	20 20 20 20 4f 52 54 48	SCP	ORTH
0060	41 4e 43 20 20 20 20 20	20 20 20 20 00 00 00 00	ANC	....
0070	00 00 00 00 00 00 00 00	00 00 00 00 00 00 00 00	.....	.....
0080	00 00 00 00 00 00 00 00	00 00 00 00 10 00 00 15	.....	.....
0090	31 2e 32 2e 38 34 30 2e	31 30 30 30 38 2e 33 2e	1.2.840.10008.3.	
00a0	31 2e 31 2e 31 20 00 00	2e 01 00 ff 00 30 00 00	1.1.1 .. .. .0..	
00b0	11 31 2e 32 2e 38 34 30	2e 31 30 30 30 38 2e 31	1.2.840.10008.1	
00c0	2e 31 40 00 00 11 31 2e	32 2e 38 34 30 2e 31 30	1@...1. 2.840.10	
00d0	30 30 38 2e 31 2e 32 50	00 00 3a 51 00 00 04 00	008.1.2P .. :0....	
00e0	00 40 00 52 00 00 1b 31	2e 32 2e 32 37 36 2e 30	.@.R...1 .2.276.0	
00f0	2e 37 32 33 30 30 31 30	2e 33 2e 30 2e 33 2e 36	.7230010 .3.0.3.6	
0100	2e 30 55 00 00 0f 4f 46	46 49 53 5f 44 43 4d 54	.0U...OF FIS DCMT	
0110	4b 5f 33 36 36		K 360	

Obrázek: PDU: ASSOCIATE-RQ Fields

- 1.: Item Type: 0x51, 2.: 0x00, 3.–4.: Len (0x1b=27), *Endianness!*,
 5.+ : Implementation Class UID
 1.2.276.0.7230010.3.0.3.6.0 A poslední část: Zkuste si ;)

ASSOCIATE-RQ

Item Bytes	Field Name	Description of Field
1	Item-type	55H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3 - 4	Item-length	This Item-length shall be the number of bytes from the first byte of the following field to the last byte of the Implementation-version-name field. It shall be encoded as an unsigned binary number.
5 - xxx	Implementation-version-name	This variable field shall contain the Implementation-version-name of the Association-requester as defined in Section D.3.3.2 . It shall be encoded as a string of 1 to 16 ISO 646:1990 (basic G0 set) characters.

Obrázek: PDU: ASSOCIATE-RQ Fields, User Information, Implementation version name, Tab. D.3.3

ASSOCIATE-RQ

0040	4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d	0+ ANY-
0050	53 43 50 20 20 20 20 20 20 20 20 20 4f 52 54 48	SCP ORTH
0060	41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00	ANC
0070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	. . . . .
0080	00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15	. . . . .
0090	31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e	.1.2.840.10008.3.
00a0	31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00	.1.1.10..
00b0	11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31	.1.2.840.10008.1
00c0	2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30	.10...1.2.840.10
00d0	30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00	008.1.2P .:0. . . .
00e0	00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30	.@.R...1.2.276.0
00f0	2e 37 32 33 30 30 31 30 2e 33 2e 30 2e 33 2e 36	.7230010 .3.0.3.6
0100	2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54	.0U...OF FIS DCMT
0110	4b 5f 33 36 34	K 360

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x55, 2.: 0x00, 3.–4.: Len ...

ASSOCIATE-RQ

```

0040 4f 2a 01 00 00 00 00 cd 00 01 00 00 41 4e 59 2d 0+ ..... ANY-
0050 53 43 50 20 20 20 20 20 20 20 20 20 4f 52 54 48 SCP      ORTH
0060 41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00 ANC      ....
0070 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
0080 00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15 .....
0090 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 1.2.840.10008.3.
00a0 31 2e 31 2e 31 20 00 00 2e 01 00 ff 00 30 00 00 1.1.1. ....0..
00b0 11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 .1.2.840.10008.1
00c0 2e 31 40 00 00 11 31 2e 32 2e 38 34 30 2e 31 30 .10...1.2.840.10
00d0 30 30 38 2e 31 2e 32 50 00 00 3a 51 00 00 04 00 008.1.2P ...0...
00e0 00 40 00 52 00 00 1b 31 2e 32 2e 32 37 36 2e 30 .@.R...1.2.276.0
00f0 2e 37 32 33 30 31 30 2e 33 2e 30 2e 33 2e 36 .7230010 .3.0.3.6
0100 2e 30 55 00 00 0f 4f 46 46 49 53 5f 44 43 4d 54 .0U...OF FIS DCMT
0110 4b 5f 33 36 34 K 360
    
```

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x55, 2.: 0x00, 3.–4.: Len ...
 OFFIS_DCMTK_360

ASSOCIATE-RQ

Souhrn:

- ▶ Protocol version: Version 1
- ▶ Called AET: ANY-SCP
- ▶ Calling AET: ORTHANC
- ▶ App.Ctx: 1.2.840.10008.3.1.1.1: DICOM App Context Name
- ▶ Pres.Ctx:
 - ▶ Abstract Syntax: 1.2.840.10008.1.1: VerificationSOPClass
 - ▶ Transfer Syntax: 1.2.840.10008.1.2: Implicit VR, LE
- ▶ User Info:

ASSOCIATE-RQ

Souhrn:

- ▶ Protocol version: Version 1
- ▶ Called AET: ANY-SCP
- ▶ Calling AET: ORTHANC
- ▶ App.Ctx: 1.2.840.10008.3.1.1.1: DICOM App Context Name
- ▶ Pres.Ctx:
 - ▶ Abstract Syntax: 1.2.840.10008.1.1: VerificationSOPClass
 - ▶ Transfer Syntax: 1.2.840.10008.1.2: Implicit VR, LE
- ▶ User Info:
 - ▶ Implementation Class UID: 1.2.276.0.7230010.3.0.3.6.0
 - ▶ Implementation Class Name: OFFIS_DCMTK_360

ASSOCIATE-RQ

Souhrn:

- ▶ Protocol version: Version 1
- ▶ Called AET: ANY-SCP
- ▶ Calling AET: ORTHANC
- ▶ App.Ctx: 1.2.840.10008.3.1.1.1: DICOM App Context Name
- ▶ Pres.Ctx:
 - ▶ Abstract Syntax: 1.2.840.10008.1.1: VerificationSOPClass
 - ▶ Transfer Syntax: 1.2.840.10008.1.2: Implicit VR, LE
- ▶ User Info:
 - ▶ Implementation Class UID: 1.2.276.0.7230010.3.0.3.6.0
 - ▶ Implementation Class Name: OFFIS_DCMTK_360
 - ▶ <http://dicom.offis.de>, DCMTK 3.6.0 Dicom Toolkit

C-ECHO Part I

```
$ echoscu -aet ORTHANC -d 172.17.0.1 4242
```

```
D: $dcmtk: echoscu v3.6.0 2011-01-06 $
D:
D: Request Parameters:
D: ===== BEGIN A-ASSOCIATE-RQ =====
D: Our Implementation Class UID:      1.2.276.0.7230010.3.0.3.6.0
D: Our Implementation Version Name:   OFFIS_DCMTK_360
D: Their Implementation Class UID:
D: Their Implementation Version Name:
D: Application Context Name:          1.2.840.10008.3.1.1.1
D: Calling Application Name:          ORTHANC
D: Called Application Name:           ANY-SCP
D: Responding Application Name:       resp. AP Title
D: Our Max PDU Receive Size:         16384
D: Their Max PDU Receive Size:       0
D: Presentation Contexts:
D:   Context ID:                      1 (Proposed)
D:   Abstract Syntax: =VerificationSOPClass
D:   Proposed SCP/SCU Role: Default
D:   Proposed Transfer Syntax(es):
D:   =LittleEndianImplicit
D: Requested Extended Negotiation: none
D: Accepted Extended Negotiation: none
D: Requested User Identity Negotiation: none
D: User Identity Negotiation Response: none
D: ===== END A-ASSOCIATE-RQ =====
...
```

C-ECHO Part II

```
$ echoscu -aet ORTHANC -d 172.17.0.1 4242
```

```
D: $dcmkt: echoscu v3.6.0 2011-01-06 $
```

```
D: Request Parameters:
```

```
D: ===== BEGIN A-ASSOCIATE-RQ =====
```

```
...
```

```
D: ===== END A-ASSOCIATE-RQ =====
```

```
I: Requesting Association
```

```
D: Constructing Associate RQ PDU
```

```
D: PDU Type: Associate Accept, PDU Length: 184 + 6 bytes PDU header
```

```
D: 02 00 00 00 00 00 b8 00 01 00 00 41 4e 59 2d 53 43
```

```
D: 50 20 20 20 20 20 20 20 20 20 20 20 4f 52 54 48 41 4e
```

```
D: 43 20 20 20 20 20 20 20 20 20 00 00 00 00 00 00
```

```
D: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
```

```
D: 00 00 00 00 00 00 00 00 00 00 10 00 00 15 31 2e
```

```
D: 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 31 2e
```

```
D: 31 2e 31 21 00 00 19 01 00 00 00 40 00 00 11 31
```

```
D: 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 2e 32
```

```
D: 50 00 00 3a 51 00 00 04 00 00 40 00 52 00 00 1b
```

```
D: 31 2e 32 2e 32 37 36 2e 30 2e 37 32 33 30 30 31
```

```
D: 30 2e 33 2e 30 2e 33 2e 36 2e 30 55 00 00 0f 4f
```

```
D: 46 46 49 53 5f 44 43 4d 54 4b 5f 33 36 30
```

```
D: Parsing an A-ASSOCIATE PDU
```

```
D: Association Parameters Negotiated:
```

```
...
```

ASSOCIATE-AC

0000	56 84 7a fe 97 99 02 42 ac 11 00 01 08 00 45 00	V.z....B .....E.
0010	00 f2 7a 8c 40 00 40 06 3d 55 ac 11 00 01 ac 11	..z.@.@.=U.....
0020	2a 01 10 92 9d c3 a1 c7 35 a1 b3 28 f4 09 80 18	*..... 5.(....
0030	00 eb 83 09 00 00 01 01 08 0a 00 ff 4f 2b 00 ff	.....0+..
0040	4f 2a 02 00 00 00 00 b8 00 01 00 00 41 4e 59 2d	0+..... ANY-
0050	53 43 50 20 20 20 20 20 20 20 20 20 4f 52 54 48	SCP ORTH
0060	41 4e 43 20 20 20 20 20 20 20 20 20 00 00 00 00	ANC
0070	00 00 00 00 00 00 00 00 00 00 00 00 00 00 00	.....
0080	00 00 00 00 00 00 00 00 00 00 00 00 10 00 00 15	.....
0090	31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e	1.2.840. 10008.3.
00a0	31 2e 31 2e 31 21 00 00 19 01 00 00 00 40 00 00	1.1.1!.....@..
00b0	11 31 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31	1.2.840. 10008.1
00c0	2e 32 50 00 00 3a 51 00 00 04 00 00 40 00 52 00	.2P.:0. ....@.R.
00d0	00 1b 31 2e 32 2e 32 37 36 2e 30 2e 37 32 33 30	..1.2.27 6.0.7230
00e0	30 31 30 2e 33 2e 30 2e 33 2e 36 2e 30 55 00 00	010.3.0. 3.6.0U..
00f0	0f 4f 46 46 49 53 5f 44 43 4d 54 4b 5f 33 36 30	.OFFIS D CMTK 360

Obrázek: PDU: ASSOCIATE-RQ Fields

1.: Item Type: 0x02, ...

ASSOCIATE-AC

PDU bytes	Field name	Description of field
1	PDU-type	02H
2	Reserved	This reserved field shall be sent with a value 00H but not tested to this value when received.
3-6	PDU-length	This PDU-length shall be the number of bytes from the first byte of the following field to the last byte of the variable field. It shall be encoded as an unsigned binary number.
7-8	Protocol-version	This two byte field shall use one bit to identify each version of the DICOM UL protocol supported by the calling end-system. This is Version 1 and shall be identified with bit 0 set. A receiver of this PDU implementing only this version of the DICOM UL protocol shall only test that bit 0 is set.
9-10	Reserved	This reserved field shall be sent with a value 0000H but not tested to this value when received.
11-26	Reserved	This reserved field shall be sent with a value identical to the value received in the same field of the A-ASSOCIATE-RQ PDU, but its value shall not be tested when received.
27-42	Reserved	This reserved field shall be sent with a value identical to the value received in the same field of the A-ASSOCIATE-RQ PDU, but its value shall not be tested when received.
43-74	Reserved	This reserved field shall be sent with a value identical to the value received in the same field of the A-ASSOCIATE-RQ PDU, but its value shall not be tested when received.
75-xxx	Variable items	This variable field shall contain the following items: one Application Context Item, one or more Presentation Context Item(s) and one User Information Item. For a complete description of these items see Section 7.1.1.2 , Section 7.1.1.14 , and Section 7.1.1.6 .

Obrázek: PDU: ASSOCIATE-AC Fields

C-ECHO Part III

```
$ echoscu -aet ORTHANC -d 172.17.0.1 4242
```

```
D: $dcmtk: echoscu v3.6.0 2011-01-06 $
```

```
D: Request Parameters:
```

```
D: ===== BEGIN A-ASSOCIATE-RQ =====
```

```
...
```

```
D: ===== END A-ASSOCIATE-RQ =====
```

```
I: Requesting Association
```

```
...
```

```
D: ===== END A-ASSOCIATE-AC =====
```

```
I: Association Accepted (Max Send PDV: 16372)
```

```
I: Sending Echo Request: MsgID 1
```

```
I: Received Echo Response (Status: Success)
```

```
I: Releasing Association
```

Aneb po stopách C-STORE

- ▶ `$ storescu -aet STORESCU -d 172.17.0.1 4242
<DICOMFILE>`

C-STORE Part I: A-Associate-RQ

```
$ storescu -aet STORESCU -d 172.17.0.1 4242 <DICOMFILE>
```

```
I: checking input files ...
D: Request Parameters:
D: ===== BEGIN A-ASSOCIATE-RQ =====
D: Our Implementation Class UID: 1.2.276.0.7230010.3.0.3.6.0
D: Our Implementation Version Name: OFFIS_DCMTK_360
D: Their Implementation Class UID:
D: Their Implementation Version Name:
D: Application Context Name: 1.2.840.10008.3.1.1.1
D: Calling Application Name: STORESCU
D: Called Application Name: ANY-SCP
D: Responding Application Name: resp. AP Title
D: Our Max PDU Receive Size: 16384
D: Their Max PDU Receive Size: 0
D: Presentation Contexts:
D: Context ID: 1 (Proposed)
D: Abstract Syntax: =AmbulatoryECGWaveformStorage
D: Proposed SCP/SCU Role: Default
D: Proposed Transfer Syntax(es):
D: =LittleEndianExplicit
D: Context ID: 3 (Proposed)
D: Abstract Syntax: =AmbulatoryECGWaveformStorage
D: Proposed SCP/SCU Role: Default
D: Proposed Transfer Syntax(es):
D: =BigEndianExplicit
D: =LittleEndianImplicit
D: Context ID: 5 (Proposed)
...
```

C-STORE Part II: A-Associate-RQ

```
$ storescu -aet STORESCU -d 172.17.0.1 4242 <DICOMFILE>
```

```
...  
D: ===== BEGIN A-ASSOCIATE-RQ =====  
D: Our Implementation Class UID:      1.2.276.0.7230010.3.0.3.6.0  
D: Our Implementation Version Name:   OFFIS_DCMTK_360  
...  
D: Our Max PDU Receive Size:         16384  
D: Their Max PDU Receive Size:       0  
D: Presentation Contexts:  
D:   Context ID:                      1 (Proposed)  
D:     Abstract Syntax: =AmbulatoryECGWaveformStorage  
D:     Proposed SCP/SCU Role: Default  
D:     Proposed Transfer Syntax(es):  
D:       =LittleEndianExplicit  
...  
D:   Context ID:                      255 (Proposed)  
D:     Abstract Syntax: =XRayRadiofluoroscopicImageStorage  
D:     Proposed SCP/SCU Role: Default  
D:     Proposed Transfer Syntax(es):  
D:       =BigEndianExplicit  
D:       =LittleEndianImplicit  
D: Requested Extended Negotiation: none  
D: Accepted Extended Negotiation: none  
D: Requested User Identity Negotiation: none  
D: User Identity Negotiation Response: none  
D: ===== END A-ASSOCIATE-RQ =====
```


C-STORE Part III: A-Associate-AC PDU Dump

```
$ storescu -aet STORESCU -d 172.17.0.1 4242 <DICOMFILE>
```

```
...
D: ===== BEGIN A-ASSOCIATE-RQ =====
...
D: ===== END A-ASSOCIATE-RQ =====
I: Requesting Association
D: Constructing Associate RQ PDU
D: PDU Type: Associate Accept, PDU Length: 4123 + 6 bytes PDU header
D: Only dumping 512 bytes.
D: 02 00 00 00 10 1b 00 01 00 00 41 4e 59 2d 53 43
D: 50 20 20 20 20 20 20 20 20 20 53 54 4f 52 45 53
D: 43 55 20 20 20 20 20 20 20 20 00 00 00 00 00 00
D: 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00 00
D: 00 00 00 00 00 00 00 00 00 00 10 00 00 15 31 2e
D: 32 2e 38 34 30 2e 31 30 30 30 38 2e 33 2e 31 2e
D: 31 2e 31 21 00 00 1b 01 00 00 40 00 00 13 31
D: 2e 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 2e 32
D: 2e 31 21 00 00 1b 03 00 00 40 00 00 13 31 2e
D: 32 2e 38 34 30 2e 31 30 30 30 38 2e 31 2e 32 2e
D: 32 21 00 00 1b 05 00 00 40 00 00 13 31 2e 32
D: 2e 38 34 30 2e 31 30 30 30 38 2e 31 2e 32 2e 31
D: 21 00 00 1b 07 00 00 40 00 00 13 31 2e 32 2e
D: 38 34 30 2e 31 30 30 30 38 2e 31 2e 32 2e 32 21
D: 00 00 1b 09 00 00 40 00 00 13 31 2e 32 2e 38
...
D: 2e 31 2e 32 2e 31 21 00 00 1b 1b 00 00 40 00
...
```

C-STORE Part III: A-Associate-AC PDU Parse

```
$ storescu -aet STORESCU -d 172.17.0.1 4242 <DICOMFILE>
```

```
...  
D: ===== BEGIN A-ASSOCIATE-AC =====  
D: Our Implementation Class UID:      1.2.276.0.7230010.3.0.3.6.0  
D: Our Implementation Version Name:  OFFIS_DCMTK_360  
D: Their Implementation Class UID:    1.2.276.0.7230010.3.0.3.6.0  
D: Their Implementation Version Name: OFFIS_DCMTK_360  
D: Application Context Name:          1.2.840.10008.3.1.1.1  
D: Calling Application Name:          STORESCU  
D: Called Application Name:           ANY-SCP  
D: Responding Application Name:       ANY-SCP  
D: Our Max PDU Receive Size:          16384  
D: Their Max PDU Receive Size:        16384  
D: Presentation Contexts:  
D:   Context ID:                       1 (Accepted)  
D:     Abstract Syntax: =AmbulatoryECGWaveformStorage  
...  
D:     Accepted Transfer Syntax: =LittleEndianExplicit  
...  
D:   Context ID:                       255 (Accepted)  
D:     Abstract Syntax: =XRayRadiofluoroscopicImageStorage  
...  
D:     Accepted Transfer Syntax: =BigEndianExplicit  
D: Requested Extended Negotiation: none  
D: Accepted Extended Negotiation: none  
D: Requested User Identity Negotiation: none  
D: User Identity Negotiation Response: none  
D: ===== END A-ASSOCIATE-AC =====
```

C-STORE Part IV: Outgoing DIMSE Msg

```
$ storescu -aet STORESCU -d 172.17.0.1 4242 <DICOMFILE>
```

```
...  
D: ===== BEGIN A-ASSOCIATE-AC =====  
...  
D: ===== END A-ASSOCIATE-AC =====  
I: Association Accepted (Max Send PDV: 16372)  
I: Sending file: BRAINSAG  
D: DcmItem::checkTransferSyntax() TransferSyntax="Little Endian Explicit"  
I: Transfer Syntax: LittleEndianExplicit -> LittleEndianExplicit  
I: Sending Store Request: MsgID 1, (MRe)  
D: ===== OUTGOING DIMSE MESSAGE =====  
D: Message Type           : C-STORE RQ  
D: Message ID             : 1  
D: Affected SOP Class UID : EnhancedMRImageStorage  
D: Affected SOP Instance UID : 1.3.6.1.4.1.5962.1.1.5010.1.1.1166546115.14677  
D: Data Set                : present  
D: Priority                 : low  
D: ===== END DIMSE MESSAGE =====  
I: Received Store Response  
...
```

C-STORE Part IV: Incoming DIMSE Msg

```
$ store scu -aet STORESCU -d 172.17.0.1 4242 <DICOMFILE>
```

```
...
D: ===== BEGIN A-ASSOCIATE-AC =====
...
D: ===== END A-ASSOCIATE-AC =====
I: Association Accepted (Max Send PDV: 16372)
I: Sending file: BRAINSAG
..
I: Transfer Syntax: LittleEndianExplicit -> LittleEndianExplicit
I: Sending Store Request: MsgID 1, (MRe)
D: ===== OUTGOING DIMSE MESSAGE =====
...
D: ===== END DIMSE MESSAGE =====
I: Received Store Response
D: ===== INCOMING DIMSE MESSAGE =====
D: Message Type           : C-STORE RSP
D: Presentation Context ID : 77
D: Message ID Being Responded To : 1
D: Affected SOP Class UID   : EnhancedMRImageStorage
D: Affected SOP Instance UID : 1.3.6.1.4.1.5962.1.1.5010.1.1.1166546115.14677
D: Data Set                 : none
D: DIMSE Status             : 0x0000: Success
D: ===== END DIMSE MESSAGE =====
I: Releasing Association
```

C-STORE Part V: Overall

```
$ storescu -aet STORESCU -d 172.17.0.1 4242 <DICOMFILE>

...
D: ===== BEGIN A-ASSOCIATE-RQ =====
...
D: ===== END A-ASSOCIATE-RQ =====
I: Requesting Association
D: Constructing Associate RQ PDU
D: PDU Type: Associate Accept, PDU Length: 4123 + 6 bytes PDU header
...
D: Parsing an A-ASSOCIATE PDU
D: Transport connection: TCP/IP, unencrypted.
D: Association Parameters Negotiated:
D: ===== BEGIN A-ASSOCIATE-AC =====
..
D: ===== END A-ASSOCIATE-AC =====
...
D: ===== OUTGOING DIMSE MESSAGE =====
D: Message Type           : C-STORE RQ
..
D: ===== END DIMSE MESSAGE =====
I: Received Store Response
D: ===== INCOMING DIMSE MESSAGE =====
D: Message Type           : C-STORE RSP
...D
D: DIMSE Status           : 0x0000: Success
D: ===== END DIMSE MESSAGE =====
I: Releasing Association
```

DICOM networking prakticky

Více na cvičení

Díky...

...za pozornost

Otázky ke zkoušce

- ▶ Rozdíl mezi C- a N- příkazy. Jaké znáte?
- ▶ Co jsou well-known UID?
- ▶ Co je SCU/SCP?
- ▶ Jak se spolu domluví SCU a SCP?
- ▶ ASOCIATE-RQ je BE/LE? Proč?
- ▶ Co je AE, AET?
- ▶ Jak probíhá asociace?
- ▶ Jaký je rozdíl mezi C-ECHO a (ICMP) ping?
- ▶ Co je/k čemu slouží SOP UID?