



プレゼンテーション層の技術

情報ネットワーク論I

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 - 📄 ASN.1
 - ネットワーク管理、ディレクトリサービス等
 - 📄 XML
 - コンポーネント統合等
- 🌟 プレゼンテーション層の選択

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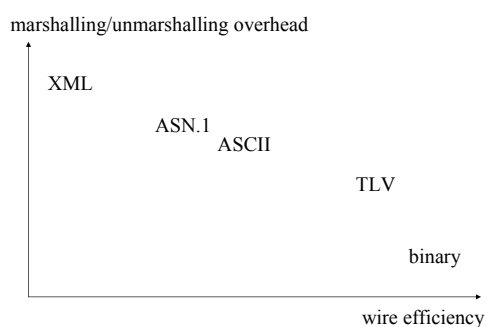
プレゼンテーション層の発達

- 🌟 binary
- 🌟 ASCII
- 🌟 TLV
- 🌟 ASN.1
- 🌟 XML

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トレードオフ



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Binary

- ✿ IP header (RFC791)
- ✿ TCP header (RFC793)

16bit source port			16bit destination port			20 octets
32bit sequence number						
32bit acknowledgment number						
4bit hlen	reserved	flags		16bit window size		
16bit TCP checksum			16bit urgent pointer			
(options)						
(TCP data)						

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ASCII

- ✿ FTP (RFC959)
- ✿ SMTP (RFC2821)
- ✿ POP3 (RFC1939), etc.

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FTP

01.204.01754: 220 ftp.isi.edu NeFTPd Server (free educational license) ready.
76.020.00021: USER anonymous
01.204.01754: 331 Guest login ok, send your complete e-mail address as password.
76.020.00021: PASS -wget@
01.204.01754: 230 Logged in anonymously.

76.020.00021: SYST
01.204.01754: 215 UNIX Type: L8
76.020.00021: PWD
01.204.01754: 257 "/" is cwd.
76.020.00021: TYPE I
01.204.01754: 200 Type okay.
76.020.00021: CWD /in-notes
01.204.01754: 250 "/in-notes" is new cwd.

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SMTP

1758: 220 ns.ij-mc.com ESMTP Sendmail 8.9.3p2+3.1W/3.7W/ns; Fri, 30 May 2003 00:15:43 +09
0025: EHLO mf.aist-nara.ac.jp
1758: 250 ns.ij-mc.com Hello 168.pool3.ftthtokyo.att.ne.jp [165.76.67.168], pleased to meet you
0025: MAIL FROM:<youki@is.aist-nara.ac.jp> SIZE=1524
1758: 250 <youki@is.aist-nara.ac.jp>... Sender ok
0025: RCPT TO:<bunji@ij-mc.com>
1758: 250 <bunji@ij-mc.com>... Recipient ok
0025: DATA
1758: 354 Enter mail, end with "." on a line by itself
0025: Received: from mf.aist-nara.ac.jp (localhost [127.0.0.1])
\$ +0900 (JST)

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TLV

🔗 Type, Length, Value

🔗 OSPF (RFC2328)

🔗 RADIUS (RFC2138)

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OSPF

🔥 (RFC2328) A.3.1 The OSPF packet header

```

0      1      2      3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Version # | Type | Packet length |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Router ID |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Area ID |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Checksum | AuType |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Authentication |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Authentication |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

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RADIUS Packet Format

🔥 (RFC2138) 3. Packet Format

```

0      1      2      3
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0 1
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Code | Identifier | Length |
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
|
| Authenticator
|
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Attributes ...
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

Code:
1 Access-Request
2 Access-Accept
3 Access-Reject

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RADIUS Attribute TLV

```

0      1      2
0 1 2 3 4 5 6 7 8 9 0 1 2 3 4 5 6 7 8 9 0
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
| Type | Length | Value ...
+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
```

Type
1 User-Name
2 User-Password
3 CHAP-Password
4 NAS-IP-Address

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Binary (TLV) vs ASCII

❁ 違いは？

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プレゼンテーション層の価値

- ❁ "wire efficiency"
- ❁ "marshalling / unmarshalling overhead"
- ❁ これらに加えて、
プレゼンテーション層における:
 - データ型 (static typing)
 - 名前空間の管理 (namespace)
 - データの自己説明性
 - ツール、ライブラリの充実
- ❁ ASN.1, XML: これらの特性を備える

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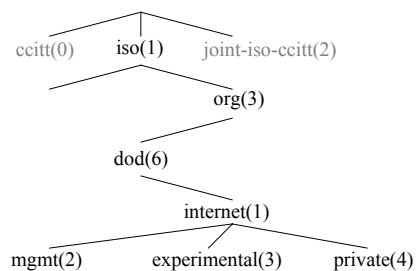
ASN.1 (BER encoding)

- ❁ (tag, length, value)
 - tag: ASN.1 type
 - length: size of the ASN.1 value
 - value: ASN.1 value
- ❁ ASN.1 の型
 - INTEGER
 - OCTET STRING
 - OBJECT IDENTIFIER
 - SEQUENCE (配列)

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インターネット用 Object Identifier



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SNMP (1)

🌟 RFC1213 "MIB-II"

🌟 RFC2578 "Structure of Management Information Version 2 (SMIv2)"

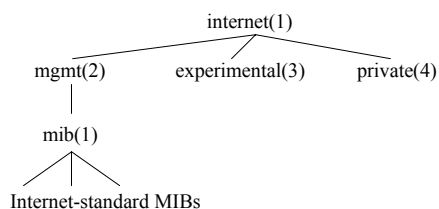
🌟 SNMPにおける

- データ型: ASN.1, SMIv2 で定義
- 名前空間の管理: MIB ツリー + RFC
- データの自己説明性: MIB ツリー + RFC
- ツールの充実: ライブラリ、管理ソフト等

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MGMT subtree



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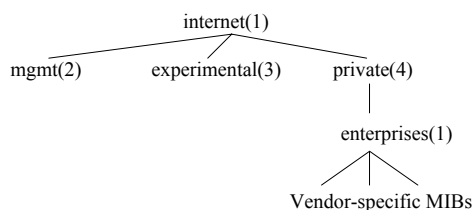
Inside 1.3.6.1.2.1: Standard MIBs (MIB-II)

- system
- interfaces
- at
- ip
- icmp
- tcp
- udp
- egp
- transmission
- snmp

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Private subtree



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SNMP (2)

```
# snmptranslate -On -IR sysDescr
.1.3.6.1.2.1.1

# snmptranslate -Onf -IR sysDescr
.iso.org.dod.internet.mgmt.mib-2.system.sysDescr

# snmptranslate -Td -IR sysDescr
SNMPv2-MIB::sysDescr
sysDescr OBJECT-TYPE
-- FROM      SNMPv2-MIB, RFC1213-MIB
-- TEXTUAL CONVENTION DisplayString
SYNTAX      OCTET STRING (0..255)
DISPLAY-HINT "255a"
MAX-ACCESS  read-only
STATUS      current
::= { iso(1) org(3) dod(6) internet(1) mgmt(2) mib-2(1) system(1) 1 }

# snmpgetnext -IR -v 1 -c sample 203.178.142.3 sysDescr
SNMPv2-MIB::sysDescr.0 = STRING: Cisco Internetwork Operating System Software
IOS (tm) GS Software (GSR-P-M), Experimental Version 12.0(20020720:053512) [akr-v3-isp2 105]
Copyright (c) 1986-2002 by cisco Systems, Inc.
Compiled Fri 09-Aug-02 22:07 by akr
```

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XML

- ❖ `<?xml version = "1.0"?>`
- ❖ `<tag attribute="value">`
`<another-tag another-attribute="value" />`
- ❖ `</tag attribute="value">`

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名前空間の管理: XML Namespace

```

<?xml version="1.0" encoding="UTF-8"?>
<soap:Envelope xmlns:soap="http://schemas.xmlsoap.org/soap/envelope/"
  xmlns:xsi="http://www.w3.org/1999/XMLSchema-instance"
  xmlns:xsd="http://www.w3.org/1999/XMLSchema"
  xmlns:soapenc="http://schemas.xmlsoap.org/soap/encoding/"
  soap:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/">
  <soap:Body>
    <n:getQuoteResponse xmlns:n="urn:xmethods-delayed-quotes">
      <Result xsi:type="xsd:float">7.92</Result>
    </n:getQuoteResponse>
  </soap:Body>
</soap:Envelope>

```

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XMLにおけるデータ型: XML Schema

```

<?xml version="1.0" encoding="UTF-8"?>
<SOAP-ENV:Envelope
  xmlns:xsi="http://www.w3.org/1999/XMLSchema-instance"
  xmlns:SOAP-ENC="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:xsd="http://www.w3.org/1999/XMLSchema"
  SOAP-ENV:encodingStyle="http://schemas.xmlsoap.org/soap/encoding/"
  xmlns:SOAP-ENV="http://schemas.xmlsoap.org/soap/envelope/">
  <SOAP-ENV:Body>
    <namespace1:getQuote xmlns:namespace1="urn:xmethods-delayed-quotes">
      <symbol xsi:type="xsd:string">AKAM</symbol>
    </namespace1:getQuote>
  </SOAP-ENV:Body>
</SOAP-ENV:Envelope>

```

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XML: その他の特徴

- 🌸 データの自己説明性: RDF
- 🌸 ツールの充実: [XPath](#), XSLT, etc.
- 🌸 APIの充実: DOM, SAX, etc.
- 🌸 一部分の署名、暗号化
 - 📄 XML [Digital Signature](#)
 - 📄 XML [Encryption](#)

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[XPath](#)

```
#!/usr/bin/perl
#
# extract IMG SRC from xhtml file

use XML::XPath;
use XML::XPath::XMLParser;

foreach $file (@ARGV) {
    my $xp = XML::XPath->new(filename => $file);

    foreach my $node ($xp->find("//img[@src]"))->get_nodelist() {
        ...
    }
}
```

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XML vs ASN.1

- 🌸 違いは？

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プレゼンテーション層の選択 (1)

- 🌐 無線LAN経由でのロボット操作

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プレゼンテーション層の選択 (2)

- 🌐 企業間のシステム相互接続

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プレゼンテーション層の選択 (3)

- 🌐 センサ・ネットワークからの情報収集

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まとめ

- プレゼンテーション層
 - 伝送効率、処理のオーバーヘッド
- 適用領域
 - ツール
 - API (= 上位層へのインターフェース)
- プログラミング言語的側面
 - データ型
 - 名前空間
 - 自己説明性
 - 変換操作

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