

Networking Services) Cisco CNS(Cisco [8] Juniper
 Networks JUNOScript[9] [11]
 XBM EWS XML
 (Configuration Management) IETF
 EWS IP
 XML Network
 (Performance Configuration(netconf)[12] 2003
 Management) 5 [13,
 가 (Fault Management) 14]
 , XBM XML
 . 2
 XML SNMP
 , XML/SNMP
 . 3 XBM 가 J.P. Martin-Flatin
 XBM SNMP MIB XML (specification translation) Model-level
 , 4 3 Metamodel-level [10]. F.
 XBM . 5 가 Strauss SNMP MIB Java, CORBA, C, XML
 4 IP 가 SMI MIB
 . 6 XBM 가 'libsmi'
 가 , 7 [15]. Avaya Labs Research[16] SNMP
 XML XML SMI
 XML-RPC[17] XML
 가
 XML/SNMP SNMP
 SMI XML [18]
 (interaction translation)[19]
2.
 XML
 XBM
2.1 XML
 XML XML DTD
 XML [6]
 XML
 XML XML
 XML XML 가
 , XML SNMP MIB
 HTTP XML 가
 ,
 J.P. Martin-Flatin Web
 (WIMA)[10]
 XML XML/HTTP
2.2 XBM
 Cisco Juniper Networks
 XBM
 Cisco
 CNS(Cisco Networking Services) [8]
 Juniper Networks JUNOScript[9]
 XBM
2.2.1 Cisco CNS
 Cisco Configuration Registrar
 Cisco IOS
 . Configuration Registrar
 CNS
 . Cisco 가
 , Configuration
 Registrar가 CNS
 . Configuration Registrar
 HTTP XML

CNS XML Cisco XML HTTP XML (EWS) HTML HTTP
 Cisco XML EWS
 XBM XML XML XPath[22]

2.2.2 Juniper Networks JUNOScript

Juniper Networks JUNOScript JUNOScript JUNOScript XML EWS (Client-driven) 가 SNMP
 JUNOScript JUNOScript XML
 JUNOScript XML-RPC (notification) XBM
 RPC JUNOScript DTD(Data Type Definition) DTD
 JUNOScript 가 JUNOScript SNMP
 JUNOScript JUNOScript 가 가
 JUNOScript CLI 가 가

3.

가 XBM

XBM 가

가

3.1

(Embedded Web Server)

3.2

HTTP EWS HTML HTML CPU 가
 EWS 가 가 가
 HTML 가 가 가
 XML 가 EWS 가 가
 [11]. XBM XBM

4. XBM

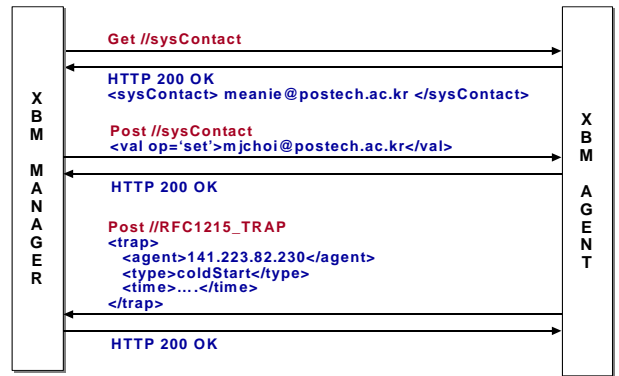
3 XBM
 4.1
 4.2 XBM
 4.1
 XML 가 XML
 DTD XML [6]가 DTD
 XML
 XML
 XML
 SNMP MIB II
 MIB (object) XML
 (syntax) , (access)
 (attribute) XML

```

<xsd:element name="system">
  <xsd:complexType>
    <xsd:all>
      <xsd:element ref="sysDescr" minOccurs="0"/>
      <xsd:element ref="sysObjectID" minOccurs="0"/>
      <xsd:element ref="sysUpTime" minOccurs="0"/>
      <xsd:element ref="sysContact" minOccurs="0"/>
      <xsd:element ref="sysName" minOccurs="0"/>
      <xsd:element ref="sysLocation" minOccurs="0"/>
      <xsd:element ref="sysServices" minOccurs="0"/>
    </xsd:all>
  </xsd:complexType>
</xsd:element>
<xsd:element name="sysDescr">
  <xsd:complexType>
    <xsd:simpleContent>
      <xsd:restriction base="DisplayString_0_255">
        <xsd:attribute name="access" type="xsd:string"
          use="fixed" value="read-only"/>
      </xsd:restriction>
    </xsd:simpleContent>
  </xsd:complexType>
</xsd:element>
...
  
```

1. XML Schema of MIB II – System Group

1 MIB II XML
 'sysDescr' XML DTD XML
 XML 가 XML
 ALTOVA xmlspy[20] XML
 XML HTTP[7]
 HTTP TCP
 HTTP Get Post가 SNMP
 Get Set HTTP Get
 가 , HTTP Post
 Get XML 가 Post
 HTTP OK 가
 XML
 XPath Get
 XPath 가
 가
 가
 2 XBM XBM
 Get, Set(Post), Trap
 MIB II
 sysContact Trap
 SNMPv1 coldStart



2. Communication Ex. between Manager & Agent

(notification) XBM 가 Post
 Push
 Push
 가
 Post

Push

XML Get Post HTTP

4.2 XBM

3 EWS XML XBM

가 EWS XML Processor가 XML

3 XBM XML Processor가 XML

XML Processor XML Parser

SAX(Simple API for XML) Parser XPath Handler SAX Parsr[23]

Module Write [11]

XBM DOM[21] XPath[22]

XML DOM API

가 Linux CPU

DOM SAX[23]

SAX DOM [24, 25].

SAX XML (event-driven)

DOM XML SAX 가 SAX XML (serial)

가 DOM XPath

가 XML

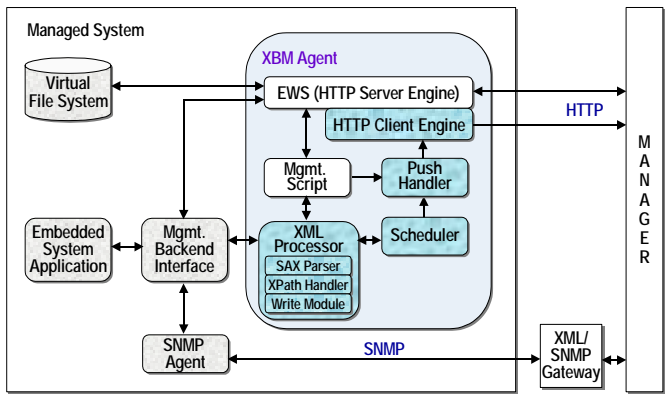
가 SAX SAX

Write Module 가

SAX XBM SAX Parser XML

XBM 가 Management Backend Interface 가 , SAX Write Module

XML



3. XBM Agent Architecture

DOM XML DOM CPU

DOM XPath 가 가

XML Processor (Notification) Push Handler HTTP Client Engine Scheduler가

HTTP Client Engine Scheduler (subscription) (subscriber), (item), (schedule) Scheduler가 Scheduler Push Handler HTTP Client Script가 Push Handler HTTP Client XBM SNMP

Agent SNMP Agent
가 , XBM
Management Backend Interface

SNMP Agent XML/SNMP
[18, 19]

5. XBM

4 XBM IP

CPU

C EWS ID
XBM

EWS 가XBM IP
MPC850DE[26]

16MB linux-2.2.13-

7 powerpc-linux-gcc XBM

XBM 가

Get/Set

Mgmt. script xml filename XPath 가
가 Get
xml filename xmlOpen()
XML , XPath
getXpath() Get

xmlOpen() 가 xml document getXpath()
XPath parseXml()
xml document XPath

Mgmt. Backend Interface 가 , setXML()
xml document

xml document returnXml() 가
Mgmt. Script

xmlClose() xml document
file

Set Get
Get

가 xml document XPath
xml document setXml()

xml document Mgmt.
Backend Interface

document Set xml
returnXml()

Mgmt. script Set
HTTP OK

4 getXpath() 가 XPath
XPath Handler XPath

가 XPath가
[27], XPath

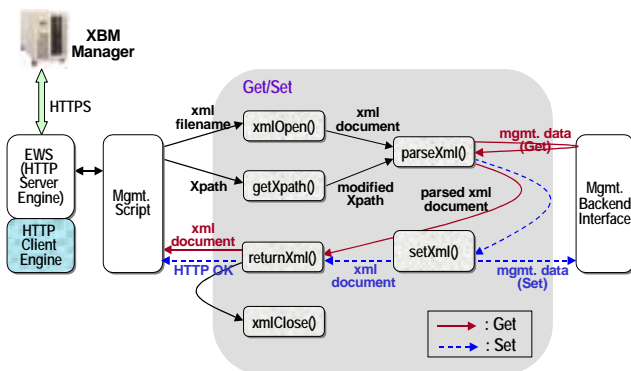
[28] XPath Handler

XBM

XML

XPath 가

4 XBM Get/Set



4. Flow of Get/Set Process

XBM

Get

Get

/		/AAA/BBB
//		//BBB
*		//*
@		//@id
[]		BBB[@id='b1']
=		BBB[@id='b1']
	OR	/AAA // BBB
&	AND	/AAA & // BBB

1. Supported XPath Grammar of XBM Agent

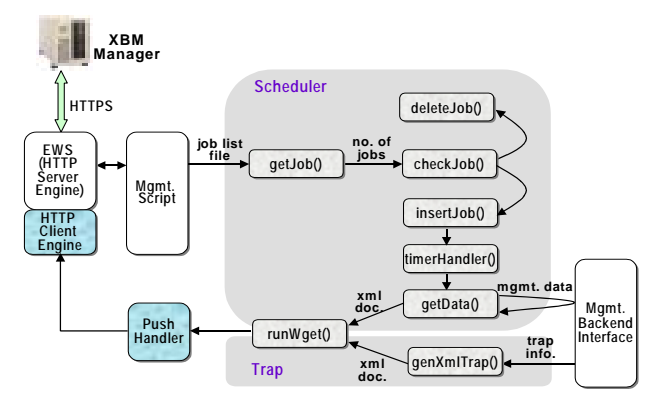
1 XPath 가
XBM 가 XPath

가

XPath

XPath
 4 *parseXml()* 가 SAX Parser XML
 가 XPath XML
 가 *getXpath()*
 Xpath
 Write Module
 XML
 XML
 XML
 5
 Trap
 XML
 4 Set
 Backend Interface
 XML
 XBM
 Management

XBM
 Management Backend Interface
 Trap
 Trap
 Trap
 runWget()
 XML
 XBM
 6. XBM
 가
 XBM
 IP
 Net-SNMP[30]
 SNMP
 CPU
 (run-time)
 가
 Push
 SNMP
 XBM
 Get/Set
 (response
 time)
 2 CPU,
 SNMP
 XBM
 top
 proc
 status
 SNMP MIB II
 SNMPv1
 SNMP



5. Flow of Trap/Schedule Process

threads
 가
getJob()
 , *getJob()* job list file
 가 . job list file 4.2
 (subscriber),
 (item), (start) (end),
 (interval)
 (schedule) . *getJob()*
 (no. of jobs) *checkJob()*
checkJob() pthreads
 가 thread
 (*insertJob()*) (*deleteJob()*)
 thread
 가 *timerHandler()*
runWget()
runWget() Push Handler
 Wget[29] Http Client Engine

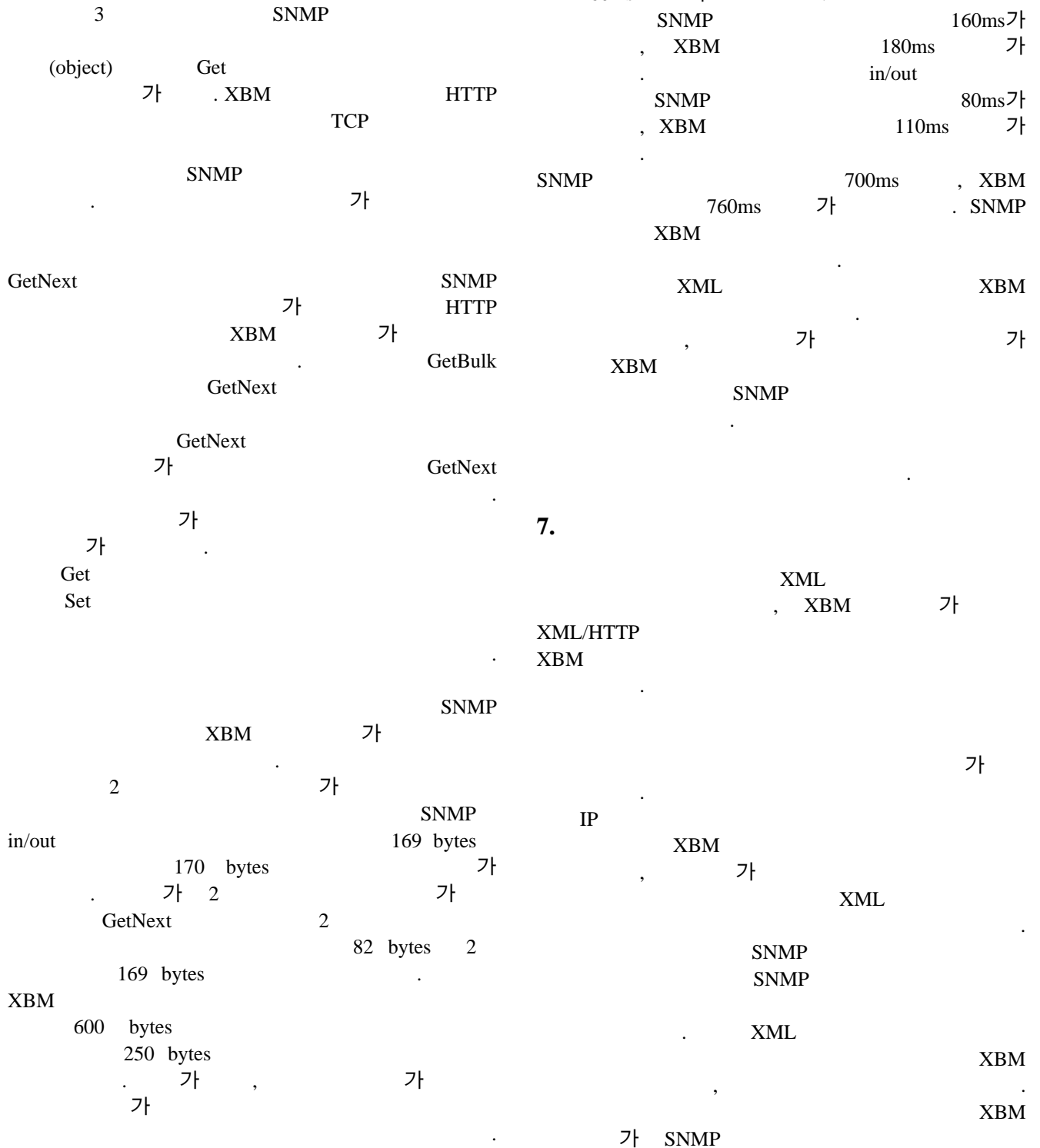
	CPU		
SNMP	17 %	600 KB	400 KB
XBM	20 %	700 KB	550 KB

2. Resource Utility of SNMP & XBM Agent

2 SNMP XBM
 XML
 가
 XBM
 3 MIB II
 XBM
 Ethereal[31]

	Get (bytes)		Get (bytes)	
	SNMP	XBM	SNMP	XBM
	sysDescr	82	238	145
sysContact	82	240	103	190
system Group	572	241	722	624
inOctects	169	240	175	252
outOctects	169	241	176	256
interfaces Group	3720	241	3818	1654

3. Message Size of Get Operation



XBM

가 , SAX Parser XPath Handler
가

XBM XBM

(scalability)

SNMP

8.

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1998 ,
 1998 ~ 2000 ,
 2000 ~ ,

< > XML ,
 ,



1983 Univ. of Western Ontario,
 1985 Univ. of Western Ontario,
 1985 ~ 1986 Univ. of Western Ontario,
 1986 ~ 1991 Univ. of Waterloo,
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 1995 ~ ,

< > ,
 , CORBA, Internet ,