

A Network Monitoring Tool for CCN

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Presented by Taeseong Kim

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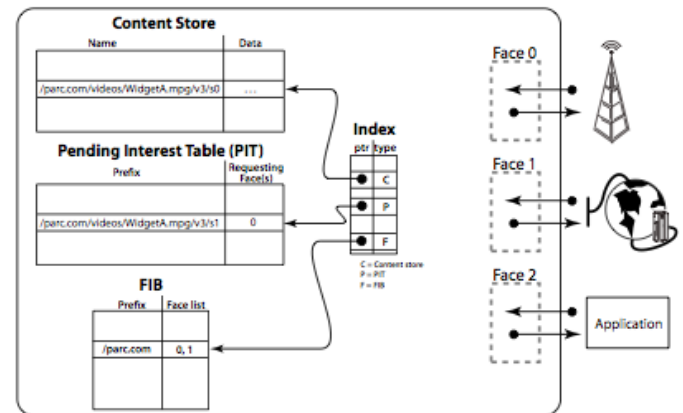
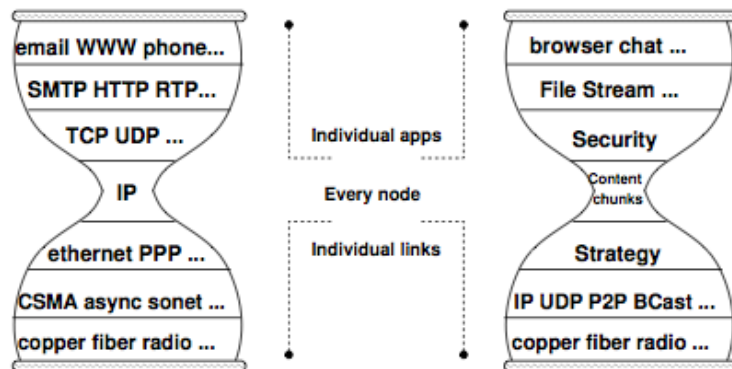
- Introduction
- Monitoring Methods
- Results
- Conclusion

Motivation

- Goal
 - To develop a Content Centric Networking (CCN) traffic monitoring tool
- Scope
 - Data collection with SNMP, IPFIX and HTTP
 - Visualization of traffic characterization and concentration in CCN
 - Implementation in Web UI

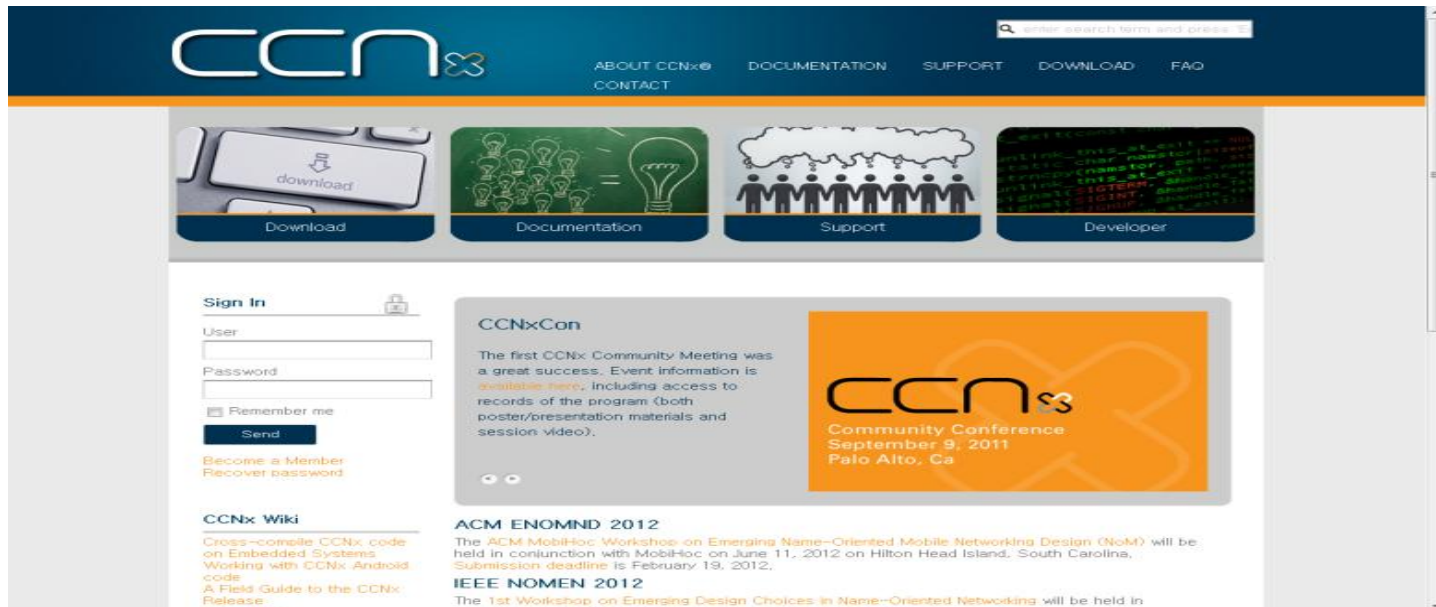
Background

- CCN
 - Communication driven by the consumers of data
 - Two type of packets
 - Interest
 - Content Object
 - State tables in CCN node CS, PIT, and FIB
 - CS (Content Store) : the buffer memory for the content
 - PIT (Pending Interest Table) for tracking Interest packet that have not been satisfied
 - FIB (Forwarding Information Base) to forward Interest packet toward source of mat ching data



Background

- CCNx (<http://www.ccnx.org>)
 - Implementation of CCN
 - Linux, Android
 - C, JAVA
 - An overlay prototype of CCN over IP



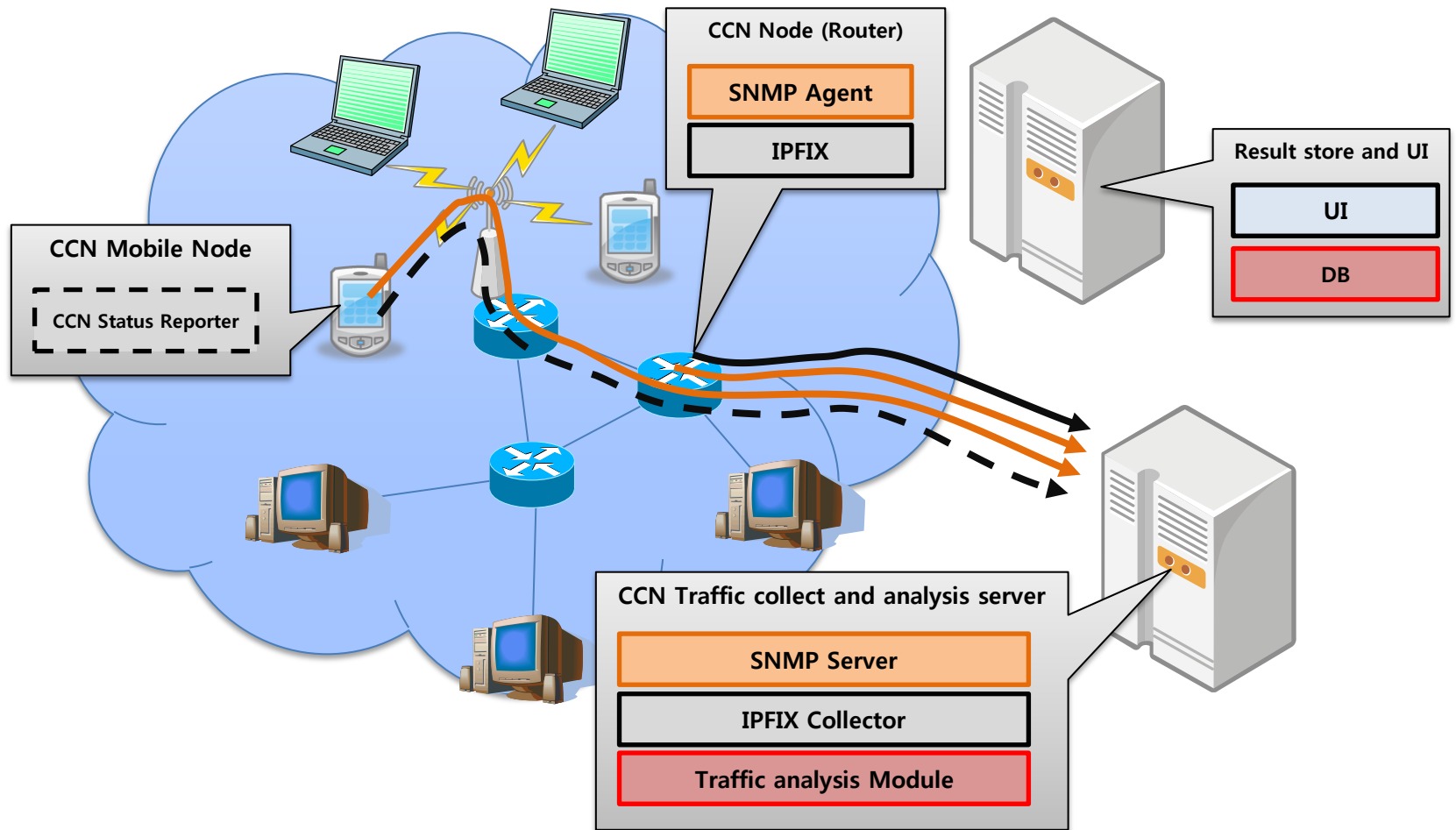
Background

- IPFIX
 - IPFIX is IETF standard based on Cisco's NetFlow version 9
- SNMP
 - Network management protocol for monitoring on IP network
 - SNMP agents will collect information on devices
 - Information element defined in MIB

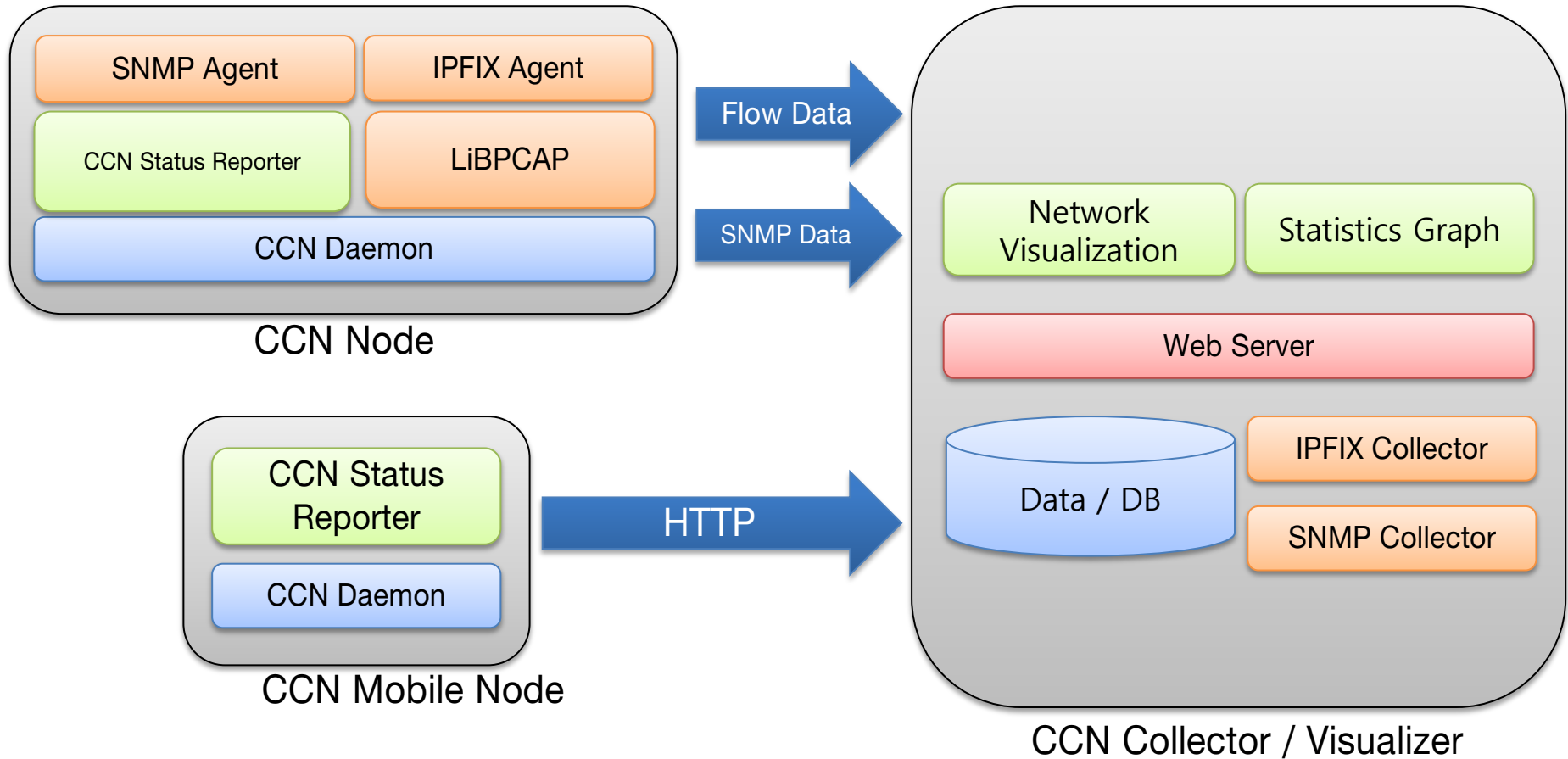
- IPFIX template set

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
FlowSet ID = 2											Length										
Template ID = 256											Field Count										
Information Element id. 1.1											Field Length 1.1										
Enterprise Number 1.1																					
Information Element id. 1.2											Field Length 1.2										
...											...										
Information Element id. 1.N											Field Length 1.N										
Enterprise Number 1.N																					
Template ID = 257											Field Count										
Information Element id. 2.1											Field Length 2.1										
Information Element id. 2.2											Field Length 2.2										
Enterprise Number 2.2																					
...											...										
Information Element id. 2.N											Field Length 2.N										
Enterprise Number 2.N																					
Padding (optional)																					

CCN Monitoring Tool

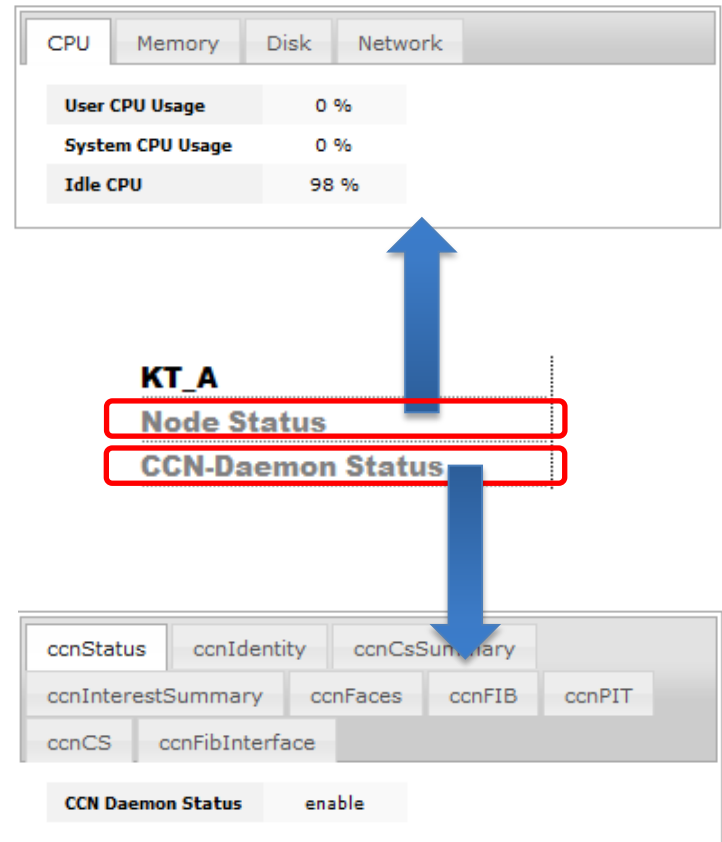


Software Stack of CCN Monitoring Tool

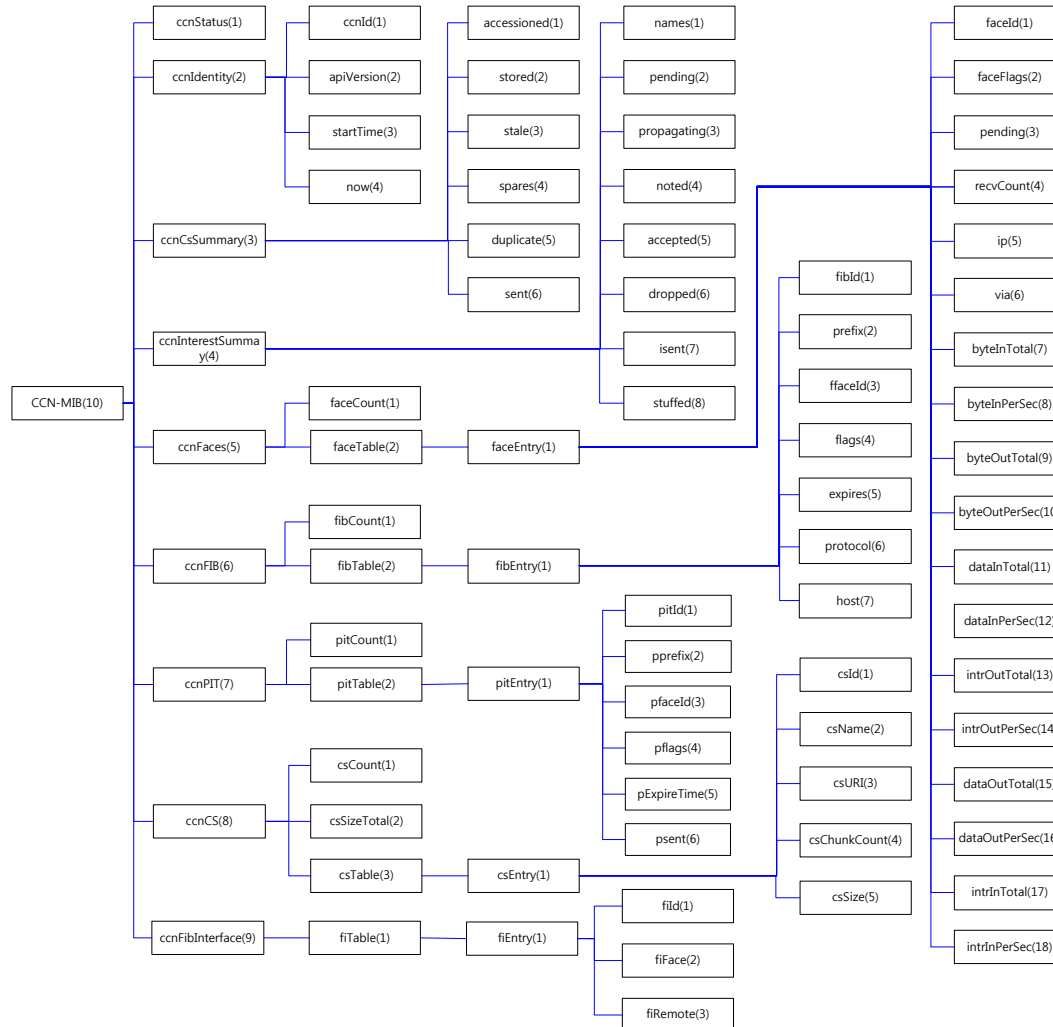


Gathering Information of CCN Node with SNMP

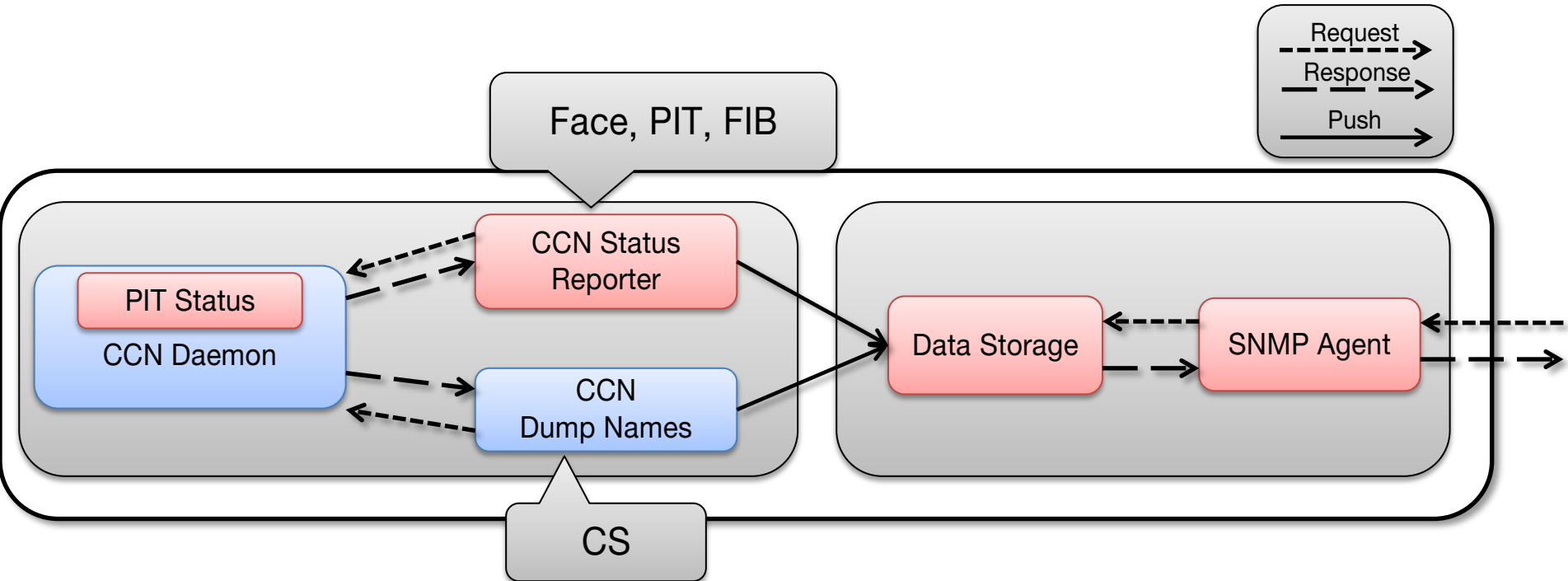
- Method
 - New Private MIB for CCN
- CCN system information
 - CPU, Memory, HDD, Network Interface
- CCN information
 - Daemon status
 - Face information
 - Content Store information
 - Pending Interest Table information
 - Forwarding Information Base information



SNMP Private MIB for CCN



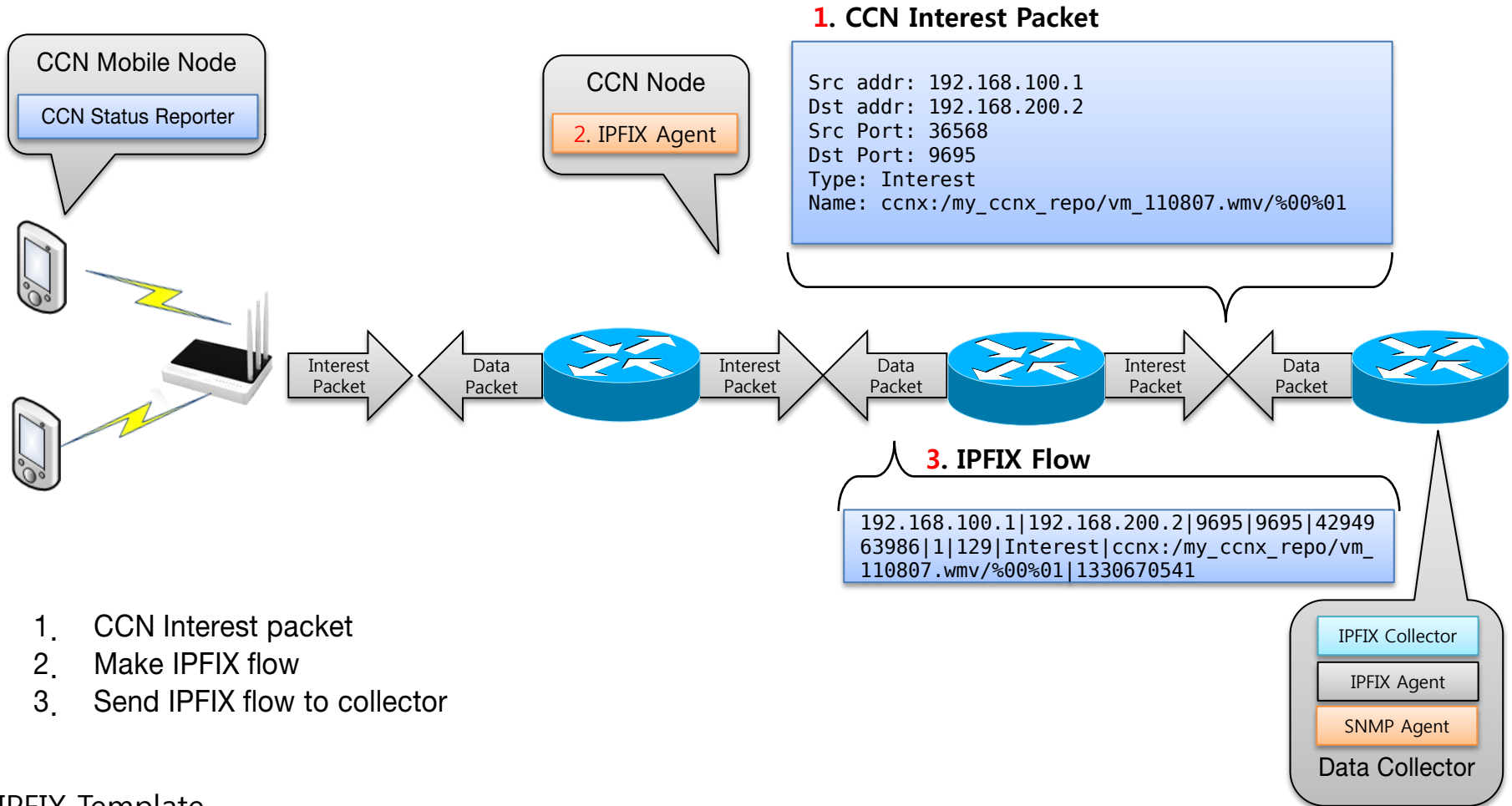
Communication in SNMP



Using SNMP for gathering CCN information

- CS : use *ccndumpnames*
- PIT : our PIT lookup module in CCN daemon
- FIB, Face : our CCN status reporter

Gathering CCN Flow Data with IPFIX

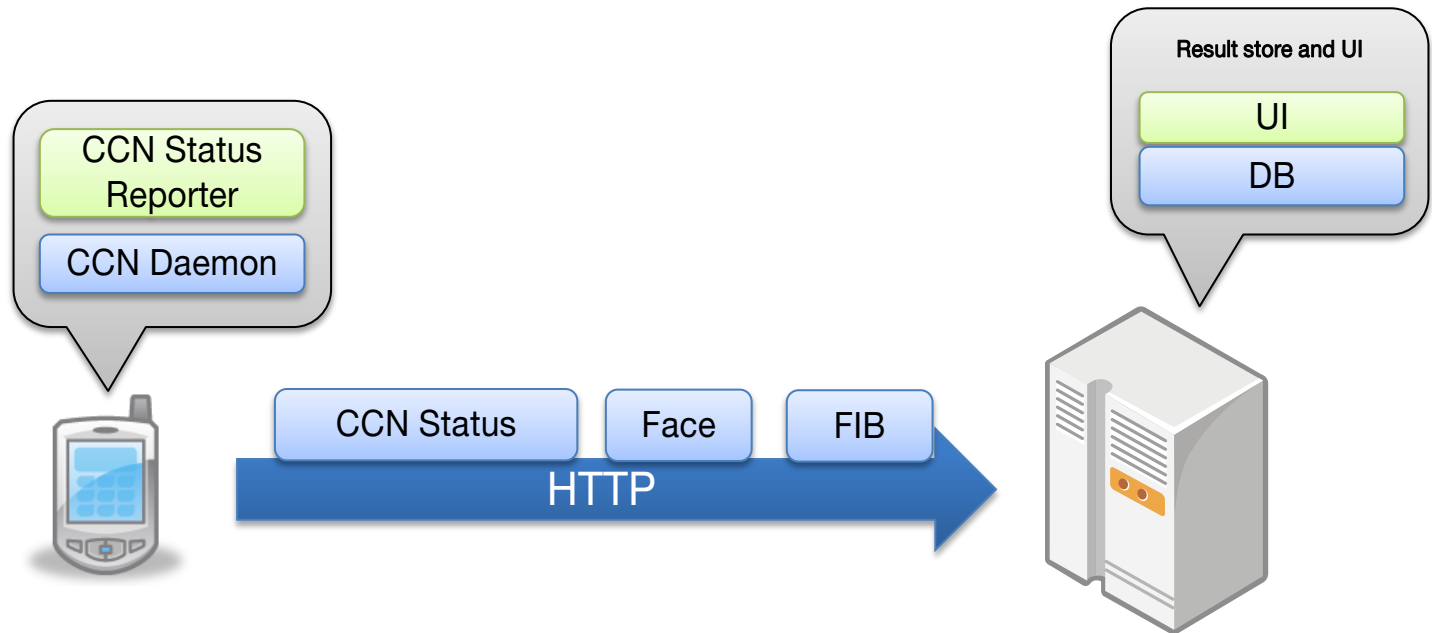


IPFIX Template

Src IP	Dst IP	Src Port	Dst Port	Flow ID	Out Packets	Out Byte	Type	Content Name	Time Stamp
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Gathering Information of CCN Mobile Node with HTTP

- Data collection with HTTP
 - HTTP : unable to use SNMP and IPFIX in Android
 - Our module
 - XML data parser for CCN daemon reporter



Web User Interface (1/2)

CCN Monitoring System

성능 모니터링 | 통계

- 5 Mbps ~
- 5 Mbps ~ 1Mbps
- 1 Mbps ~ 0 bps
- 0 bps

Content Consumer

Summary | CCN Status | Face | Forwarding

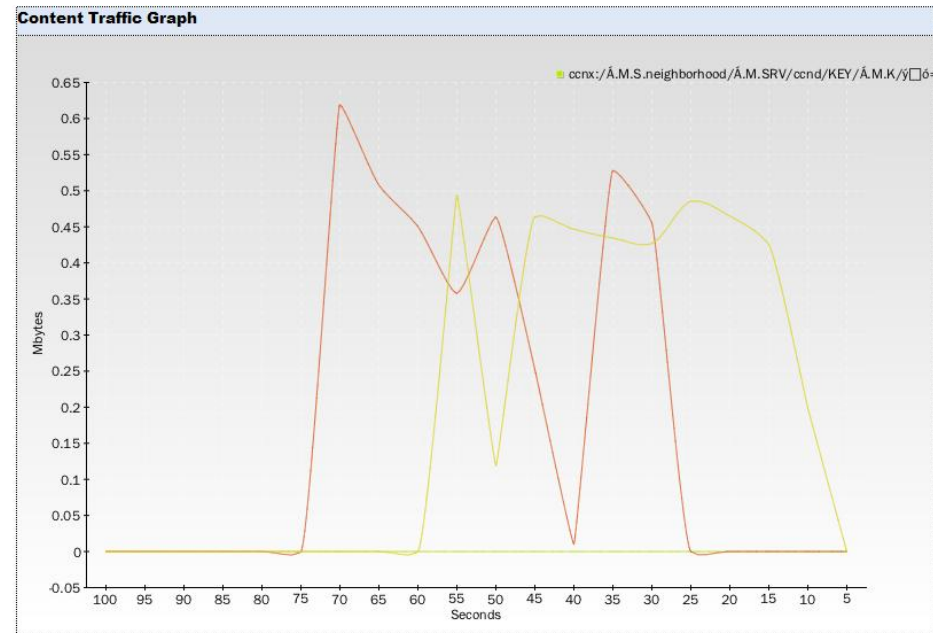
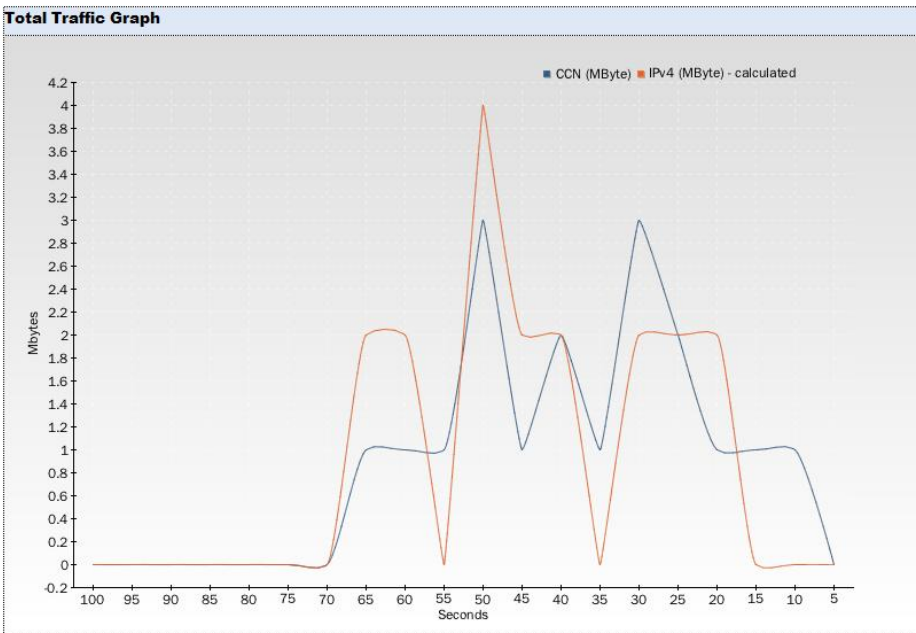
Prefix	Face ID	Expires
ccnx:/ccnx/t%EAH%87~-%00%17%ECJ%DC2%98a%3F%86%2A%B3%93%3E~%3CW%7D%90%FD%ACY%88%FF%BE%2C%08	0	2038-01-19 12:05:57
ccnx:/ccnx.org/Users/Repository/Keys/%C1.M.K%00%CBF%FF%0E%AF%2Bx%	-	2038-01-19

Content: 532956

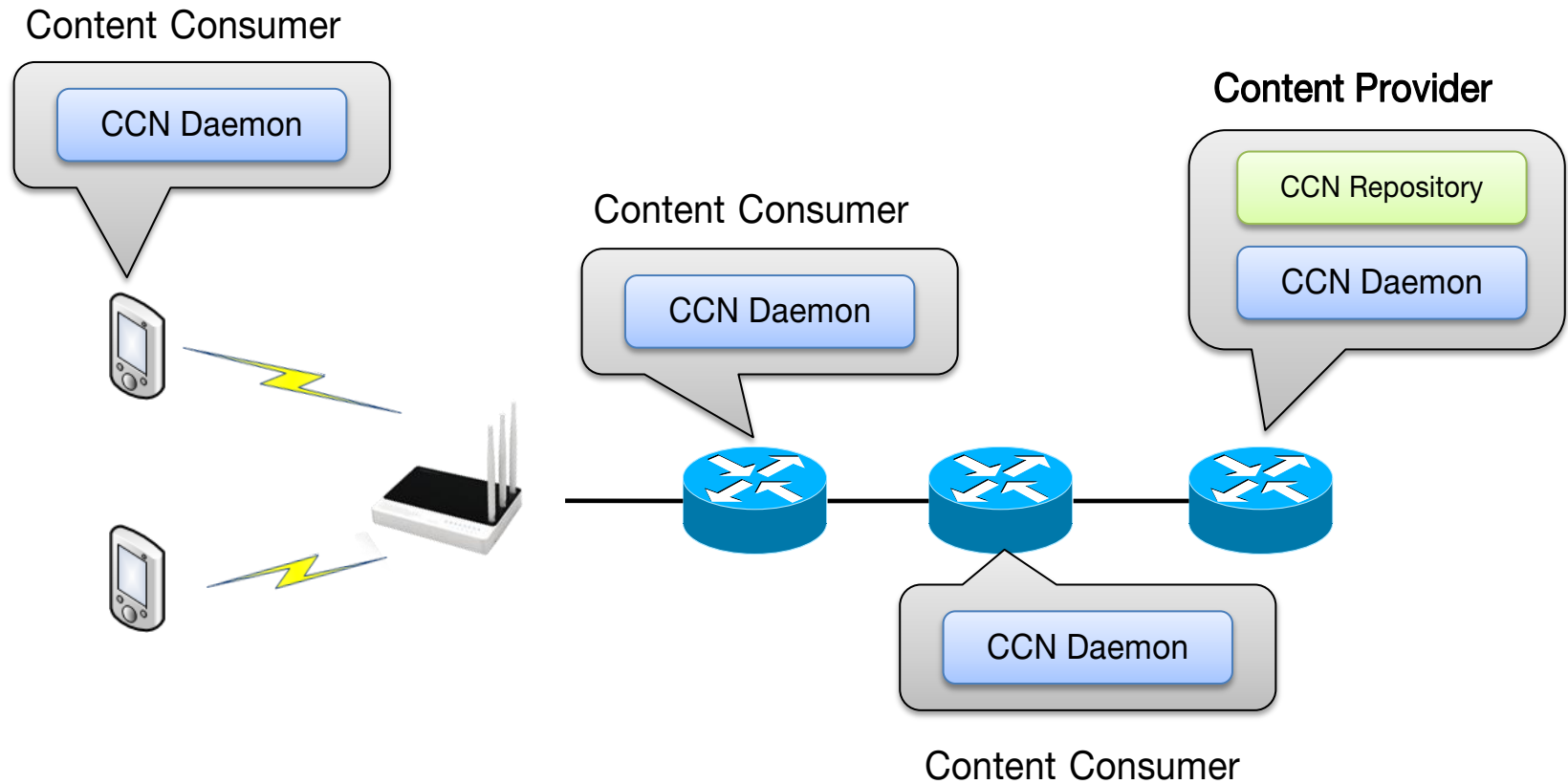
Stored Content: 50000

Content Name	Byte Count
/my_ccnx_repo/testFile4	38.01 MB
/C.M.S.neighborhood/C.M.SRV.F	615 B
/my_ccnx_repo/testFile3	1.80 MB
/C.M.S.neighborhood/C.M.SRV.	3.60 KB
/my_ccnx_repo/testFile2	40.50 MB

Web User Interface (Graph)



Experiment



Conclusion

- Develop a CCN monitoring tool with SNMP, IPFIX and HTTP
- Currently, our monitoring tool works in only IP-Overlay network
- Future work
 - CCN-native monitoring method