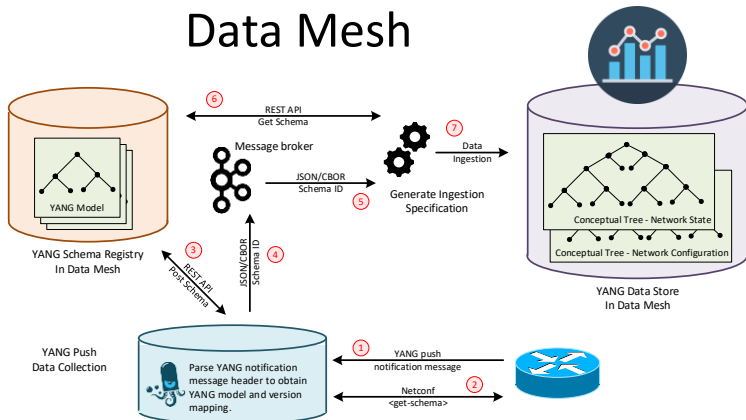


Validate Configured Subscription YANG- Push Publisher Implementations NETCONF & NMOP WG



IETF 122
March 15-16th, 2025
Hackathon

Hackathon – Plan and Software

Test Plan

- Validate work in progress vendor YANG-Push publisher implementations.
- Configure RFC 8641 compliant YANG-Push configured subscription.
- Verify output in packet capture before YANG-Push receiver and after transformation.
- Verify YANG Library and YANG-Push systems and notifications capabilities discovery.

Development Plan

- MVP 1 – Basic Requirements (9)
- MVP 2 – Scale and Secure (3)
- MVP 3 – Optimizations (2)

Software

- YANG-Push Publisher - Cisco IOS XR
- YANG-Push Publisher - 6WIND VSR
- YANG-Push Publisher - Huawei NE (Router) and MA (OLT)
- YANG-Push Receiver – Pmacct
- YANG-Push Receiver – Netgauze
- udp-notif dissector - Wireshark

Hackathon – Repository

Test Repository

- <https://github.com/network-analytics/ietf-network-analytics-document-status/tree/main/122/Hackathon>
- Contains
 - Packet capture on the wire
 - Netconf RPCs and YANG-Push JSON and CBOR encoded messages
 - Python script which performed test cases

The screenshot shows the GitHub interface for the repository 'network-analytics / ietf-network-analytics-document-status'. The 'Code' tab is selected, and the 'main' branch is chosen. The file explorer on the left shows a directory structure with folders 116 through 121, and a folder named 'Hackathon' which is currently expanded. The 'Hackathon' folder contains several files: 'TestReport_6wind_VS...', 'TestReport_Cisco_IOS...', 'TestReport_Huawei_V...', 'dissector-udp-notif.lua', 'ietf-121-hackathon-v...', and 'ietf-121-hackathon-v...'. The main content area shows a commit by 'graf3net' titled 'Merge branch 'main' of https://github.com/network-analytics/ietf-netw...'. Below the commit, a table lists the files changed in this commit.

Name	Last commit message
..	
TestReport_6wind_VSR_3901_YANG_Push_20241102_174354.log	6wind_report
TestReport_Cisco_IOSXR_25.1.1.102S-YP2_YANG_Push_20241...	xr
TestReport_Huawei_VRP_R024C10SPC500TP1_YANG_Push_202...	update
dissector-udp-notif.lua	udp-notif wireshark dissector
ietf-121-hackathon-validate-yang-push-publisher.pdf	updated
ietf-121-hackathon-validate-yang-push-publisher.pptx	updated
ipf-zbl1243-r-daisy-21-yangpush-20241102-1030.pcap	Huawei VRP test results
ipf-zbl1243-r-daisy-91-yangpush-20241102-163622.pcap	update
ipf-zbl1327-r-daisy-91-yangpush-20241102-153314.pcap	IOSXR
ipf-zbl1843-r-daisy-58-yangpush-20241102-165955.pcap	6wind_3.9.0.1
ipf-zbl1843-r-daisy-58-yangpush-20241102-174354.pcap	6wind_report

An Architecture for YANG-Push to Apache Kafka Integration

draft-ietf-nmop-yang-kafka-integration

- Subscription to YANG Notifications
[RFC 8639](#)
- Subscription to YANG Notifications for Datastore Updates
[RFC 8641](#)
- UDP-based Transport for Configured Subscriptions
[draft-ietf-netconf-udp-notif](#)
- Subscription to Distributed Notifications
[draft-ietf-netconf-distributed-notif](#)
- Extensible YANG Model for YANG-Push Notifications
[draft-ietf-netconf-notif-envelope](#)
- Support of Versioning in YANG Notifications Subscription
[draft-ietf-netconf-yang-notifications-versioning](#)
- YANG Modules Describing Capabilities for Systems and Datastore Update Notifications
[RFC 9196](#)
- YANG Notification Transport Capabilities
[draft-ietf-netconf-yp-transport-capabilities](#)
- YANG Library
[RFC 8525](#)
- Augmented-by Addition into the IETF-YANG-Library
[draft-ietf-netconf-yang-library-augmentation](#)
- Encoding of Data Modeled with YANG in the CBOR
[RFC 9254](#)

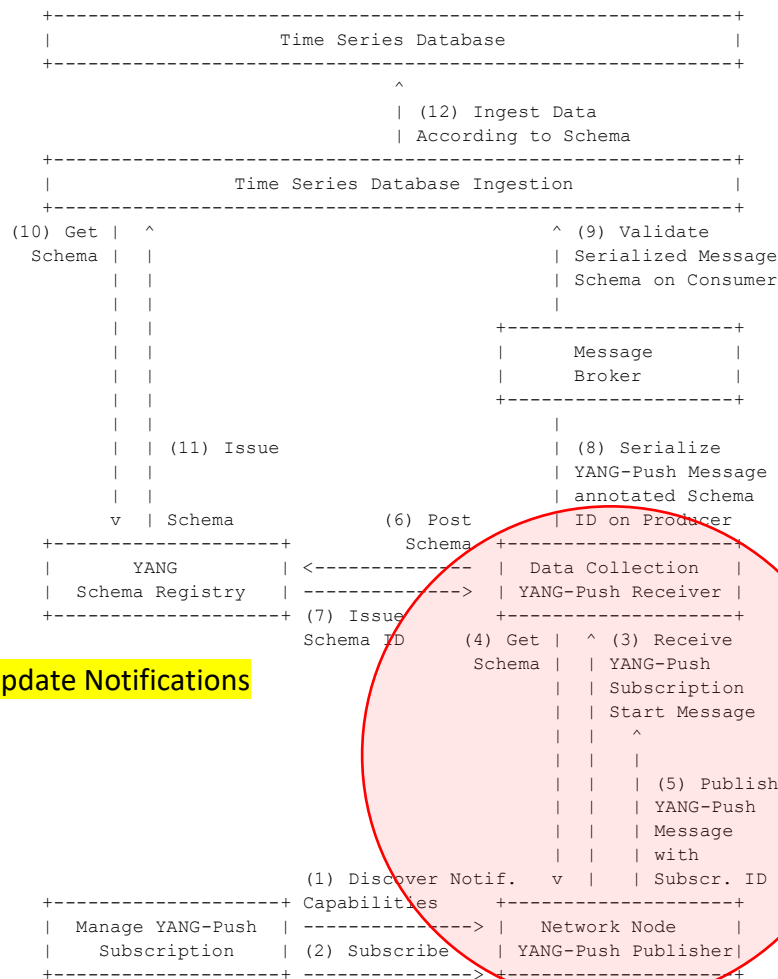


Figure 1: End to End Workflow

Cisco IOS XR – Subscription Notifications

Subscription-Started Notification

```
{
  "ietf-yp-notification:envelope": {
    "event-time": "2025-03-12T11:33:37.918Z",
    "hostname": "ios",
    "sequence-number": 2,
    "contents": {
      "ietf-subscribed-notifications:subscription-started": {
        "id": 0,
        "ietf-yang-push:datastore": "operational",
        "ietf-yang-push:datastore-xpath-filter": "Cisco-IOS-XR-pfi-im-cmd-oper:interfaces",
        "transport": "ietf-udp-notif-transport:udp-notif",
        "ietf-yang-push-revision:module-version": [
          {
            "module-name": "Cisco-IOS-XR-pfi-im-cmd-oper",
            "revision": "2024-02-29"
          }
        ],
        "ietf-yang-push-revision:yang-library-content-id": "6da7f478e60adccd442070e18843ca1318b20ca4",
        "encoding": "encode-json",
        "ietf-yang-push:periodic": {
          "period": 3000
        }
      }
    }
  }
}
```

Huawei MA – Push Notifications

Subscription Started Notification

```
{
  "ietf-notification:notification": {
    "eventTime": "2025-03-06T13:31:00.520+01:00",
    "ietf-notification-sequencing:sysName": "ipd-zbl1535-s-fh-79",
    "ietf-notification-sequencing:sequenceNumber": 0,
    "ietf-subscribed-notifications:subscription-started": {
      "id": 1,
      "ietf-yang-push:datastore": "ietf-datastores:running",
      "ietf-yang-push:datastore-xpath-filter": "/ietf-
interfaces:interfaces-state/interface[type='iana-if-
type:ethernetCsmacd']/statistics",
      "dscp": 0,
      "transport": "ietf-udp-notif-transport:udp-notif",
      "encoding": "ietf-subscribed-notifications:encode-json",
      "ietf-yang-push:periodic": {
        "period": 500
      }
    }
  }
}
```

Push-Update Notification of initial on-change sync-on-start

```
{
  "ietf-notification:notification": {
    "eventTime": "2025-03-06T13:31:00.970+01:00",
    "ietf-notification-sequencing:sysName": "ipd-zbl1535-s-fh-79",
    "ietf-notification-sequencing:sequenceNumber": 1,
    "ietf-yang-push:push-update": {
      "id": 20,
      "ietf-yp-observation:timestamp": "2025-03-06T13:31:00.970+01:00",
      "ietf-yp-observation:point-in-time": "initial-state",
      "ietf-distributed-notif:message-publisher-id": 3021116856,
      "datastore-contents": {
        "ietf-interfaces:interfaces-state": {
          "interface": [
            {
              "name": "ethernetCsmacd.0.9.0",
              "oper-status": "up"
            },
            {
              "name": "ethernetCsmacd.0.9.1",
              "oper-status": "down"
            },
            {
              "name": "ethernetCsmacd.0.9.2",
              "oper-status": "down"
            }
          ]
        }
      }
    }
  }
}
```

Huawei MA – YANG-Push Capabilities

System Capabilities

```
<?xml version="1.0" encoding="utf-8"?>
<rpc-reply message-id="1739882832263"
  xmlns="urn:ietf:params:xml:ns:netconf:base:1.0">
  <data>
    <system-capabilities
      xmlns="urn:ietf:params:xml:ns:yang:ietf-system-capabilities">
      <datastore-capabilities
        xmlns="urn:ietf:params:xml:ns:yang:ietf-system-capabilities">
        <datastore
          xmlns:ds="urn:ietf:params:xml:ns:yang:ietf-
datastores">ds:running
        </datastore>
        <per-node-capabilities>
          <node-selector
            xmlns:if="urn:ietf:params:xml:ns:yang:ietf-interfaces"
            xmlns:ianaift="urn:ietf:params:xml:ns:yang:iana-if-
type">/if:interfaces-
state/if:interface[if:type='ianaift:ethernetCsmacd']
          </node-selector>
          <subscription-capabilities
            xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-
capabilities">
            <max-nodes-per-update>2</max-nodes-per-update>
            <on-change-supported>state-changes</on-change-supported>
            <minimum-dampening-period>500</minimum-dampening-period>
            <supported-excluded-change-type>none</supported-excluded-
change-type>
          </subscription-capabilities>
          </per-node-capabilities>
        </datastore-capabilities>
      </system-capabilities>
    </data>
  </rpc-reply>
```

Subscription Capabilities

```
<subscription-capabilities
  xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-capabilities">
  <max-nodes-per-update
    xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-capabilities">2
  </max-nodes-per-update>
  <periodic-notifications-supported
    xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-
capabilities">config-changes state-changes
  </periodic-notifications-supported>
  <minimum-update-period
    xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-
capabilities">6000
  </minimum-update-period>
  <on-change-supported
    xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-
capabilities">state-changes
  </on-change-supported>
  <minimum-dampening-period
    xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-
capabilities">1000
  </minimum-dampening-period>
  <supported-excluded-change-type
    xmlns="urn:ietf:params:xml:ns:yang:ietf-notification-
capabilities">none
  </supported-excluded-change-type>
</subscription-capabilities>
</system-capabilities>
</data></rpc-reply>
```

6WIND VSR – Subscription Notifications

Subscription-Started Notification

```
{
  "ietf-yp-notification:envelope": {
    "event-time": "2025-03-04T07:31:36.806021107+00:00",
    "hostname": "daisy-ietf-ipf-zbl1843-r-daisy-58",
    "sequence-number": 48,
    "notification-contents": {
      "ietf-subscribed-notifications:subscription-started": {
        "id": 12345678,
        "ietf-yang-push:datastore": "ietf-datastores:operational",
        "ietf-yang-push:datastore-xpath-filter": "/state/vrf/l3vrf/interface/loopback/enabled",
        "transport": "ietf-udp-notif-transport:udp-notif",
        "encoding": "encode-json",
        "purpose": "send notifications",
        "ietf-distributed-notif:message-publisher-ids": [
          0
        ],
        "ietf-yang-push:on-change": {
          "sync-on-start": true
        },
        "ietf-yang-push-revision:module-version": [
          {
            "module-name": "vrouter-loopback",
            "revision": "2024-04-22"
          }
        ],
        "ietf-yang-push-revision:yang-library-content-id": "3625735881"
      }
    }
  }
}
```


6WIND VSR – Push Notifications

Push-Update Notification

```
{
  "ietf-yp-notification:envelope": {
    "event-time": "2025-03-04T07:37:40.725023242+00:00",
    "hostname": "daisy-ietf-ipf-zb11843-r-daisy-58",
    "sequence-number": 58,
    "notification-contents": {
      "ietf-yang-push:push-update": {
        "id": 4,
        "datastore-contents": {
          "vrouters:state": {
            "vrf": [
              {
                "name": "main",
                "vrouters-interface:interface": {
                  "physical": [
                    {
                      "name": "ens192",
                      "counters": {
                        "in-octets": "189227",
                        "in-unicast-pkts": "736",
                        "in-discards": "271",
                        "in-errors": "0",
                        "out-octets": "759448",
                        "out-unicast-pkts": "5548",
                        "out-discards": "0",
                        "out-errors": "0"
                      }
                    }
                  ]
                }
              }
            ]
          }
        }
      }
    }
  }
}
```

Push-Change-Update Notification

```
{
  "ietf-yp-notification:envelope": {
    "event-time": "2025-03-04T07:32:37.561586599+00:00",
    "hostname": "daisy-ietf-ipf-zb11843-r-daisy-58",
    "sequence-number": 50,
    "notification-contents": {
      "ietf-yang-push:push-change-update": {
        "id": 3,
        "datastore-changes": {
          "yang-patch": {
            "patch-id": "patch-1",
            "edit": [
              {
                "edit-id": "edit-1",
                "operation": "replace",
                "target": "/vrouters:state/vrf[name='main']/l3vrf[name='A9']/vrouters-interface:interface/vrouters-loopback:loopback[name='Loopback-A9']/enabled",
                "value": {
                  "vrouters-loopback:enabled": "false"
                }
              }
            ]
          }
        },
        "ietf-distributed-notif:message-publisher-id": 0,
        "ietf-yp-observation:timestamp": "2025-03-04T07:32:37.561829359+00:00",
        "ietf-yp-observation:point-in-time": "state-changed"
      }
    }
  }
}
```

6WIND VSR – CBOR Named Identifiers

6wind-vsr-yang-push-20250305-1133-receiver-cbor.pcap

File Edit View Go Capture Analyze Statistics Telephony Wireless Tools Help

Apply a display filter ... <Ctrl-/>

No.	Time	Source IP	Destination IP	Protocol	Length	Info
7	2025-03-05 17:34:22.630703	203.0.113.58	100.105.33.20	UDPPUBCHANNEL	672	59279 → 10003 Len=62
8	2025-03-05 17:34:52.893654	203.0.113.58	100.105.33.20	UDPPUBCHANNEL	672	59279 → 10003 Len=62
9	2025-03-05 17:35:23.160913	203.0.113.58	100.105.33.20	UDPPUBCHANNEL	672	59279 → 10003 Len=62

> Frame 8: 672 bytes on wire (5376 bits), 672 bytes captured (5376 bits)
> Linux cooked capture v1
> Internet Protocol Version 4, Src: 203.0.113.58, Dst: 100.105.33.20
> User Datagram Protocol, Src Port: 59279, Dst Port: 10003
▼ UDP-Notif Protocol, Publisher: 0, Msg ID: 3
 001. = Header Version: 1
 ...0 = Media Type Space: standard media types (0)
 0011 = Media Type: application/yang-data+cbor (3)
 Header Length: 12
 Message Length: 628
 Publisher ID: 0
 Message ID: 3
▼ Concise Binary Object Representation
 ▼ Map: (indefinite length)
 101. = Major Type: Map (5)
 ...1 1111 = Size: Indefinite Length (31)
 ▼ Text String: ietf-yp-notification:envelope
 011. = Major Type: Text String (3)
 ...1 1000 = Size: 1 byte (24)
 Length: 29
 Text String: ietf-yp-notification:envelope
 ▼ Map: (indefinite length)
 101. = Major Type: Map (5)
 ...1 1111 = Size: Indefinite Length (31)
 ▼ Text String: event-time
 011. = Major Type: Text String (3)
 ...0 1010 = Length: 10
 Text String: event-time
 ▼ Text String: 2025-03-05T10:34:53.606715118+00:00
 011. = Major Type: Text String (3)
 ...1 1000 = Size: 1 byte (24)
 Length: 35
 Text String: 2025-03-05T10:34:53.606715118+00:00

0000 00 00 00 01 00 06 00 50 56 82 48 25 00 00 08 00P V-H&....
0010 45 00 02 90 a3 87 40 00 3d 11 d6 1d cb 00 71 3a E.....@ =.....q:
0020 64 69 21 14 e7 8f 27 13 02 7c 4f 81 23 0c 02 74 di!.....' .|0 #.t
0030 00 00 00 00 00 00 00 03 bf 78 1d 69 65 74 66 2dx ietf-
0040 79 70 2d 6e 6f 74 69 66 69 63 61 74 69 6f 6e 3a yp-notif ication:
0050 65 6e 76 65 6c 6f 70 65 bf 6a 65 76 65 6e 74 2d envelope .jevent-
0060 74 69 6d 65 78 23 32 30 32 35 2d 30 33 2d 30 35 timex#20 25-03-05
0070 54 31 30 3a 33 34 3a 35 33 2e 36 30 36 37 31 35 T10:34:5 3.606715
0080 31 31 38 2b 30 30 3a 30 30 68 68 6f 73 74 6e 61 118+00:0 0hostname
0090 6d 65 78 21 64 61 69 73 79 2d 69 65 74 66 2d 69 mexidals y-ietf-i
00a0 70 66 2d 7a 62 6c 31 38 34 33 2d 72 2d 64 61 69 pf-zbl18 43-r-dai
00b0 73 79 2d 35 38 6f 73 65 71 75 65 6e 63 65 2d 6e sy-S8ose quence-n
00c0 75 6d 62 65 72 03 75 6e 6f 74 69 66 69 63 61 74 umber-un otificat
00d0 69 6f 6e 2d 63 6f 6e 74 65 6e 74 73 bf 78 1a 69 ion-cont ents-x-i
00e0 65 74 66 2d 79 61 6e 67 2d 70 75 73 68 3a 70 75 etf-yp- .push:pu
00f0 73 68 2d 75 70 64 61 74 65 bf 62 69 64 01 72 64 sh-updat e-bid-rd
0100 61 74 61 73 74 6f 72 65 2d 63 6f 6e 74 65 6e 74 atastore -content
0110 73 bf 6d 76 72 6f 75 74 65 72 3a 73 74 61 74 65 s-mvrout er:state
0120 bf 63 76 72 66 9f bf 64 6e 61 6d 65 64 6d 61 69 -cvrf- d namedmai
0130 6e 78 1b 76 72 6f 75 74 65 72 2d 69 6e 74 65 72 nx-vrout er-inter
0140 66 61 63 65 3a 69 6e 74 65 72 66 61 63 65 bf 68 face:int erface-h
0150 70 68 79 73 69 63 61 6c 9f bf 64 6e 61 6d 65 66 physical .dnamef
0160 65 6e 73 31 39 32 68 63 6f 75 6e 74 65 72 73 bf ens192hc ounters.
0170 69 69 6e 2d 6f 63 74 65 74 73 1a 00 3f 81 43 6f iin-octe ts-? .Co
0180 69 6e 2d 75 6e 69 63 61 73 74 2d 70 6b 74 73 19 in-unica st-pkts-
0190 3e 1c 6b 69 6e 2d 64 69 73 63 61 72 64 73 19 16 > .kin-di scards..
01a0 cf 69 69 6e 2d 65 72 72 6f 72 73 00 6a 6f 75 74 -iin-err ors-jout
01b0 2d 6f 63 74 65 74 73 1a 02 de 3c f5 70 6f 75 74 -octets. -< .pout
01c0 2d 75 6e 69 63 61 73 74 2d 70 6b 74 73 1a 00 02 -unicast -pkts-
01d0 4e c7 6c 6f 75 74 2d 64 69 73 63 61 72 64 73 00 N-lout-d iscards-
01e0 6a 6f 75 74 2d 65 72 72 6f 72 73 00 ff ff ff ff jout-err ors-
01f0 ff ff ff ff 78 2b 69 65 74 66 2d 64 69 73 74 72x-ie tf-distr
0200 69 62 75 74 65 64 2d 6e 6f 74 69 66 3a 6d 65 73 ibuted-n otif:mes
0210 73 61 6f 65 2d 70 75 62 6c 69 73 68 65 72 2d 69 sage-pub lisher-i
0220 64 00 78 1d 69 65 74 66 2d 79 70 2d 6f 62 73 65 d-x-ietf -yp-obs-
0230 72 76 61 74 69 6f 6e 3a 74 69 6d 65 73 74 61 6d rvation: timestam
0240 70 78 23 32 30 32 35 2d 30 33 2d 30 35 54 31 30 px#2025- 03-05T10
0250 3a 23 3a 3a 3c 33 7a 2c 30 37 31 33 3c 33 37 30 :34:53 6 0715370

YANG-Push Implementation Status

IETF 122 – MVP 1

	6WIND VSR	Huawei NE	Huawei MA	Cisco IOS XR	Open- Source
RFC 8639 YANG-Push Subscription	✓	✓	✓	✓	
RFC 8641 YANG-Push Notification	✓	✓	✓	✓	
draft-ietf-netconf-udp-notif	✓	✓	✓	✓	✓
draft-ietf-netconf-yang-notifications-versioning	✓	✓	✓	✓	
draft-tgraf-netconf-notif-sequencing	✓	✓	✓	✓	
draft-tgraf-netconf-yang-push-observation-time	✓	✓	✓	✓	
RFC 8525 YANG Library	✓	✓	✓	✓	
draft-ietf-netconf-yang-library-augmentation	✓	✓	✓		✓
RFC 9196 System and Notification Capabilities			✓		
draft-netana-netconf-notif-envelope	✓			✓	



Green marked describes new capability at IETF 122. "P" to partially implemented.

YANG-Push Implementation Status

IETF 122 – MVP 2

	6WIND VSR	Huawei NE	Huawei MA	Cisco IOS XR	Open- Source
draft-ietf-netconf-distributed-notif	✓	✓	✓		
RFC 9254 CBOR Named Identifiers	✓				
RFC 6347/RFC 9147 DTLS					



Green marked describes new capability at IETF 122. "P" to partially implemented

YANG-Push Implementation Status

IETF 122 – MVP 3

	6WIND VSR	Huawei NE	Huawei MA	Cisco IOS XR	Open- Source
RFC 8641 on-change subscriptions	✓	✓	✓	P	
draft-netana-netconf-yp-transport-capabilities			✓	✓	



Green marked describes new capability at IETF 122. "P" to partially implemented

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- Zhuoyao Lin – Huawei (remote)
- Jiale Li – Huawei (remote)
- Jian Ping– Huawei (remote)
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- Holger Keller – DT
- Nils Warnke - DT
- Alex Huang-Feng – INSA Lyon
- Yannick Buchs – Swisscom (remote)
- Thomas Graf – Swisscom

