IP over MPEG-2/DVB (ipdvb) WG

MONDAY, March 7th, 2005
19:30-22:00 Evening Session

CHAIR:

Gorry Fairhurst <gorry@erg.abdn.ac.uk>

Active Drafts:

draft-ietf-ipdvb-arch-03.txt
draft-ietf-ipdvb-ule-05.txt

draft-fair-ipdvb-ar-03.txt
draft-montpetit-ipdvb-config-00.txt
draft-stiemerling-ipdvb-config-00.txt

Archive:

http://www.erg.abdn.ac.uk/ipdvb/archive
ftp://ftp.ietf.org/ietf-mail-archive/ipdvb/

3rd IETF ipdvb WG meeting

Agenda

1. Agenda Bashing (5 minutes) - Chair

* Agenda changes
* Scribe for Proceedings

2. Working Group Status (10 minutes)

3. Architecture/Framework (5 minutes)

draft-ipdvb-arch-03.txt

4.Ultra Lighweight Encapsulation (ULE) (10 minutes)

draft-ietf-ipdvb-ule-05.txt

5. ULE Security Extension (10 minutes)

See mailing list

6. ipdvb and RObust Header Compression (20 minutes)

draft-bormann-rohc-over-802-01.txt

Agenda

7. Problem Statement: IP Address Configuration for IPDVB (20 mins)

draft-stiemerling-ipdvb-config-00.txt

8. Address Resolution (15 minutes)

draft-fair-ipdvb-ar-03.txt

9. Protocols for MPEG-2 network configuration (5 minutes)

draft-montpetit-ipdvb-config-00.txt

10. ARIB broadcast program resource identifier (5 minutes)

draft-aoki-arib-uri-00.txt

11. Review of Milestones (10 minutes) - Chair

IPR Notice

You MUST disclose any IPR you know of relating to the technology under discussion

When starting a presentation you MUST say if:

- There is IPR associated with your draft
- The restrictions listed in section 5 of RFC 3667 apply to
  - Your draft
  - When asking questions
  - Commenting on a draft

BCP78 (RFC 3667), BCP79 (RFC 3668) and the “Note Well” text

2. WG Status

Gorry Fairhurst <gorry@erg.abdn.ac.uk>

Active IDs

Published RFCs:

None.

RFC Ed Queue:

None.

AD Review:

Framework/Architecture ID (INFO)

draft-ietf-ipdvb-arch-03.txt

Ultra Lightweight Encapsulation (ULE) (for Proposed STD)

draft-ietf-ipdvb-ule-05.txt

Documents in Last Call:

None.

Active IDs

Individual:

Address Resolution Framework (INFO - AS)
draft-fair-ipdvb-ar-03.txt *

Address Resolution Config
draft-montpetit-ipdvb-config-00.txt *
draft-stiemerling-ipdvb-config-00.txt

Other IDs being discussed at this meeting:
draft-bormann-rohc-over-802-01.txt
draft-aoki-arib-uri-00.txt

* Individual Submission

Milestones

Done Draft of a WG Architecture ID
Done Draft of a WG ID on Encapsulation (ULE)
Done Submit Architecture to IESG (for Nov 2004)

Jan 05 Draft of a WG ID on AR Framework

Feb 05 Draft of a WG ID on AR Protocol
Done Submit Encapsulation to IESG

Oct 05 Submit AR Framework to IESG

Dec 05 Submit AR Protocol to IESG
Dec 05 Progress ULE RFC along IETF Standards Track

Dec 05 Recharter or close WG?

3. ARCH Status

Marie-Jose Montpetit
(mmontpetit@motorola.com)

A Framework for transmission of IP datagrams over MPEG-2 Networks

draft-ietf-ipdvb-arch-03.txt

Marie-José Montpetit (ed.)
mmontpetit@motorola.com
Gorry Fairhurst
Horst D. Clausen
Bernhard Collini-Nocker
Hilmar Linder

March 7 2004

Progress Since Last Version

- Working Group Last Call (WGLC) of rev -02.
  - Changes following WGLC
    - Updated figure 1
    - Fixed typos and inconsistencies in page numbering.
    - Added DVB-S2, Open Cable and MHP references.
    - Removed a paragraph in the Appendix.
- Document submitted to AD
  - Write-Up requesting publication as an INFO RFC
- Revision -03
  - Terminology update following WGLC of ULE ID
- Document in IESG Evaluation (some discuss flags)

4. ULE Status

Gorry Fairhurst <gorry@erg.abdn.ac.uk>

Changes in Rev -04

Rev -04

This rev followed WGLC comments.

Changes included:

(i) Revised definition text
(ii) Improved clarity with respect to ISO 13818-1
(iii) Bridging and Extension-Padding formats move to section 5
(iv) Clarified NPA address before extension headers

Changes in rev-05

Rev -05 following a second WGLC

Title change:

Ultra Lightweight Encapsulation (ULE) for transmission of IP datagrams over an MPEG-2 Transport Stream

Changes:

(i) Test & Bridge Extension Headers must be last
(ii) D field renamed : “Destination Address Absent field”
(iii) Revised IANA procedures to REQUIRE definition of extensions
(iv) Defined NPA mapping for multicast
(v) Lots of NiTs :-(

Current Status

Document submitted to AD for Standards Track

Update on known implementations

http://www.erg.abdn.ac.uk/ipdvb/ipdvb-impl.html

Other Issues

Stream Identifier

ULE does not define SI/PSI Information to identify the stream

Lack of an Stream_ID has two issues:
(i) it can prevent (re)multiplexors forwarding a “stream”
(ii) receivers can not identify the type using SI/PSI tables

Suggestion that we apply for a stream_id for ULE:

Who do we apply to?

ISO?
ATSC?
DVB?

ipdvb WG Meeting (IETF-62)

ULE Security Extension

University of Surrey, UK
Alcatel (ASP), Toulouse, France

Rationale for security extensions to ULE

- An optional ULE Extension Header can be used to perform link encryption of the SNDU Payload.
- This approach is generic and decouples the encapsulation from future security extensions:
  - The operation provides functions that resemble those currently used with IPsec ESP
- This is as an additional security mechanism to IP, transport or application layer security - not a replacement

Security extensions to ULE (1)

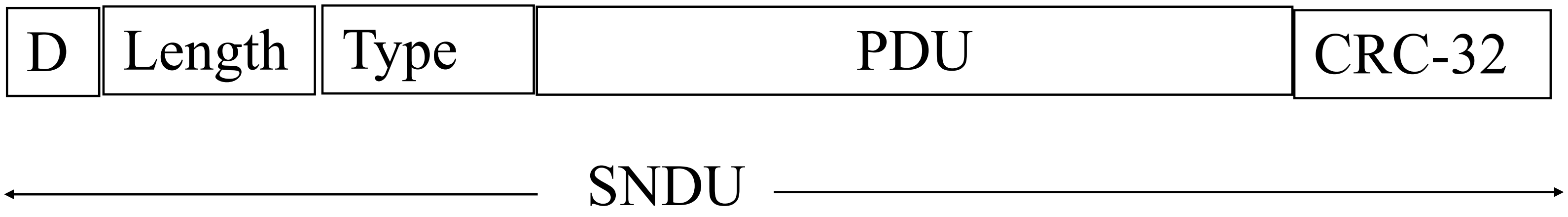
- Define a new Header Extension Type for security
- Define an extension header for Security Association ID (SA-ID):
  - Similar to the IPsec Security Parameter Index (SPI).
  - A method must be defined to uniquely identify the encryption keys.
- Link layer encryption is considered the major security service needed for ULE:
  - Therefore Encryption algorithms, key lengths, etc will be defined, using the IPsec standard security suites.

Security extensions to ULE (2)

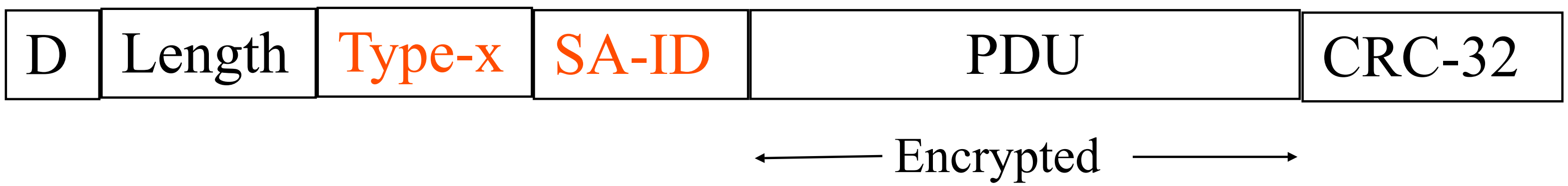
- Link layer <u>authentication</u> is not critical for ULE
  - 32 bit checksum is sufficient for most scenarios.
- Optionally will add authentication header.
  - Extension header will be longer than encryption only.
- The key management system for ULE security can use IKE (IPsec) or MSEC key management systems:
  - Satellite specific systems such as Flat Multicast Key Exchange (FMKE), under consideration in MSEC WG.
  - Generic key management such as GDOI GSAKMP

ULE security illustration

Without security



With security



L2 Security?

- What is it that is being protected? (Security **objectives**)
- How does the **key management** relate to the link?
  - How is the ID space managed? How do link and KM bind?
- Are there any specific requirements on the **crypto** algorithms that can be used with this approach?
- What are the **threats**? (Threat analysis)
- Worked **example** (bits in actual packet sequences)
  - E.g., how exactly is the decrypted payload parsed? Padding?

- And, of course:
- **Why aren't we doing this with existing mechanisms?**

6. ipdvb & ROHC

Carsten Borman

(slides to follow)

Header Compression and DVB ULE

- Carsten Bormann <cabo@tzi.org>
  IETF 62 • Minneapolis, MN, US, 2005-03-07

Early Header Compression (HC)

- TCP/IP Header Compression was pioneered in 1990
  - Van Jacobson, RFC 1144
  - TELNET access over very low bandwidth vs. 40 bytes header overhead
- Little advantage for Web traffic (large packets)
- Renewed interest with IPv6 (RFC2507: IP Header Compression)
  - Can compress IP header chains

- Real-time, conversational traffic (VoIP): small packets
- RFC 2508: Compressed RTP

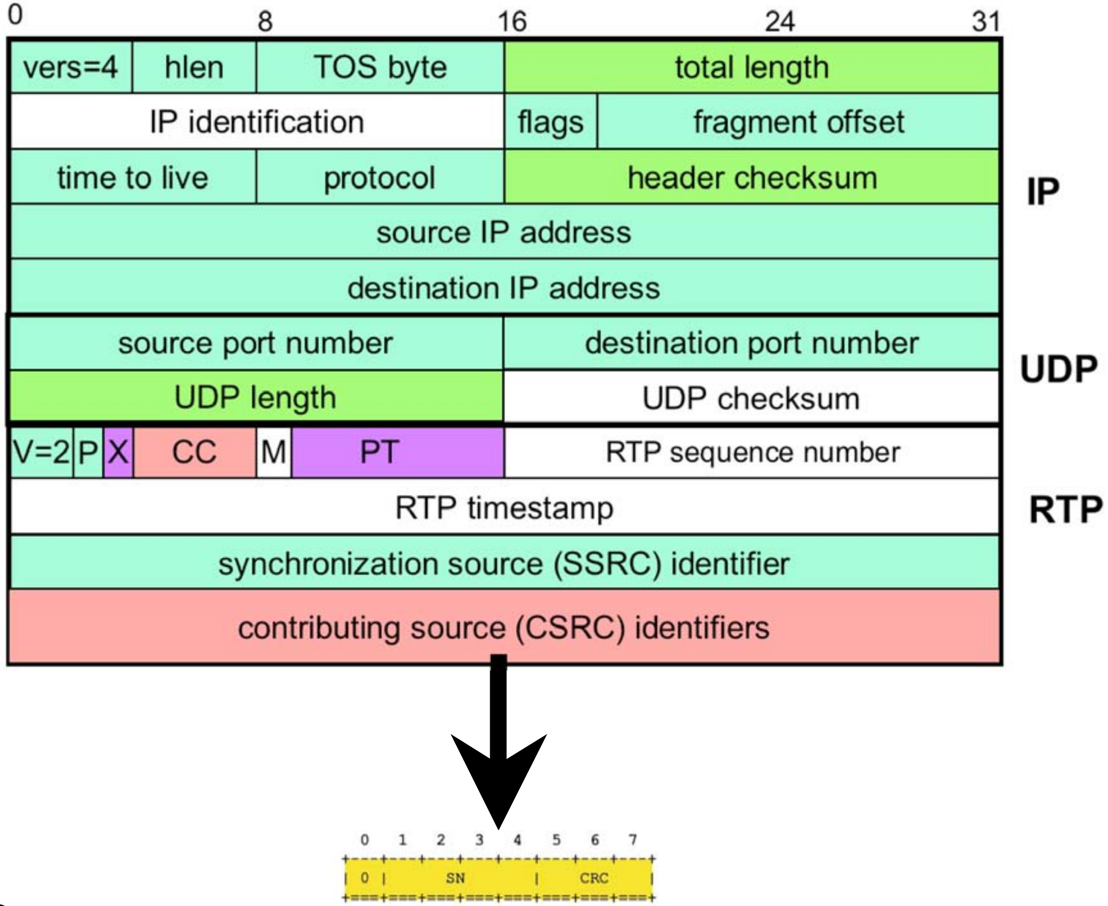
- 1990s: delta coding technology

Robust Header Compression

- The problem with delta coding: error propagation
  - No errors on wired links
  - RFC 2507/2508: Errors can be repaired in one RTT
- Significant performance impairment with wireless links
  - High loss rate
  - High RTT (interleaving!) in 2G/3G
- 1999/2000:
  - LSB encoding instead of delta encoding
  - Optimistic compression, enhanced by checksum checks

RFC 3095 (“RTP ROHC”)

- Published in July 2001
  - Robust header compression for IP/UDP/RTP, IP/ESP, IP/UDP
  - Part of 3GPP since Release 4
- Typically reduces 40 bytes of IP/UDP/RTP header to one byte
  - Zero-byte variant possible with link-layer assist (LLA, RFC 3242)
- Recently complemented by IP-only and UDP-lite variants



Requirements and Issues

- Requirements
  - Transparency — HC is hop-by-hop; hosts don't get to know
  - Performance — within design bracket
  - Error Tolerance — does not break when used outside design bracket
- Issues
  - Header compression is “organized layer violation”
    - Need to track L3-L7 protocols
  - Headers get bigger (IPv4 ➔ IPv6)
  - New headers are introduced (IPsec, tunneling/mobility, ...)
  - New options are invented for existing protocols (e.g., for TCP)
  - New protocols (e.g., DCCP)

Current IETF Work

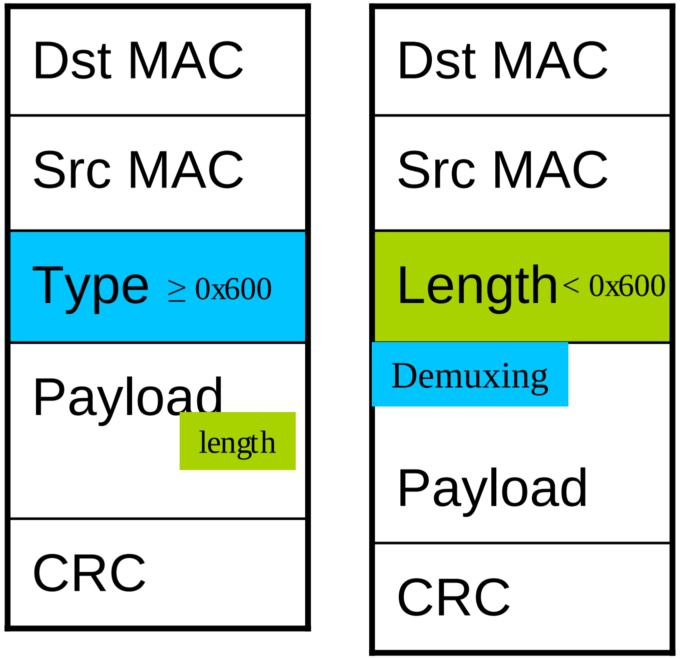
- Complement UDP/RTP ROHC by a TCP ROHC
- TCP has changed since RFC 1144 (and RFC 2507)
  - Large Windows, Timestamps; SACK; ECN
- Assumption: Lower error rates (see RFC 3819!)
- Various approaches for combining header compression and lower-layer protocols (e.g., MPLS)
- New protocols are being designed with HC in mind
  - New transport protocol DCCP was reviewed for compressibility
  - SRTP security scheme was designed to allow compressibility

ROHC-over-802 (1)

- ROHC needs link-layer bindings (ROHC-over-X)
  - Often provided by link-layer standardizers (3GPP, 3GPP2)
  - For PPP: RFC 3241
  - Work started on ROHC-over-802
- Ethernet (IEEE 802.3): dominating LAN technology
  - Family of related standards: IEEE 802
  - Another important 802 standard: IEEE 802.11 (WLAN)
- 802.3 legacy issue: Padding
  - With CSMA/CD, a packet needed to be 64 bytes (14+46+4) minimum
  - Padding still done even with modern Ethernet implementations
- Compressed ROHC packet is often smaller than 46 bytes
  - Wastes Bandwidth
  - More important: ROHC **requires** link layer length indication

ROHC-over-802 (2)

- 802 architecture often uses **bridges**
  - Packets often go over an 802.3 Ethernet before going to an 802.11 WLAN
- Make sure ROHC-over-802 survives arbitrary 802 L2 paths
- **Solution**: Use length-field encoding, not type-field encoding



- Demux based on LLC
  - DSAP, SSAP, C (0x03 = “UI”)
  - SAP = 0xAA: 3+2 bytes follow
- Proposal: ROHC gets its own LLC address (DSAP/SSAP)
  - Demux wastes 3 bytes only

LLC vs. ULE

- ULE has different SNDU types for various 802 formats

	ULE Type (no MAC)	ULE Type (with MAC)
IPv4	0x0800	0x0001
IPv6	0x86DD	0x0001
LLC	???	0x0001

- Possible Solution:
  Add Extension Type 3
  for ROHC payloads

```
 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
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|1|         Length  (15b)       |         Type = 0x0003         |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                                                               |
=                          ROHC payload                         =
|                                                               |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
|                           (CRC-32)                            |
+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+-+
```

7. Problem Statement

draft-stiemerling-ipdvb-config-00.txt

Martin Stiemerling

(slides to follow)

Problem Statement: IP Address Configuration for IPDVB

draft-stiemerling-ipdvb-config-00.txt

Martin Stiemerling — NEC Network Labs Europe
stiemerling@netlab.nec.de

IPDVB Working Group, 62th IETF meeting

Problem Space

- Configuration of DVB receivers
  - IP address resolution configuration
  - Other IP related configuration (proxies?)
  - Additional configuration (service related)
- Future IPDVB networks require powerful IP address configuration
  - IPDVB networks to be more "embedded" into IP
  - Flexible IP address management
  - Receivers probably not only receivers

Network Scenario 1

- Basic configuration scenario

```
                          ,-----.
        DVB uplink       /  DVB  \
     *##################( Network )
     #                   \       /
+----*------+             `--.--'
|  Network  |                |
|  Provider +-<-+            v DVB downlink
+-----------+   |            |
                |      +-----v------+
                +--<<--+    DVB     |
              uplink   |  Receiver  |
                       +------------+
```

Network Scenario 2

- DVB only configuration scenario
  - Uplink and downlink via DVB

```
                                      ,-----.
        DVB    link                  /  DVB  \
     *##################(  Network  )
     #                               \       /
+----*-------+                    `--.--'
|  Network   |                       |
|  Provider  |                       | DVB link
+------------+                       |
                              +------+------+
                              |     DVB     |
                              |  Receiver   |
                              +-------------+
```

Network Scenario 3

- DVB based IP broadcast
  - No uplink

```
                          ,-----.
        DVB   link       /  DVB  \
     *#######>>>########( Network )
     #                   \       /
+----*------+             `--.--'
|  Network  |                |
|  Provider |                v DVB link
+-----------+                v
                             |
                       +-----+------+
                       |    DVB     |
                       |  Receiver  |
                       +------------+
```

Configuration Scenarios

- IP configuration available
  - IP pre-configured by the service provider or by users
  - IP service information, such as DNS server, proxies, etc
  - multicast configuration and routing information
  - broadcast configuration ("open bitstream" without any registration, DVB receivers just receive IP streams)
  - security configuration, e.g., keys, policies.
- Complete Bootstrap

Conclusions

- A first attempt on with IP address address configuration.
- Open questions are:
  - What are the configuration scenarios?
  - What exactly should be configured?
  - How to configure?
  - Who is in control of the receiver?
- Some differences to others
  - 1*10e3 (or 1e*10e4) hosts per cable head end to be configured.
  - IPDVB must consider up to 1*10e5 hosts per segment

Thank you!

Question?

8. AR Status

Marie-Jose Montpetit (mmontpetit@motorola.com)

Address Resolution for IP datagrams over MPEG-2 networks

draft-fair-ipdvb-ar-03.txt

Gorry Fairhurst
Marie-José Montpetit
mmontpetit@motorola.com
Hidetaka Izumiyama

March 7 2004

IETF-62 ipdvb WG

Case Study for NDP with UDLR

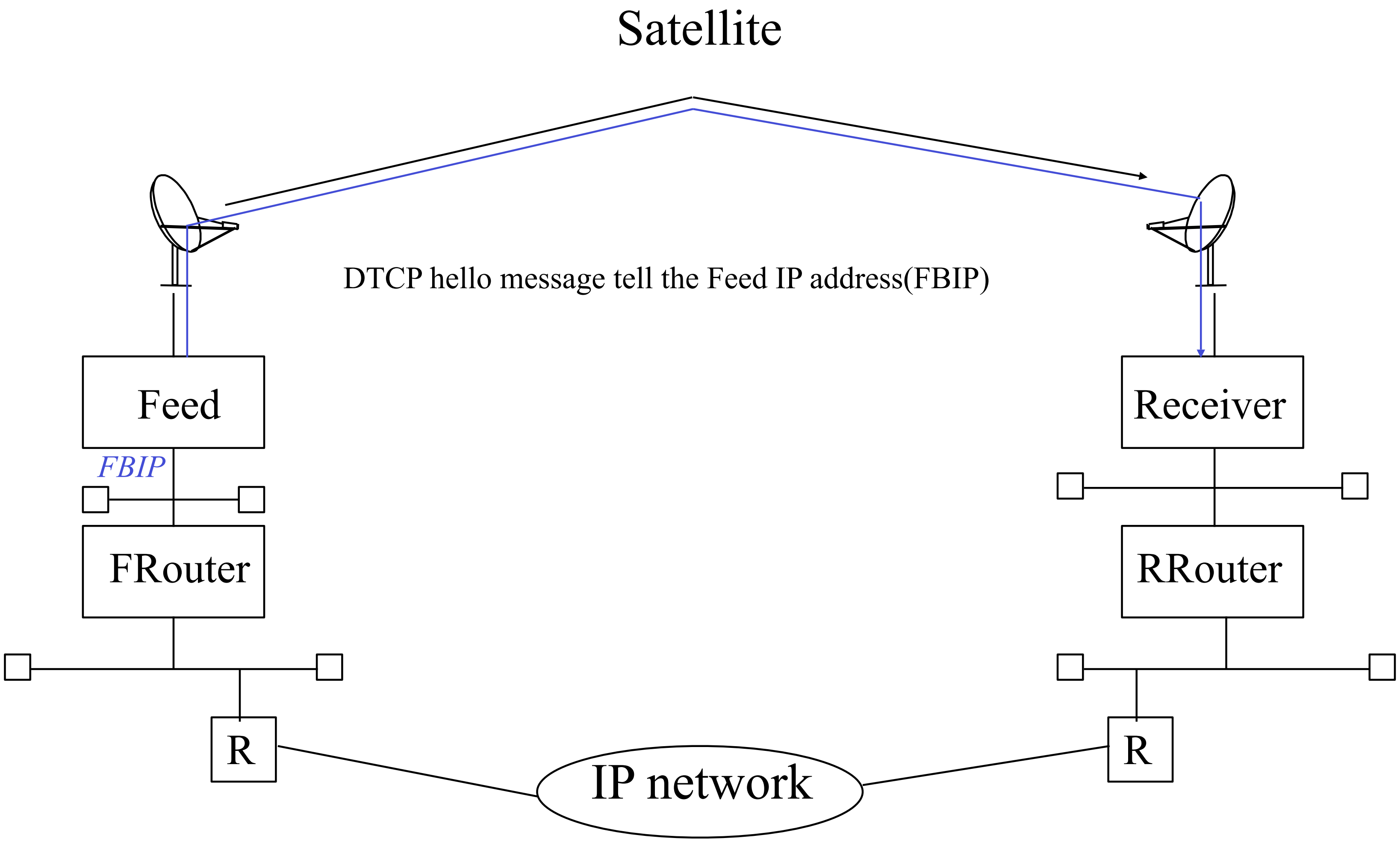
Hidetaka Izumiyama
WISHnet Inc.

Case Study:1
Address Resolution for Feed

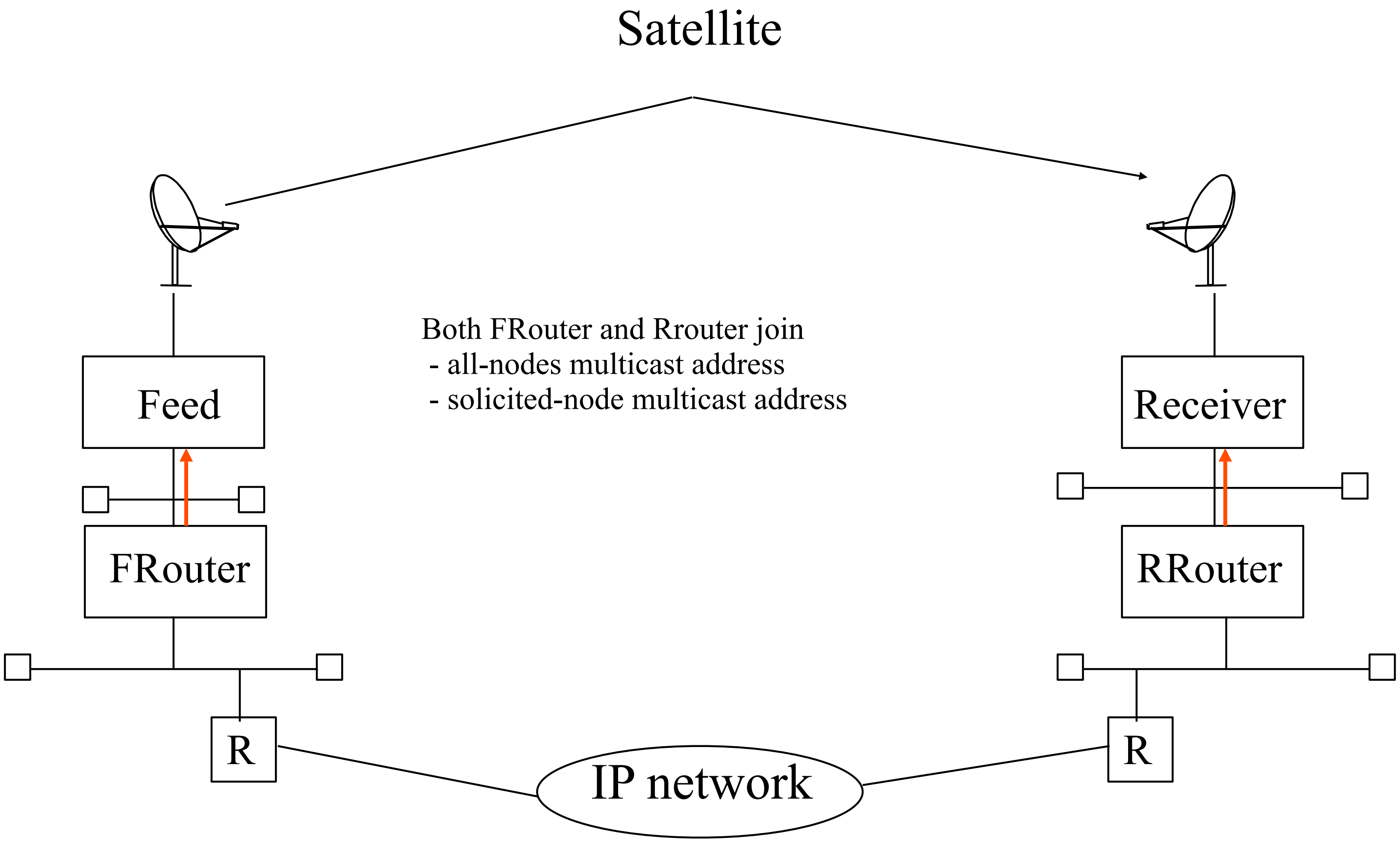
- UDLR tunnel setup
- Address Resolution

- Blue line : UDLR related packet
- Red line : ND related packet

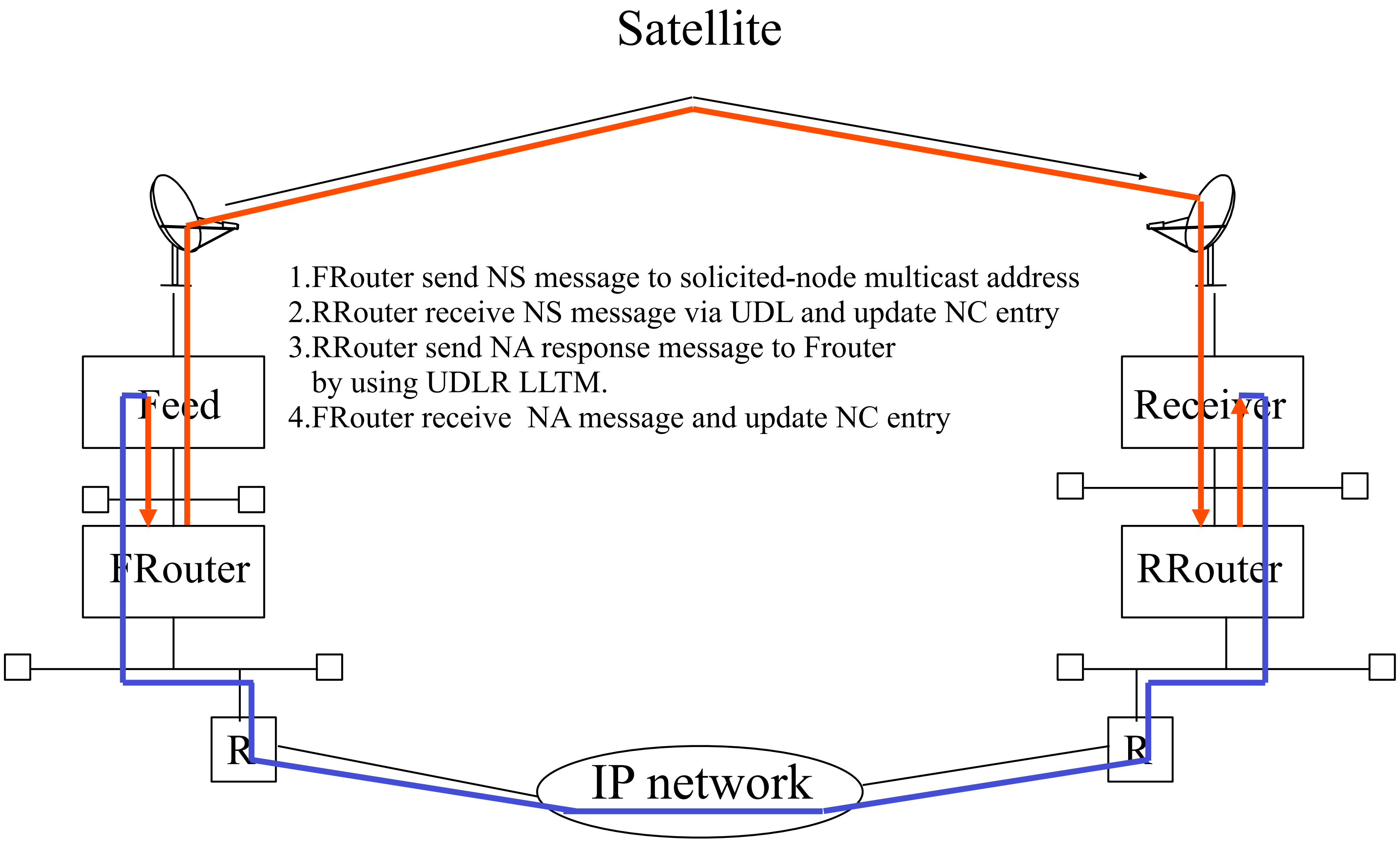
Step-1 : UDLR tunnel setup



Step-2 : Interface Initialization

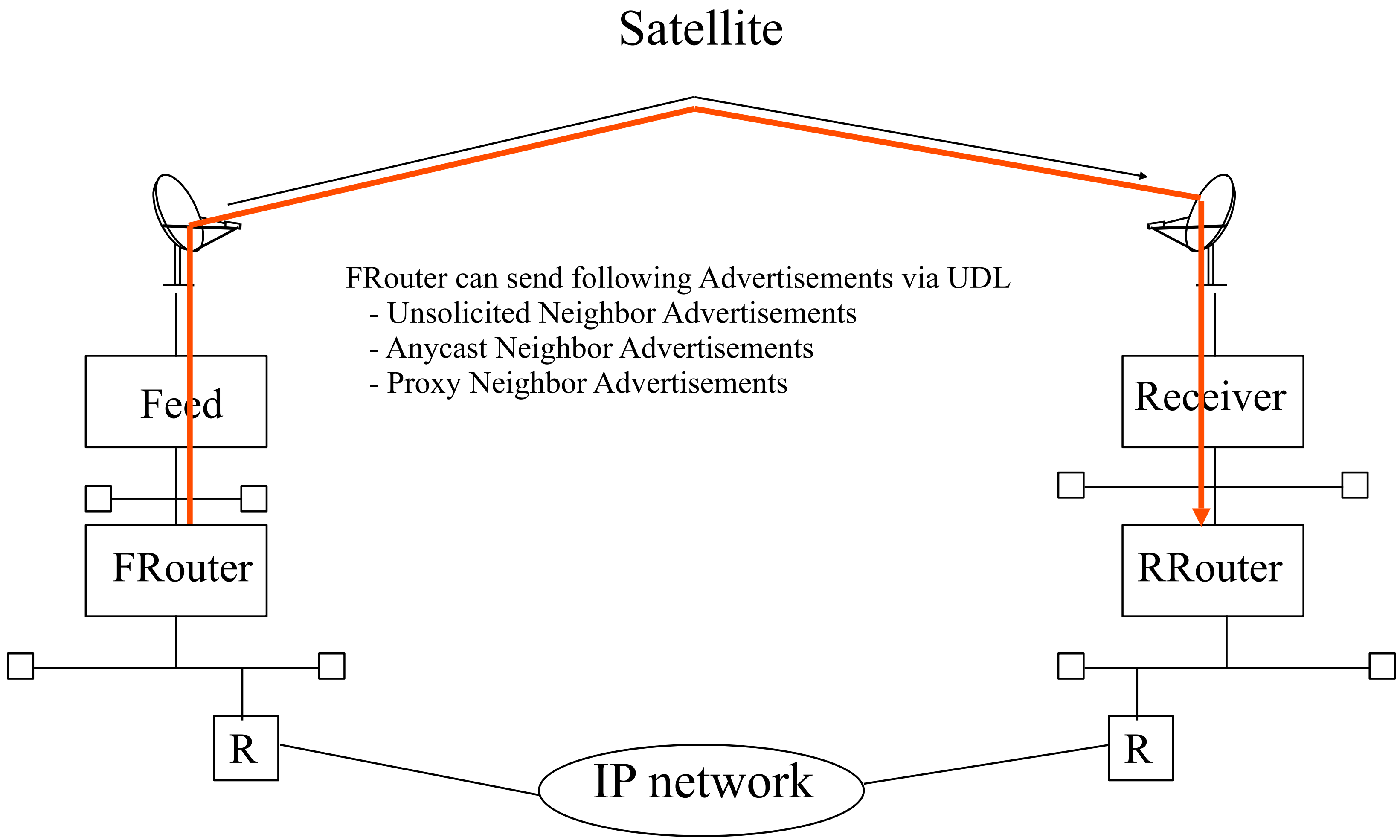


Step-3 : NS and NA



1.FRouter send NS message to solicited-node multicast address
2.RRouter receive NS message via UDL and update NC entry
3.RRouter send NA response message to Frouter
by using UDLR LLTM.
4.FRouter receive NA message and update NC entry

Step-4 : Sending Advertisements

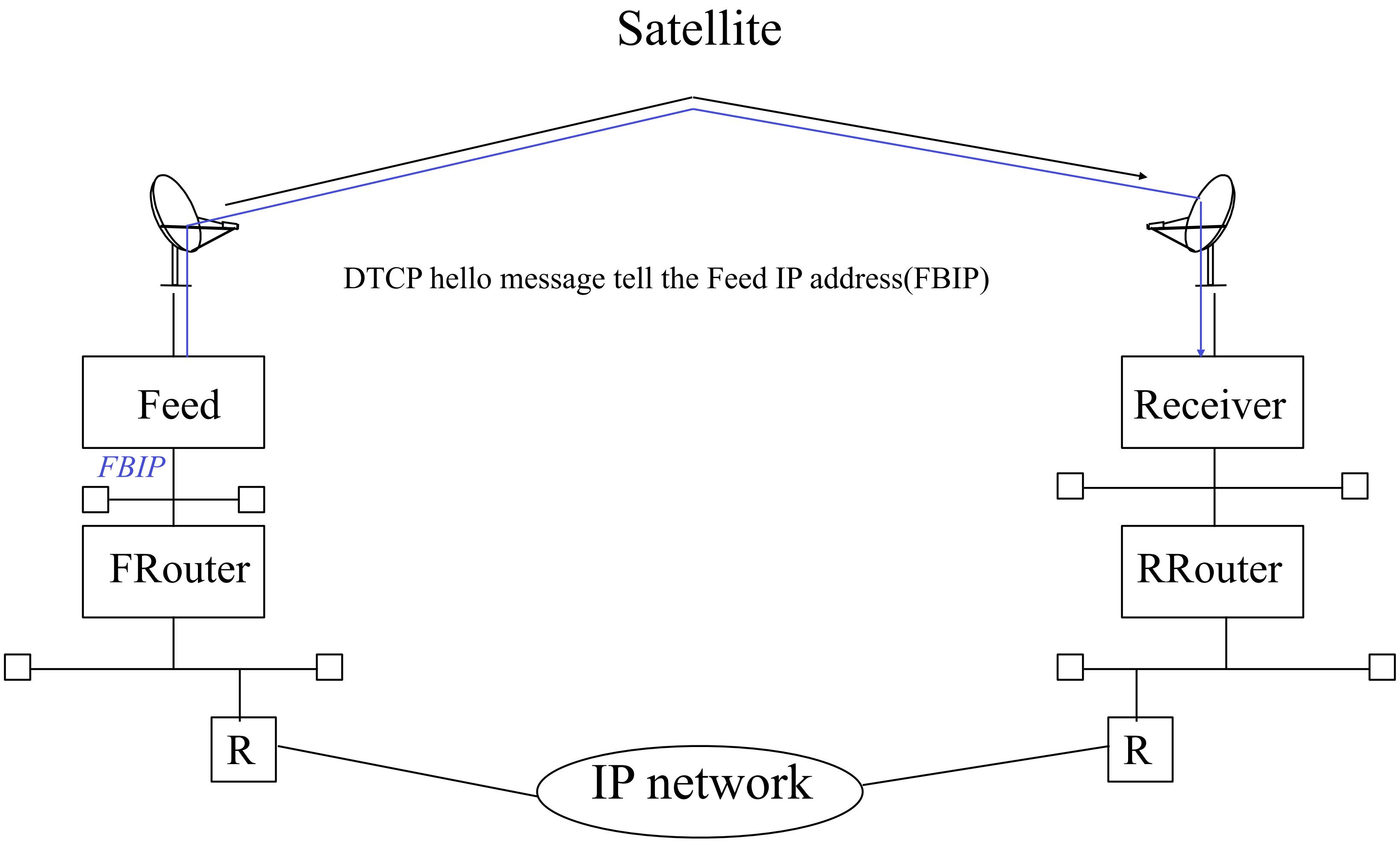


Case Study:2
Address Resolution for Receiver

- UDLR tunnel setup
- Address Resolution

- Blue line : UDLR related packet
- Red line : ND related packet

Step-1 : UDLR tunnel setup



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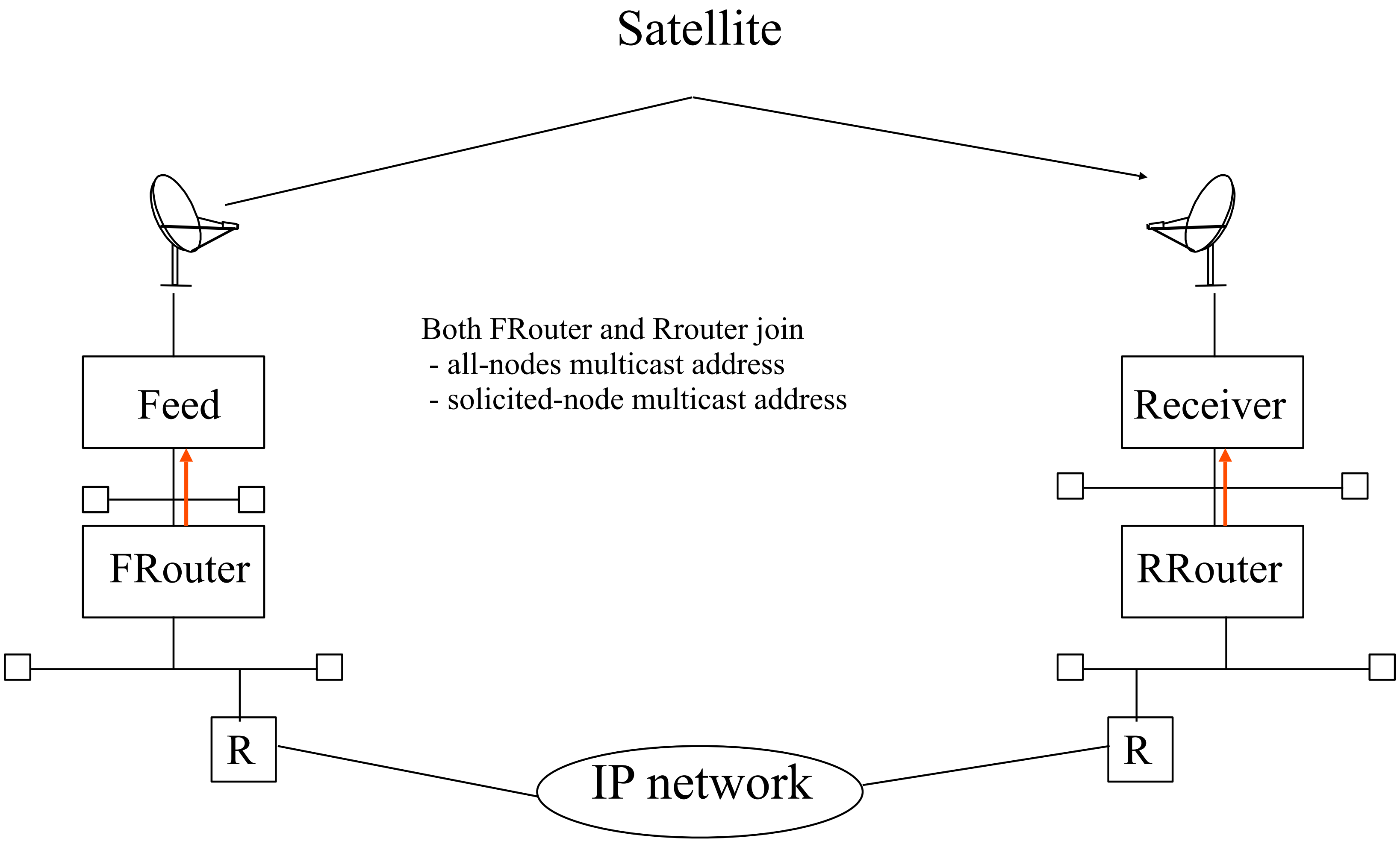
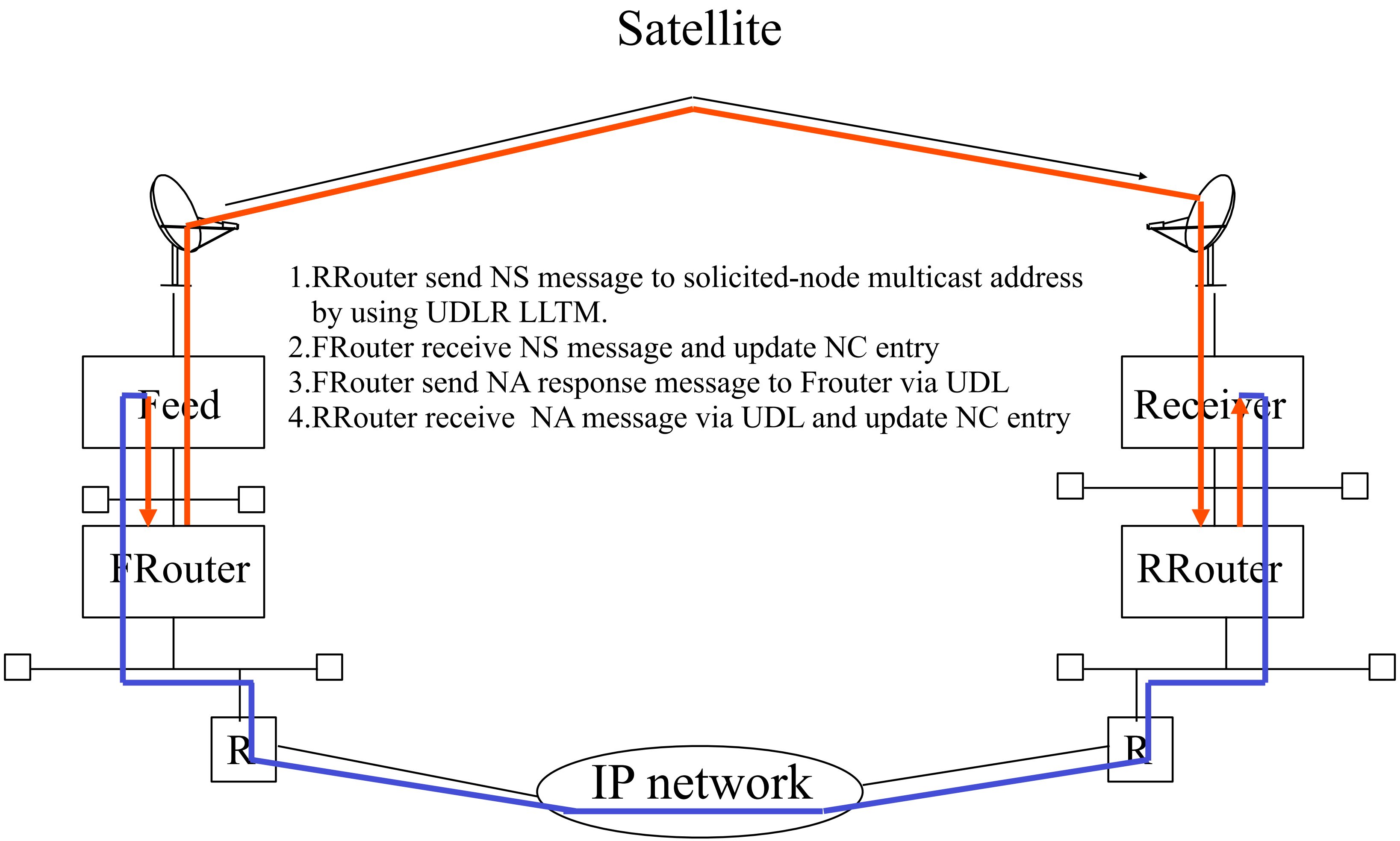


Both FRouter and Rrouter join
- all-nodes multicast address
- solicited-node multicast address

Step-3 : NS and NA



1.RRouter send NS message to solicited-node multicast address by using UDLR LLTM.
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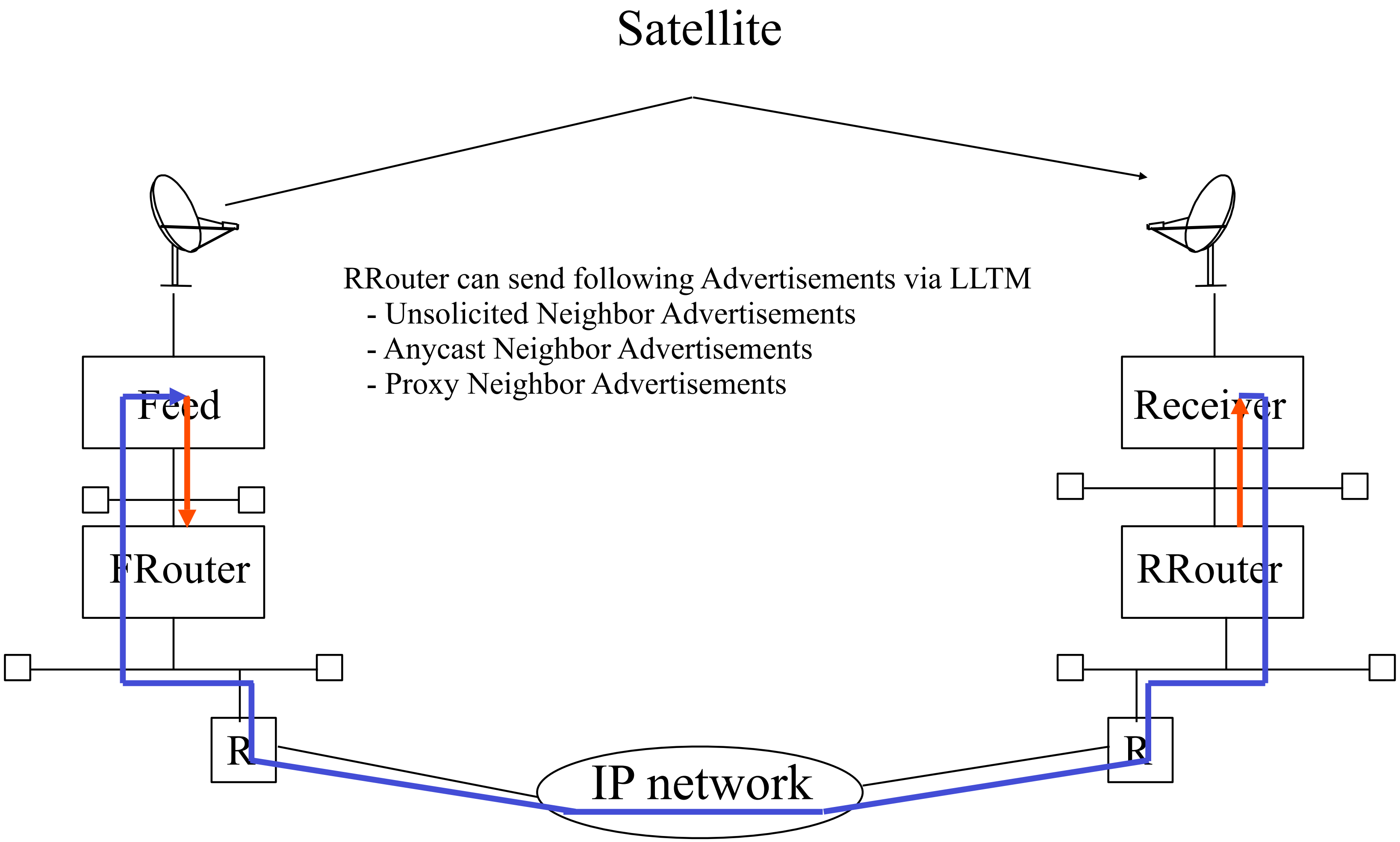
Step-4 : Sending Advertisements



Scope of Draft

- Based on ARCH requirements for AR
- Review table-based (INT,AIT,MMT) mechanisms to resolve:
  - IP addresses to MPEG-2 TS PIDs
  - IP addresses to MAC addresses
- Review known implementations and solved/known issues
  - How to implement DHCP, ARP, ND in a table based environment
- Set the basis for a coherent view of AR in MPEG-2 networks
  - Wants to include all MPEG-2 based networks both wired (cable) and wireless

Progress Since Last Version

- Current rev (v03 individual)
  - Fairly important review
- Updated to 03 by adding descriptions of use cases from the MHP and OpenCable:
  - MHP uses the AIT table
    - Can be easily extended
  - OpenCable currently uses a single PID so AR is done above the MPEG-2 layer
    - However, in future more PIDs may be used
- Re-wrote section on implementations to focus on a common approach
- Edited wording and structure

Document Structure

- A review of existing mechanisms and how they interact with IP layer protocols

- MPEG-2 address resolution operation
  - Review of table-based approaches
  - Implementation issues when dealing with diverse MPEG-2 technologies:
    - Satellite
    - Wireless
    - Cable

- Focus on address resolution requirements
  - For both unicast and multicast
  - Static and dynamic AR considered

Future Work

- WG inputs needed on specific implementations
  - INT usage for IP/PID, IP/MAC resolution
  - DHCP and NAT issues
  - DVB-RCS use cases
- Add section on experience with ND/ARP

9. XML-based AR Configuration Protocol

draft-montpetit-ipdvb-config-00.txt

Marie-Jose Montpetit
mmontpetit@motorola.com

Protocols for MPEG-2 network configuration

draft-montpetit-ipdvb-config-00.txt

Marie-José Montpetit
mmontpetit@motorola.com

March 7 2004

Scope of draft

- XML-based AR configuration protocol
- Based on ARCH requirements for AR
- Builds on the table-based (INT,AIT,MMT) mechanisms:
  - Define a simple auto-configuration protocol based on common semantics
  - XML provides the common language for defining extended AR records for unicast and multicast single addresses and group of addresses
  - Build on current mechanisms for *above IP* network configuration
  - Raises the potential of an industry-wide IETF standard mechanism for all MPEG-2 based networks

Current Plans

- Draft needs to be updated to align with similar work in other WGs
- WG inputs are requested in the use of XML to configure MPEG-2 devices

10. Content locator in the Digital Broadcasting

[draft-aoki-arib-uri]

Kirilka Nikolova

Digital Broadcasting Service

Envisioned Service

*** Retrieve the required TV/Radio program contents***

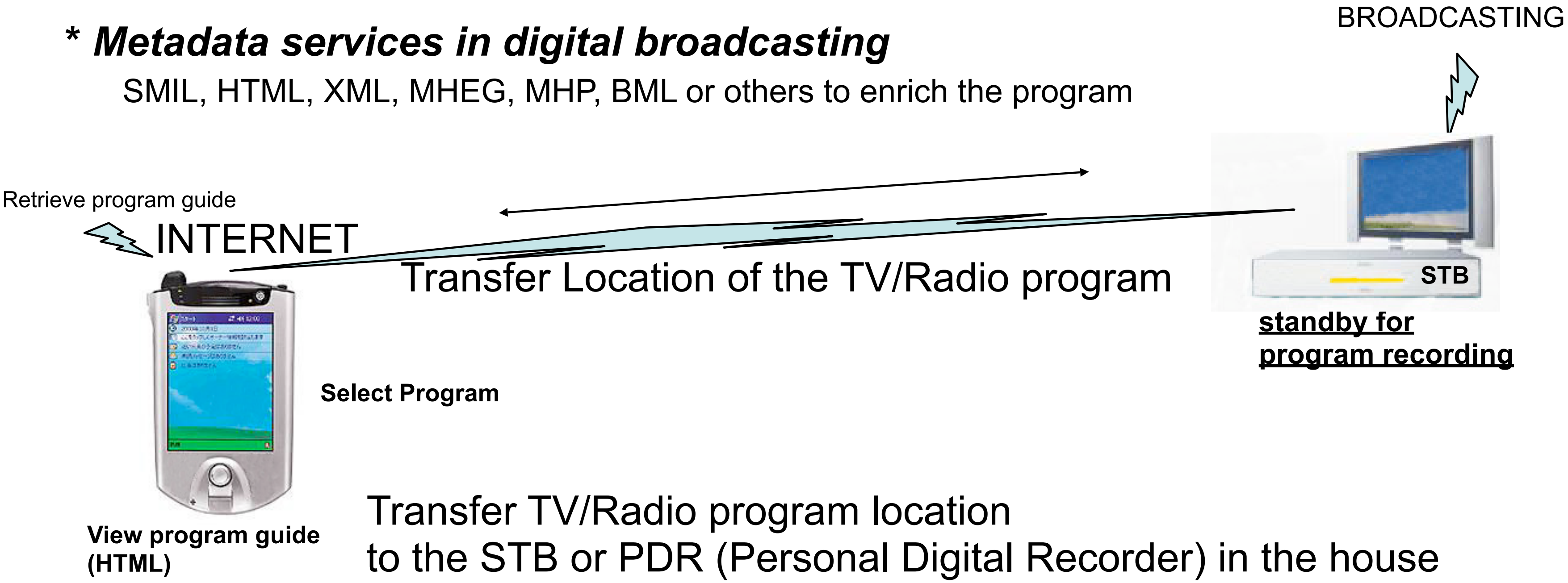
PDA or Cellular phone connects to the internet to get the broadcasting program

-> Order reservation of favorite program to STB in the house from the internet

-> Multi-browser handles/displays not only the Web but also Broadcasting contents

*** Metadata services in digital broadcasting***

SMIL, HTML, XML, MHEG, MHP, BML or others to enrich the program



Content Identification

Content distributed over MPEG-2 systems identified by PSI/SI

PSI/SI (Program Specific Information / Service Information)

- **MPEG standard**
- **Elementary information for filtering the TS packet**
- **The TV/Radio program embedded in the TS packet can be identified**
  - PAT (Program Association Table PID:0x0000)
    - ✓ Transport Stream ID
    - ✓ PID of PMT for each service (service_id)
  - PMT (Program Map Table)
    - ✓ PID of ES, elementary stream, with associated component tag (default ES or other ES)
  - EIT (Event Information Table)
    - ✓ Description of the program event
      - -> Name of the program, program start/end time
      - -> Unique number for each program event (event_id or content_id)

Content Identification

PAT (TS PID 0x00)

PROGRAM # (Service id)	TS PID
0x00	0xAA
0x01	0xBB
…	…
N	0xCC

PMT (TS PID 0xAA)

	PES PID	Stream Type	Component tag
Stream 1	0x11	0x0F (AAC audio)	0x10 (default audio ES)
Stream 2	0x22	0x02 (MPEG2 Video)	0x30 (default video ES)
…	…	…	…
Stream N	0x33	0x0F (AAC audio)	0x2F (audio ES)

Header	Data

PES Packet PID 0x11

Program Locator

The content ID (Program Locator) of the digital broadcasting scheme

The content distributed over MPEG-2 systems can be identified by PSI/SI

Embed the location of the broadcasting program into the element of markup language for metadata service

XML, HTML, SMIL, BML, MHEG, MHP, others

The content should be the medium independent

TV/Radio program can be acquired in the internet and broadcast medium

content is also identified in the internet

The content ID of the digital broadcasting (locator) should conform with RFC3986

Locator

The locator conformance with URI

Backgrounds

Identifies the specific program (broadcasting service)

Identifies the specific audio / video / private data component stream

Each broadcasting service is comprised from audio / video / private data components

The component (audio / video / private data) has unique ID in each service

Association of Radio Industries and Businesses (ARIB) standardized URI for ISDB service

arib://broadcaster_domain/comp_path

broadcaster_domain = <original_network_id>.<transport_stream_id>.<service_id>[;<content_id>][.<event_id>]

comp_path =
the path (sequence of characters (string)) to the specific audio, video component in the program

Locator (broadcaster_domain)

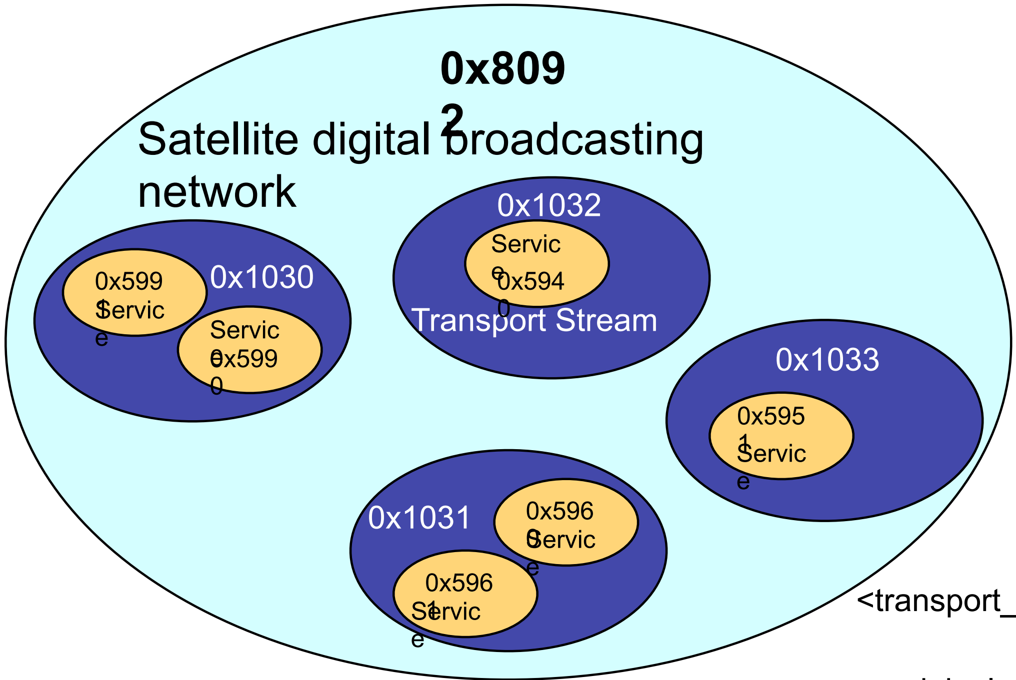
<original_network_id>.<transport_stream_id>.<service_id>[;<content_id>][.<event_id>]

Each ID number with hexadecimal specifies each system
MPEG2-Systems (ISO/IEC 13818-1)

Example:

- **0x8092** specifies digital BS satellite broadcasting

  0x8096 specifies one of the digital terrestrial broadcasting in Tokyo metropolitan area



The exact content in the service is identified by <event_id> or <content_id>.

<service_id> indicates with Hexadecimal

<transport_stream_id> indicates with Hexadecimal

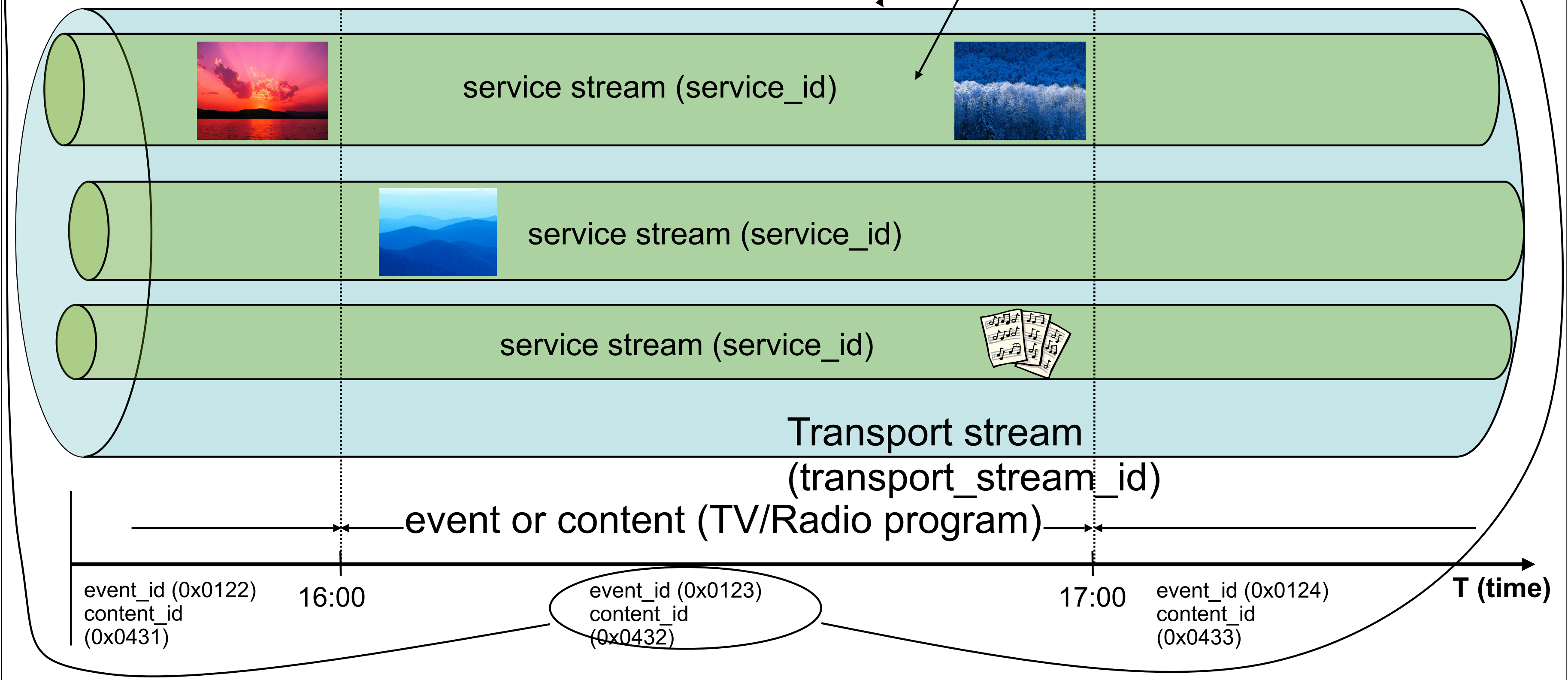
<original_network_id> indicates with Hexadecimal

Locator (broadcaster_domain)

The following identifies the specific TV/Radio program

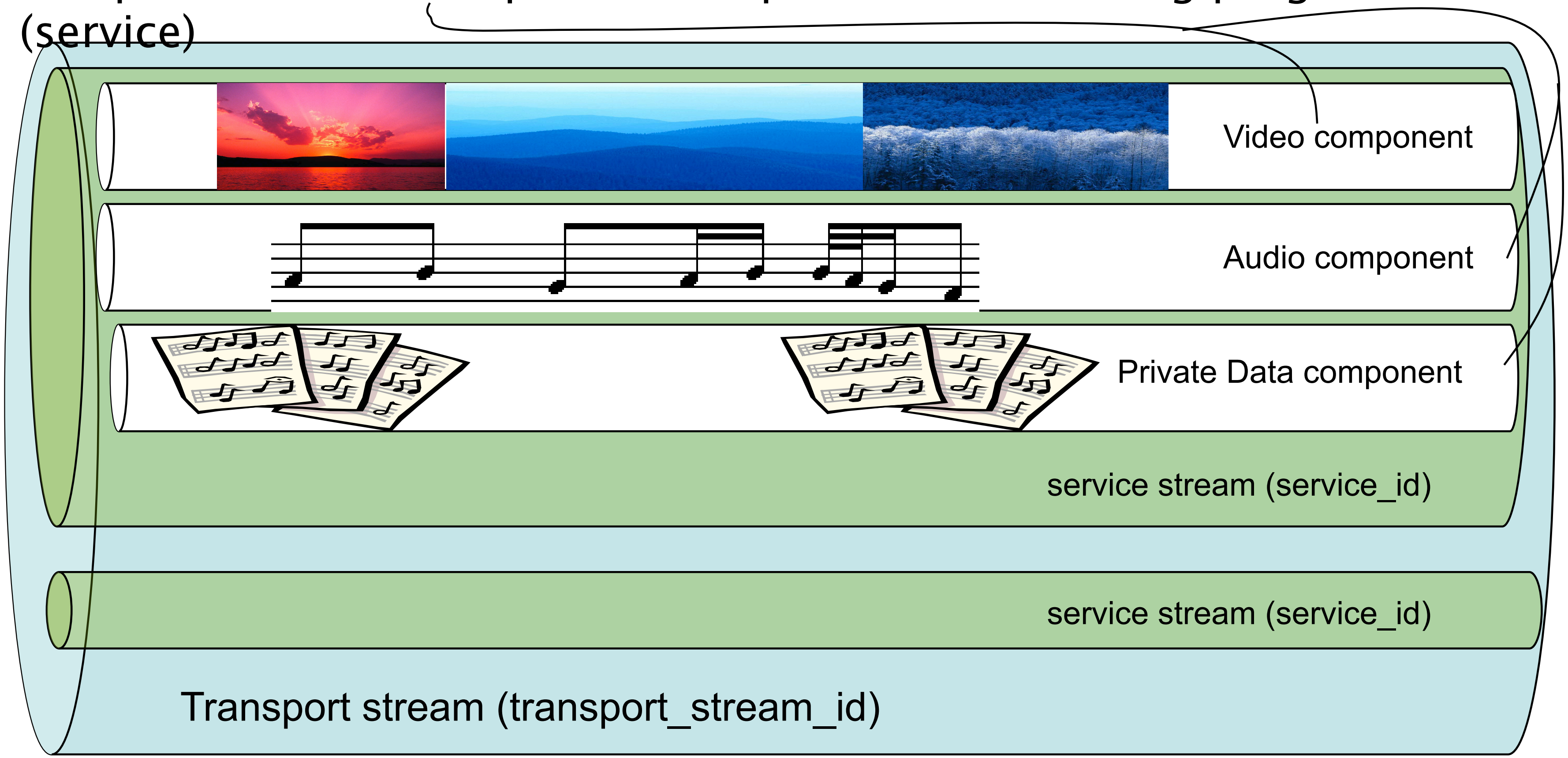
<original_network_id>.<transport_stream_id>.<service_id>[;<content_id>]
[.<event_id>]

Transport stream, service, content and event



Locator (comp_path)

The path for each component comprise a broadcasting program (service)



Summary

The arib URI scheme :

- ✧ **The arib URI enables the internet application to acquire the digital broadcasting program**
- ✧ **Metadata embedded the broadcasting program location in XML, HTML or others is being distributed from the internet**

The content becomes medium independent

TV/Radio program can be acquired in the internet and broadcast medium

The convergence of radio and television with the internet

Review of Milestones

WG Chair <gorry@erg.abdn.ac.uk>

Stage 1a: Identify what exists and what is needed

- Informational document relating to IP traffic
- Broadcast scenarios: INT; MMT; PSIP; etc.

Stage 1b: Identify what exists and what is needed

- What is needed to make IETF protocols work?
- ARP and ND operation

Stage 2a: Specify AR Syntax for 1a

- IP-based table-based IPv4/IPv6
- QoS; Policy options; Authentication; etc.

Stage 2b: Specify AR Transport for 1a

- UDP-based & Multicast-capable

IP over MPEG-2/DVB Transport (ip-dvb)

1. **Architecture/Requirements** (INFORMATIONAL) - DONE

2. **Encapsulation for MPEG-2 TS - ULE** (STANDARDS TRACK) DONE

3. **Address Resolution Mechanisms for IPv4/IPv6**
   (INFORMATIONAL)

4. **Address Resolution Protocol(s)** (STANDARDS TRACK)
   Dynamic Unicast & Multicast