SIEMENS

ISIS-SPB-PCR (IEEE 802.1Qca) Extensions for Path Control & Reservation

2012-11-12

IEEE 802.1 Meeting – San Antonio

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Structure of this Presentation

1. **AVB Gen 1**
   MSRP Role and Stream Properties for Reserved Traffic
   Task of MSRP Talker Advertise
   Task of MSRP Listener Ready

2. **AVB Gen 2**
   Why there is a need for new MSRP / ISIS-SPB-PCR Mechanism?
   Extensions for MSRP and ISIS-SPB-PCR for Reserved- and Scheduled Traffic

3. **Proposal for MSRP Gen 2 / ISIS-SPB-PCR Mechanism**
   Concerns about the proposed Solutions

4. **Proposal for new TLV's or Sub-TLV's used by ISIS-SPB-PC**

AVB Gen1
MSRP: Role and Stream Properties for Reserved- Traffic

Role:

- **Talker**
  - Advertisement & Transmission of Streams
- **Listener**
  - Initiation of reservation & receiving streams
- **AV-Bridges**
  - Reservation of resources
  - Control forwarding of Reserved-Traffic

Network:

- **RSTP** provides a single loop free path from Talker to Listener (s)
  (recovery time in case of network failures is not addressed)

- **MSRP** is used for resource reservation and control forwarding of Reserved-Traffic

- **MAC Address**
  - Unique stream destination MAC address per VLAN ID to control forwarding of streams in bridges
- **Priority**
  - Specifies traffic class for Reserved traffic (default: priority 3 for class A, priority 2 for class B)
- **VLAN ID**
  - VLAN's for streams

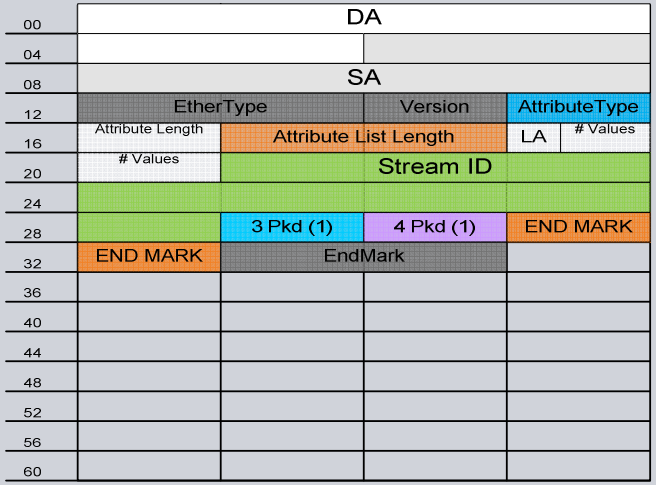
AVB Gen1
MSRP: Role and Stream Properties for Reserved- Traffic

Stream properties for reservation:

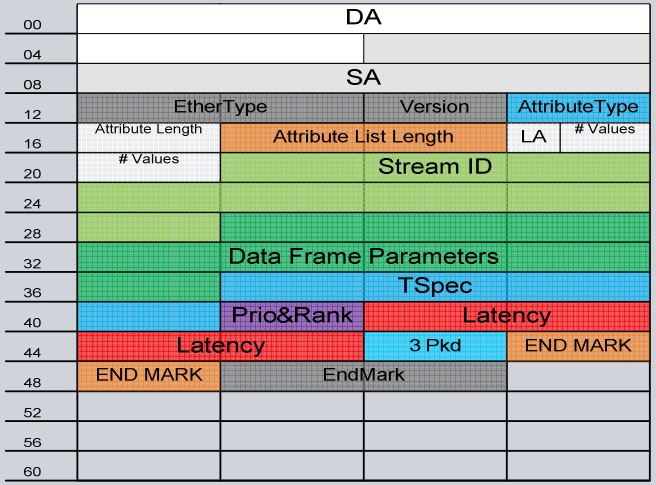
- **Stream ID**
  - Talker MAC address
  - Unique talker specific ID
- **T-Spec**
  - Max. frame size
  - Transmission period (frames / interval)
    - Reserved Traffic (125µs for class A, 250µs for class B)
- **Ranking**
  - AVB Gen 1: only one bit for ranking (default/emergency)
- **Latency**
  - Calculation for given communication path (Talker -> Listener)
- **Reservation status**
  - Resources in bridges and end stations available

AVB Gen 1
Information's used by MSRP in a MSRP PDU

Listener Informations



Talker Informations

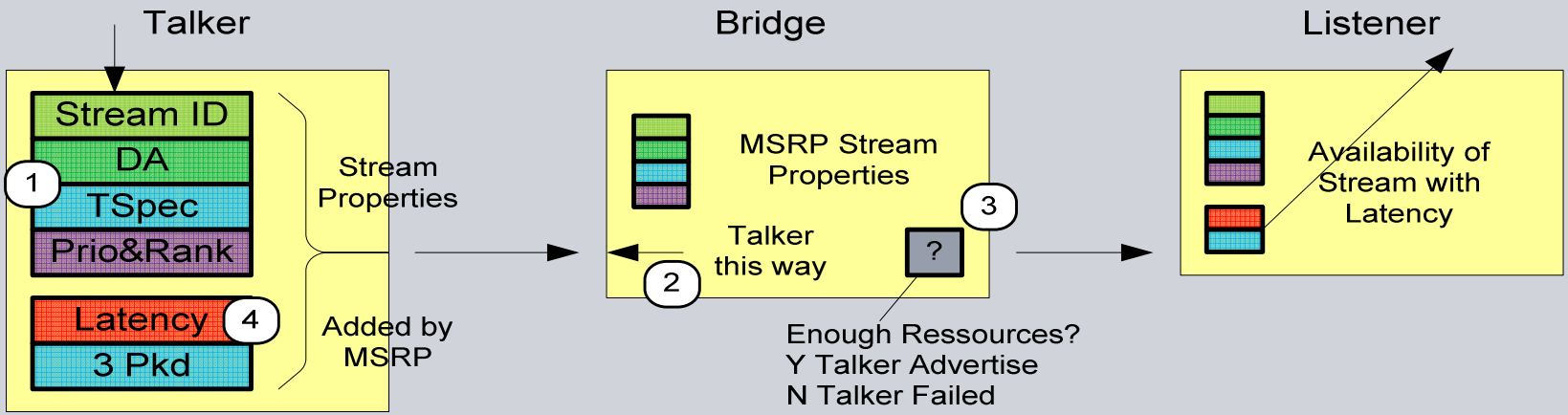


Stream ID	Unique Stream ID for Management
DA	Data send with this DA
TSpec	Needed Ressources from Stream
Prio&Rank	Priority and Ranking for Streams
Latency	Max. latency after which data arives by Listener
3 Pkd	Synchronisation of MSRP data
4 Pkd	Availability-Status of Listeners

AVB Gen 1
Task of MSRP Talker Advertise

Talker advertise is used by MSRP for:

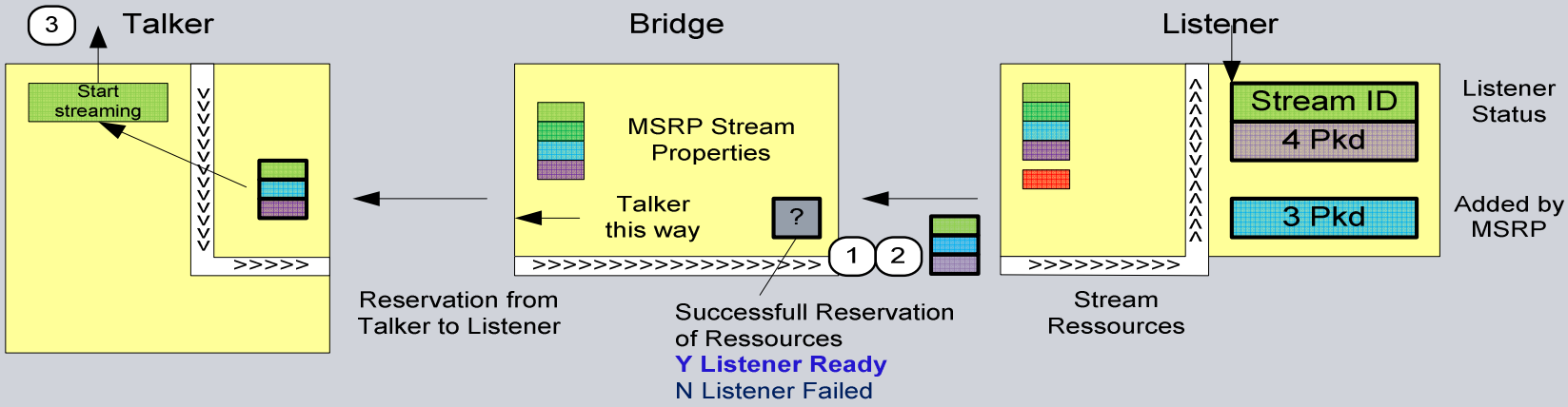
1. Announcement of stream properties (Talker -> Bridge -> Listener)
2. Find path to Talker in the RSTP network
3. Check availability of resources on the path from Talker to Listener (s)
4. Accumulate latency on the path from Talker (T) to Listener (L)



AVB Gen 1
Task of MSRP Listener Ready

The MSRP Listener Ready is used for:

1. Reservation of the resources
2. Control and set forwarding path (stop blocking)
3. Starting transmission of stream (after reservation of all resources)



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   Extensions for MSRP and ISIS-SPB-PCR for Reserved- and Scheduled Traffic

3. **Proposal of different MSRP Gen 2 / ISIS-SPB-PCR Mechanism**
   Concerns about the proposed Solutions

4. **Proposal for new TLV's or Sub-TIV's used by ISIS-SPB-PCR**

Why there is a need for new MSRP / ISIS-SPB-PCR Mechanisms?

Higher requirements from Industrial Automation and Automotive for

- **Reserved- and**
- **Scheduled- Traffic (new traffic class)**

Need: Lower latency and high availability for Reserved- and Scheduled- Traffic

Proposed Mechanism for:

Low Latency:

- **ISIS-SPB-PCR** to find „shortest“ / **optimal** path for Reserved- and Scheduled- Traffic to minimize latency

High Availability:

- **ISIS-SPB-PCR** shall be used to find “shortest” / **optimal redundant** paths for Reserved- and Scheduled Traffic to support high availability using topology information

AVB Gen 2: Extensions for MSRP and ISIS-SPB-PCR for Reserved- and Scheduled- Traffic

Role:

AV-Bridges

- Control forwarding of Reserved- and Scheduled- Traffic

Network:

➢ **ISIS-SPB-PCR** is used to find "shortest"/optimal redundant paths

➢ **ISIS-SPB-PCR and / or MSRP** is used for resource reservation and control forwarding of Reserved- and Scheduled- Traffic

- **Priority**
  - Scheduled- Traffic (to define default priorities class A and class B)
- **VLAN ID**
  - Multiple VLAN ID's for multiple path to support high availability (to define)

AVB Gen 2: Extensions for MSRP and ISIS-SPB-PCR for Reserved- and Scheduled- Traffic

Stream properties for reservation

- **T-Spec**
  - Transmission period (frames / interval)
    - Scheduled- Traffic (range between 31,25µs and 1ms)
- **Ranking**
  - Ranking for reservation for repeatability (become independent of reservation order)
- **High Availability:**
  - Number of communication paths
    - Single path (with recovery)
    - Multiple path (with or without recovery)
- **Latency**
  - Calculation has consideration for scheduler, pre-emption, bridge delay, ..
  - Min & Max latency on each communication path

AVB Gen 2: Extensions for ISIS-SPB-PCR for Reserved- and Scheduled- Traffic

Properties for routing

- **Topology (Link State Database)**
- **Relationship Talker->Listener (Relationship Database)**
- **Link Metric**
  - Available bandwidth
    - Available bandwidth for certain traffic class?
  - Latency
    - Traffic Shaper (CBSA, TAS, BLS, …)
    - Bridge delay?
    - Link delay?
  - Link Speed?

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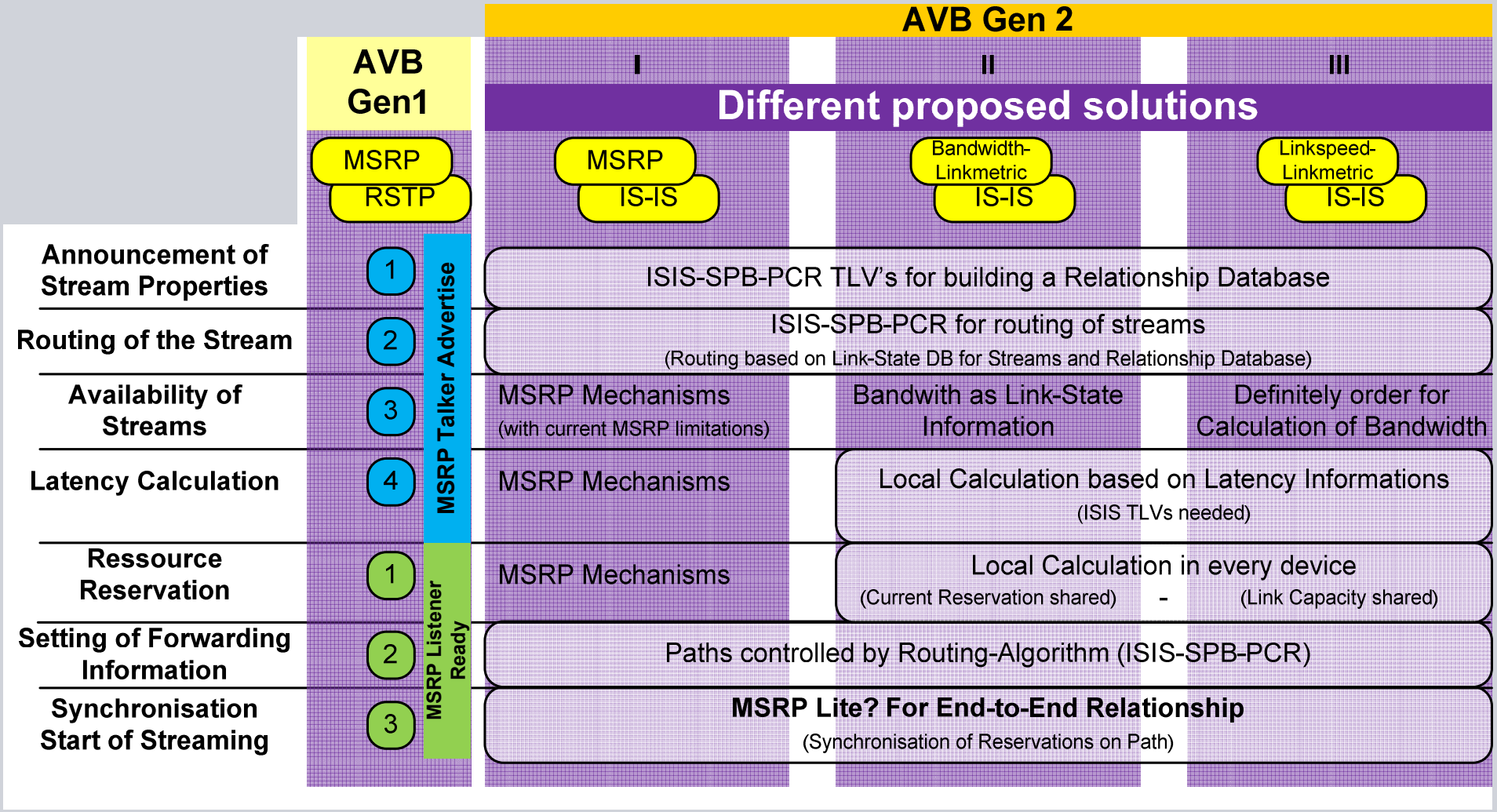
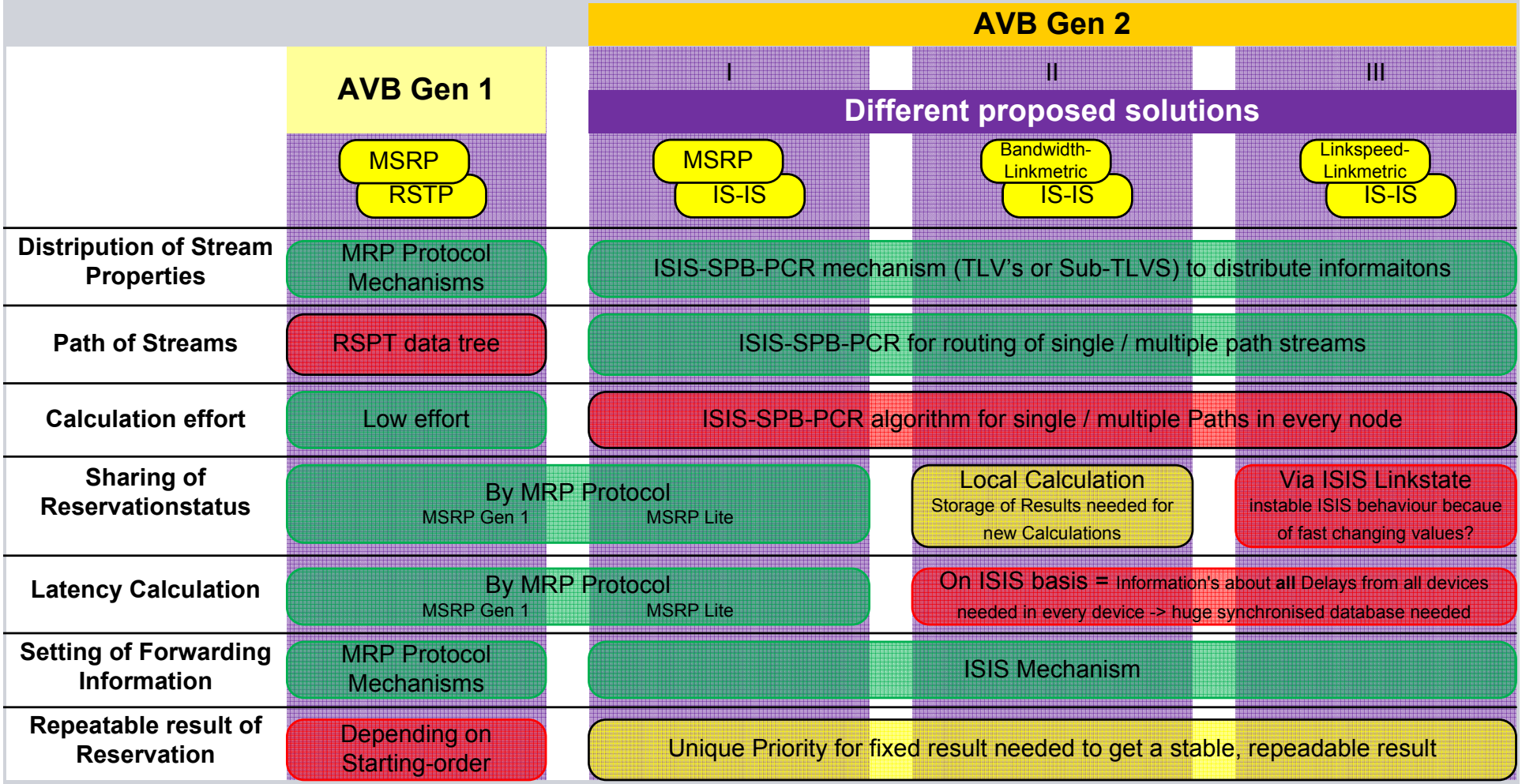
Proposal of different MSRP Gen 2 / ISIS-SPB-PCR Mechanisms



Concerns about the proposed Solutions



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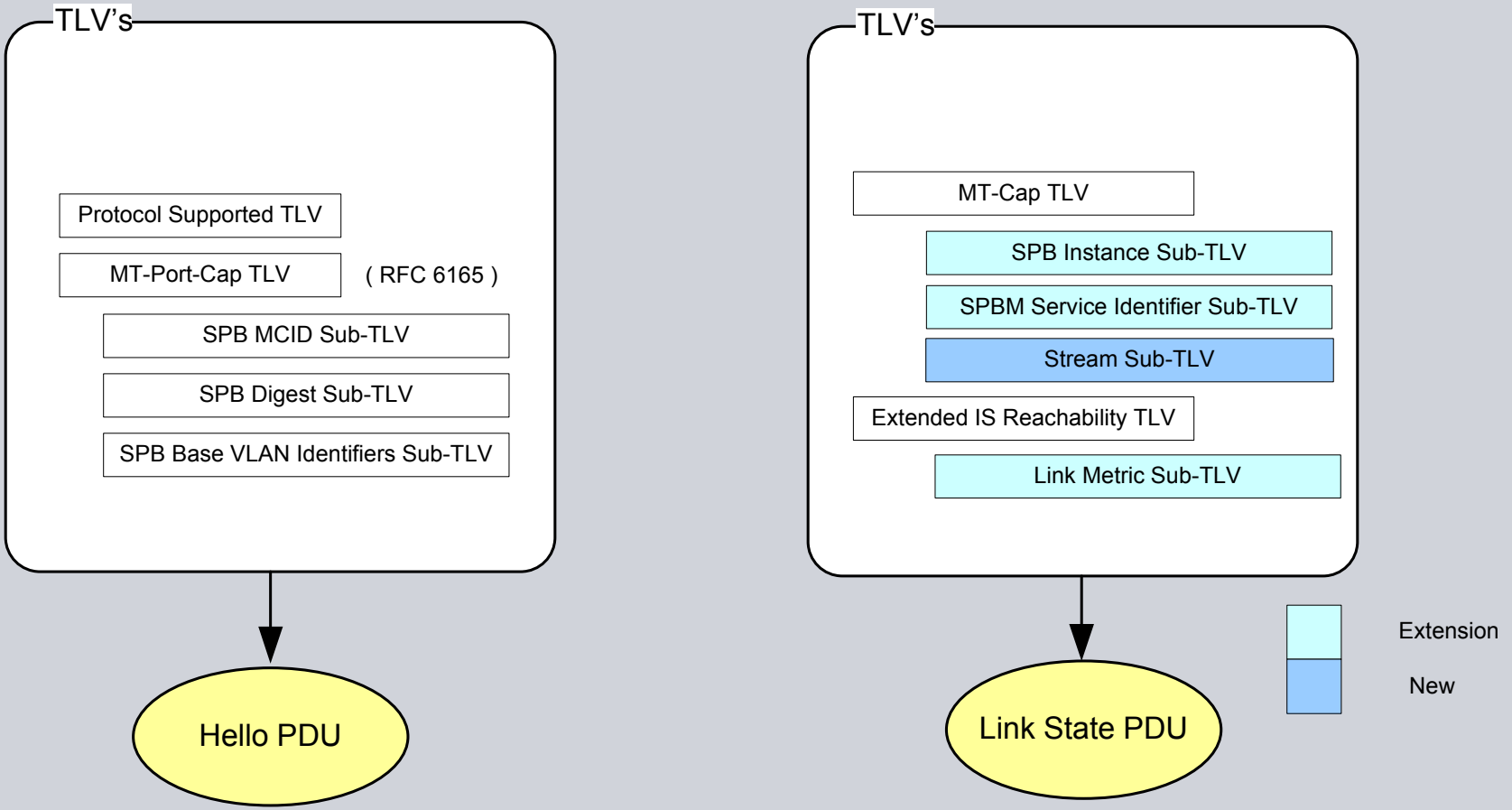
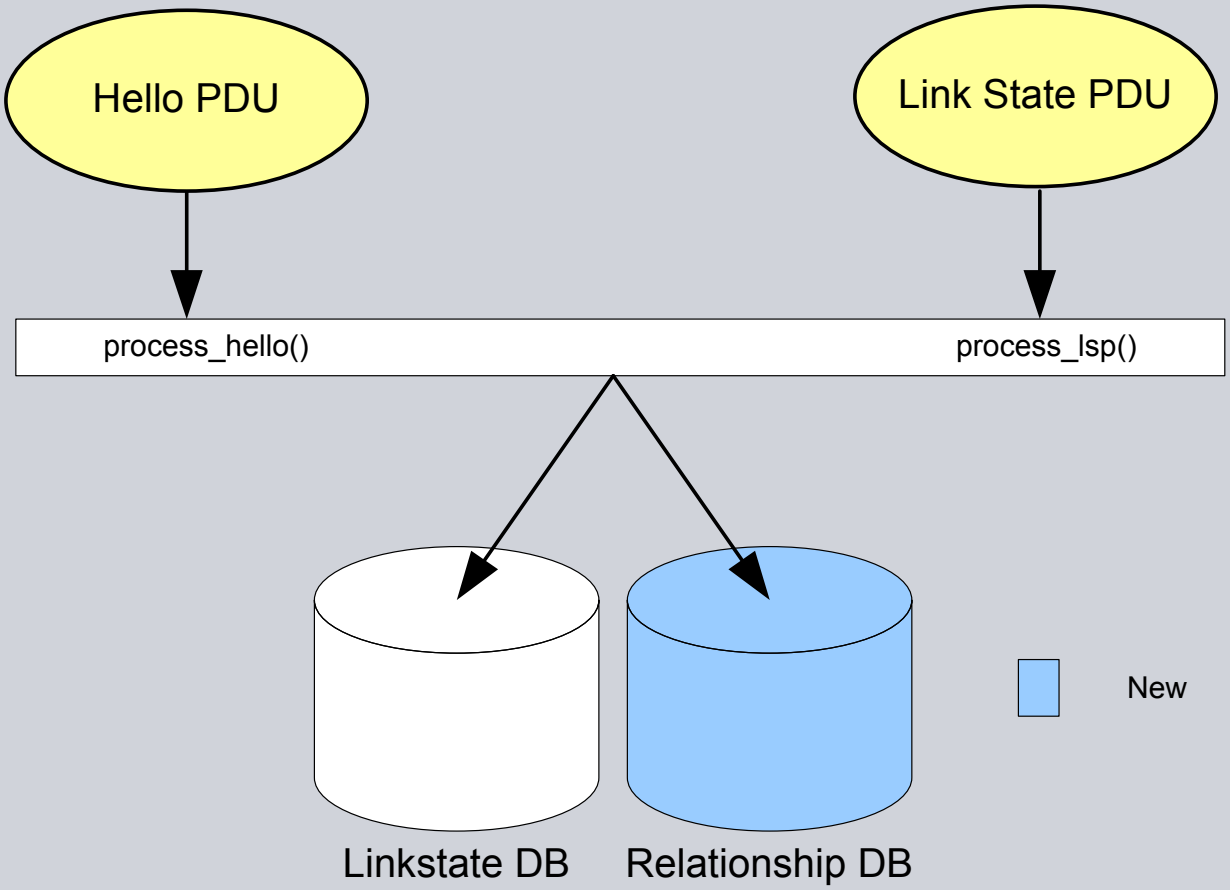
Proposal to distribute Stream Properties for Reserved- and Scheduled- Traffic with ISIS-SPB-PCR

Proposal
New TLVs or Sub-TLVs for ISIS-SPB-PCR



Proposal
Relationship Database for ISIS-SPB-PCR



Proposal for ISIS-SPB-PCR
New Instance Sub-TLV in Link-State-PDU

802.1aq ISIS-SPB Instance Sub-TLV

		Octet	Length
	Type	1	1
	Length	2	1
	CIST Root ID	3-10	8
	CIST Ext. Root Path Cost	11-14	4
	Bridge Priority	15-16	2
	Reserved	17-18	11 bits
	V	18	1 bit
	SPSourceID	18-20	20 bits
	Nr. of Tree	21	1
VLAN Tuple 1	U	22	1 bit
	M	22	1 bit
	A	22	1 bit
	reserved	22	5 bits
	ETC Algorithm	23-26	4
	Base VID	27-28	12 bits
	SPVID	28-29	12 bits
	...		
VLAN Tuple n	U	8n+14	1 bit
	M	8n+14	1 bit
	A	8n+14	1 bit
	reserved	8n+14	5 bits
	ETC Algorithm	(8n+15) – (8n+18)	4
	Base VID	(8n+19) – (8n+20)	12 bits
	SPVID	(8n+20) – (8n+21)	12 bits

ISIS-SPB-PCR Instance Sub-TLV

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	Type	1	1
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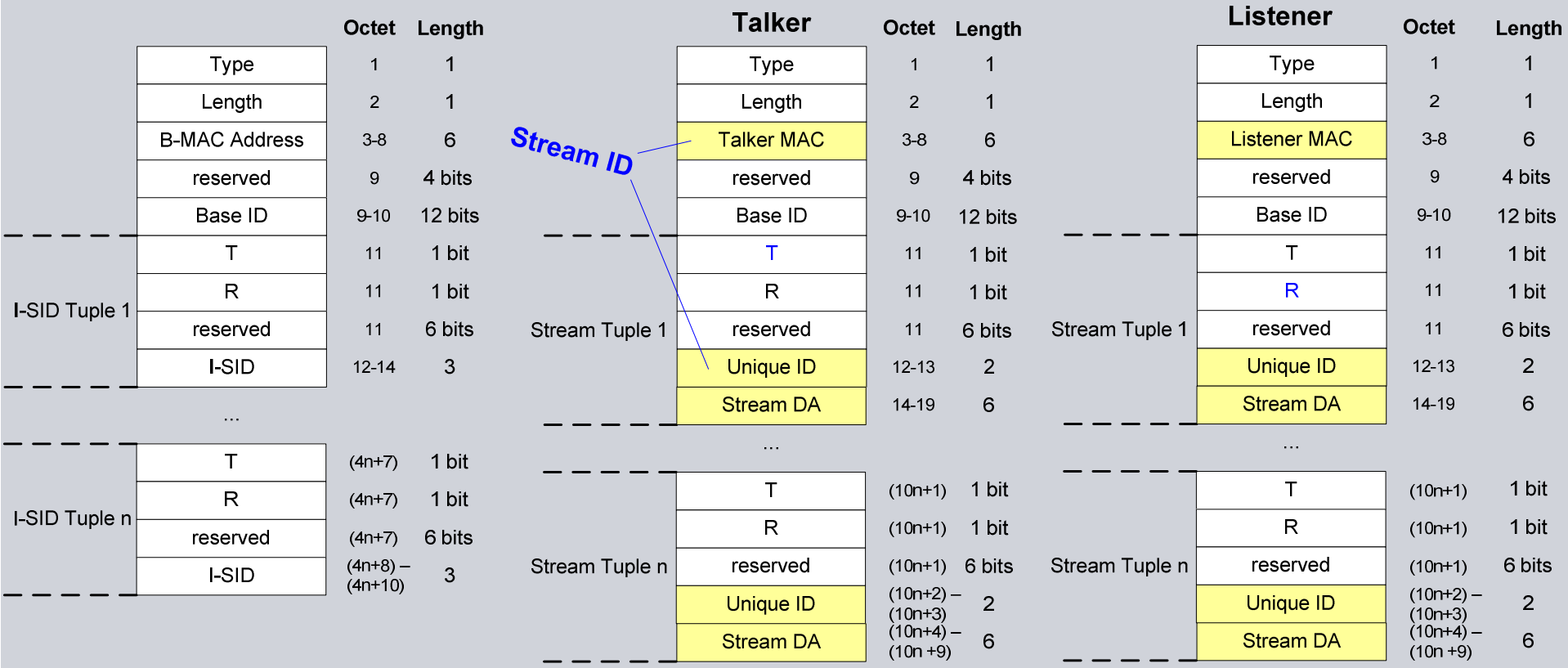
	CIST Root ID	3-10	8
	CIST Ext. Root Path Cost	11-14	4
	Bridge Priority	15-16	2
	Reserved	17-18	11 bits
	V	18	1 bit
	SPSourceID	18-20	20 bits
	Nr. of Tree	21	1
VLAN Tuple 1	U	22	1 bit
	M	22	1 bit
	A	22	1 bit
	Nr. of mult. Path	22	5 bits
	Mult. Path Algorithm	23-26	4
	Base VID (path#1)	27-28	2
	Base VID (path#2)	29-30	2
	...		
VLAN Tuple n	Base VID (path#x)	27+(x+1)-27+(x+2)	2
	SPVID	27+(x+3)-27+(x+4)	2

		Octet	Length
VLAN Tuple n	U	(7+2x)n+13-x	1 bit
	M	(7+2x)n+13-x	1 bit
	A	(7+2x)n+13-x	1 bit
	Nr. of mult. Path	(7+2x)n+13-x	5 bits
	Mult. Path Algorithm	((7+2x)n+14-x) - ((7+2x)n+17-x)	4
	Base VID (path#1)	((7+2x)n+18-x) - ((7+2x)n+19-x)	2
	Base VID (path#2)	((7+2x)n+20-x) - ((7+2x)n+21-x)	2
	...		
	Base VID (path#x)	((7+2x)n+18+1) - ((7+2x)n+18+2)	2
	SPVID	((7+2x)n+18+3) - ((7+2x)n+18+4)	2

Proposal for ISIS-SPB-PCR
New Relationship Sub-TLV in Link-State-PDU

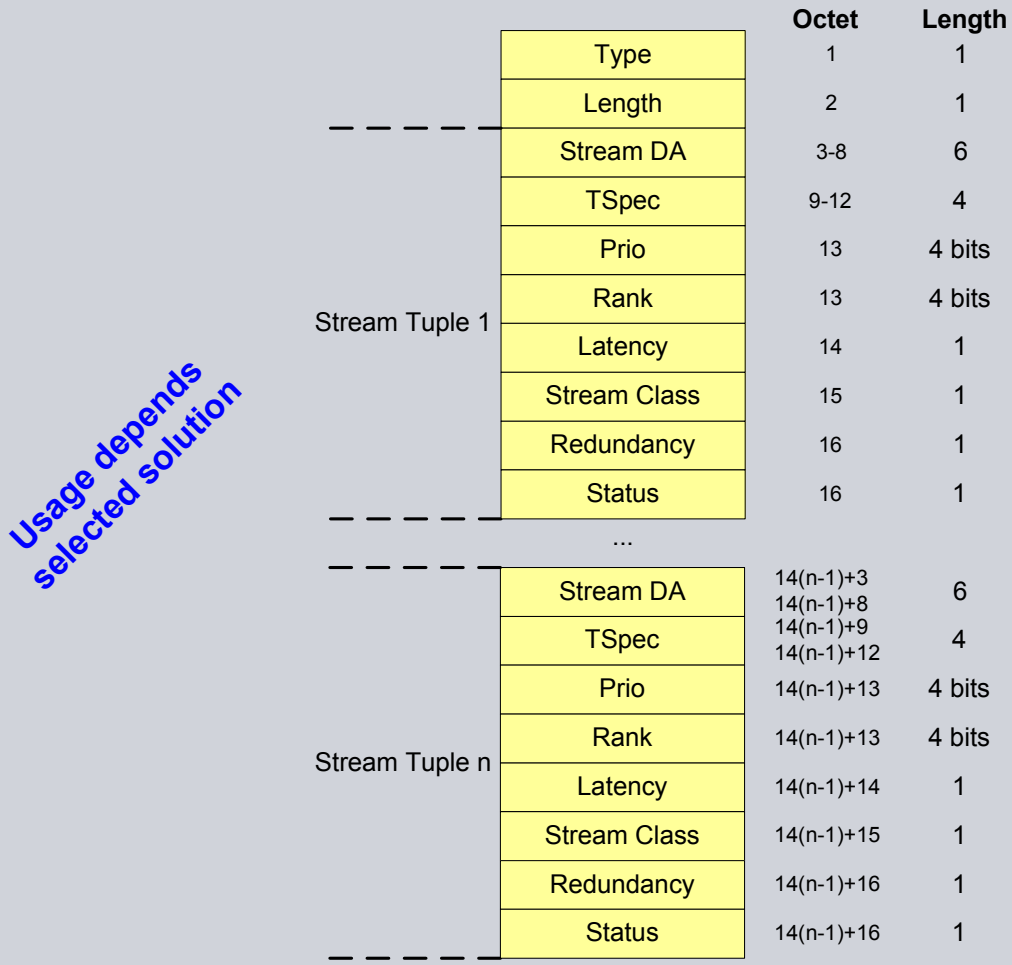
ISIS-SPB (IEEE 802.1aq)
Service Identifier

ISIS-SPB-PCR (IEEE 802.1ca)
Relationship Sub-TLV



Proposal for ISIS-SPB-PCR
New Stream Sub-TLV in Link-State-PDU

ISIS-SPB-PCR (IEEE 802.1ca) Stream Sub-TLV



Proposal for ISIS-SPB-PCR
New Link Metric Sub-TLV in Link-State-PDU

802.1aq ISIS-SPB
Link Metric Sub-TLV

	Octet	Length
Type	1	1
Length	2	1
Link Metric	3-5	3
Nr Ports	6	1
Port ID	7-8	2

ISIS-SPB-PCR
Link Metric Sub-TLV

	Octet	Length
Type	1	1
Length	2	1
Link Metric	3-5	3
Bandwidth	6	1
Link Speed	7-8	2
Bridge Delay	9-10	2
Traffic Class	11	1
Nr Ports	12	1
Port ID	13-14	2

Next Steps?

Thank You!