Proposal for splitting IEEE 802.1Qcc into several PAR's

MRP++ Transport Protocol for Registration
MSP Transport Protocol for Reservation

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.1Qcc PAR

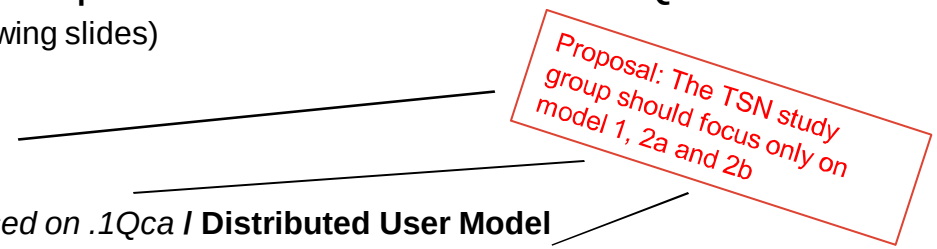
Scope of the project:

This amendment describes new protocols, procedures and managed objects for bridges and end stations, which are compatible with existing mechanisms, and provide:

- Support for more streams. The current worst case limit is less than 500 streams; there are use cases that require two orders of magnitude greater than this.
- Mechanisms that allow Stream Reservation class (SR class) parameters to be configured
- Inclusion of additional parameters and mechanisms in the stream reservation protocol that support additional applications, such as higher reliability, latency requirements, and latency changes due to network reconfiguration.
- Support for higher layer streaming sessions, such as Real-Time Protocol (RTP)-based sessions.
- Deterministic stream reservation convergence.
- User Network Interface (UNI) for routing and reservations.

It seems .1Qcc is focusing on
"User Network Interface (UNI) for routing and reservations"

In principle three concepts are discussed within .1Qcc:
(for more details see the following slides)



1. Fully Distributed Model

2a. Centralized Network *based on .1Qca* **/ Distributed User Model**
2b. NEW: Centralized Network *based on .1Qca* ***+ Scheduling*** **/ Distributed User Model**
2c. Centralized Network *based on System Protocol* **/ Distributed User Model**

3a. Fully Centralized Model *based on .1Qca*
3aa. Alternative for fully Centralized Model *based on .1Qca (see use case 2a)*
3b. NEW: Fully Centralized Model *based on .1Qca* ***+ Scheduling***
3bb. Alternative for a fully Centralized Model *based on .1Qca* ***+ Scheduling*** *(see use case 2b)*
3c. Fully Centralized Model *based on System Protocol*

⇒ **The group has to make a decision on which models they want focusing!**

Until now the TSN has support a distributed model (based on MRP) and a centralized model (based on ISIS-PCR). For these models TSN has specified interfaces which can be transferred in a YANG model. The new YANG model can be used by everyone.

See also slides 4,5,6 of presentation: http://www.ieee802.org/1/files/public/docs2014/cc-nfinn-control-flows-0414-v02.pdf

Decentralized controlled Network with Path Computation, Registration & Reservation

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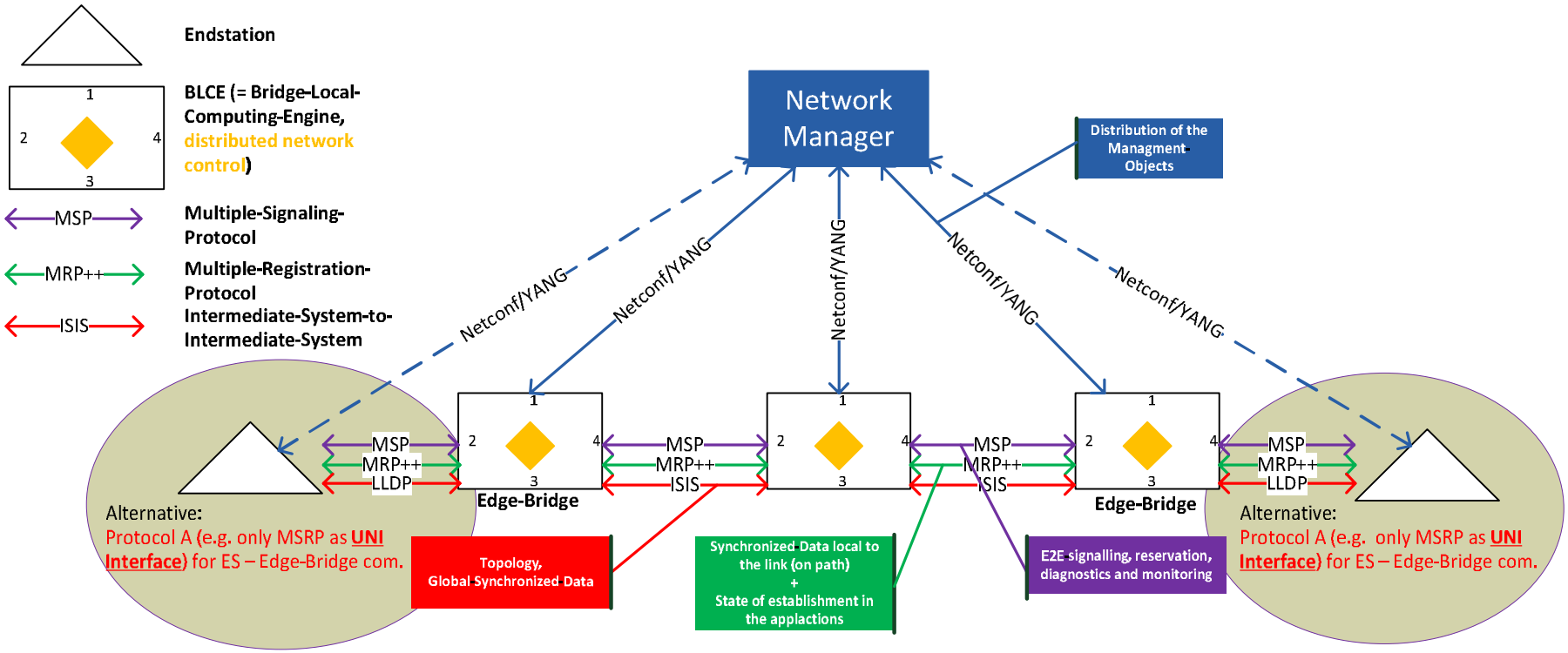
1. Fully Distributed Model

UNI Interface (ES <-> Edge-Bridge) is in scope of IEEE 802.1Qcc!



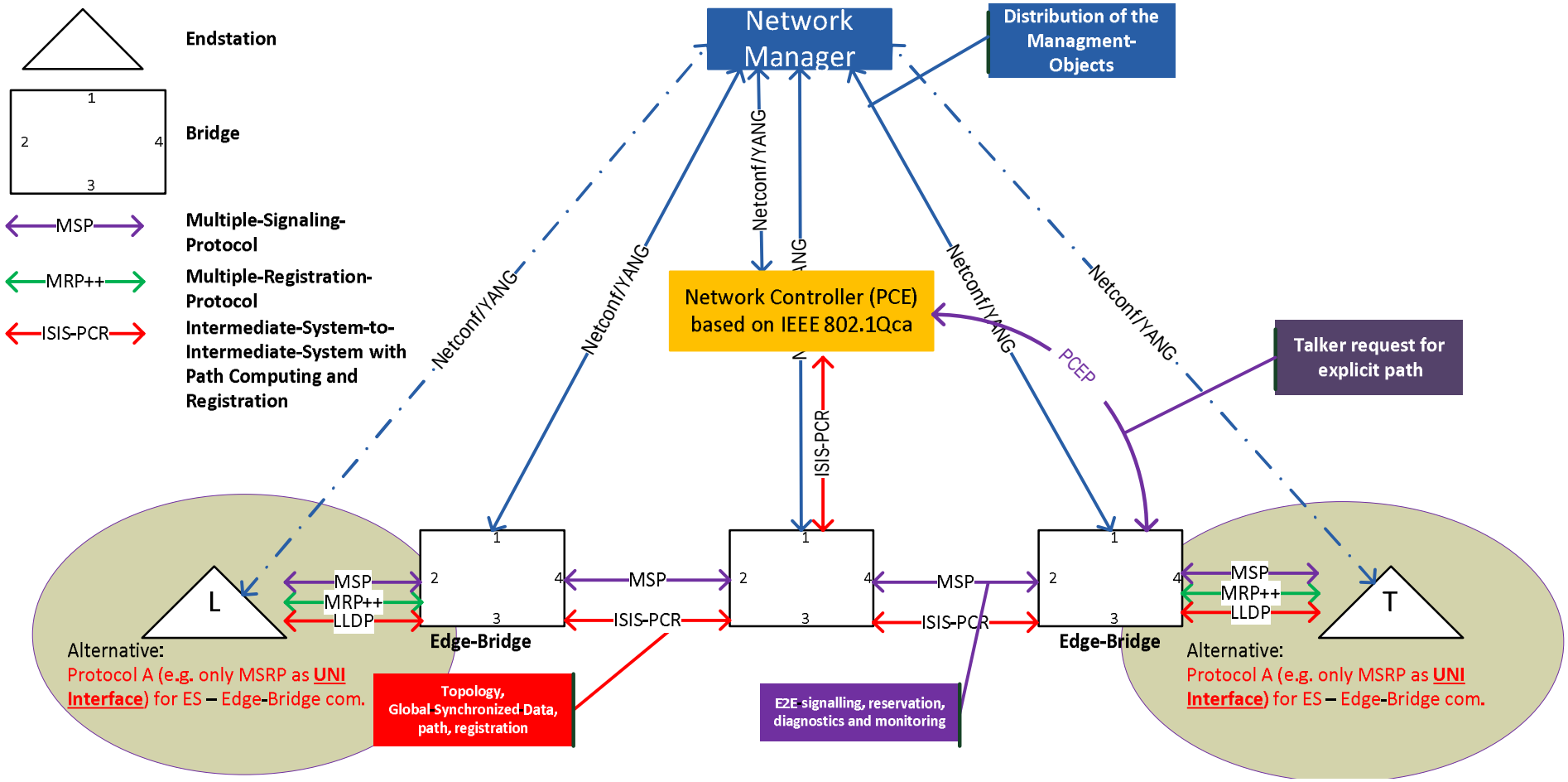
MRP++ and MSP (new version) are equivalent to MRP and its protocols (MVRP, MMRP, MSRP)

(The current version of MRP and its protocol (MVRP, MMRP, MSRP) will be supported also in future, but this is not shown in this figure)

Centralized controlled Network with Path Computation, Registration & Reservation

2a. Centralized Network *based on .1Qca* / Distributed User Model

Is PCEP for Layer 2 in scope of IEEE 802.1?



Centralized controlled Network with Path Computation, Registration & Reservation

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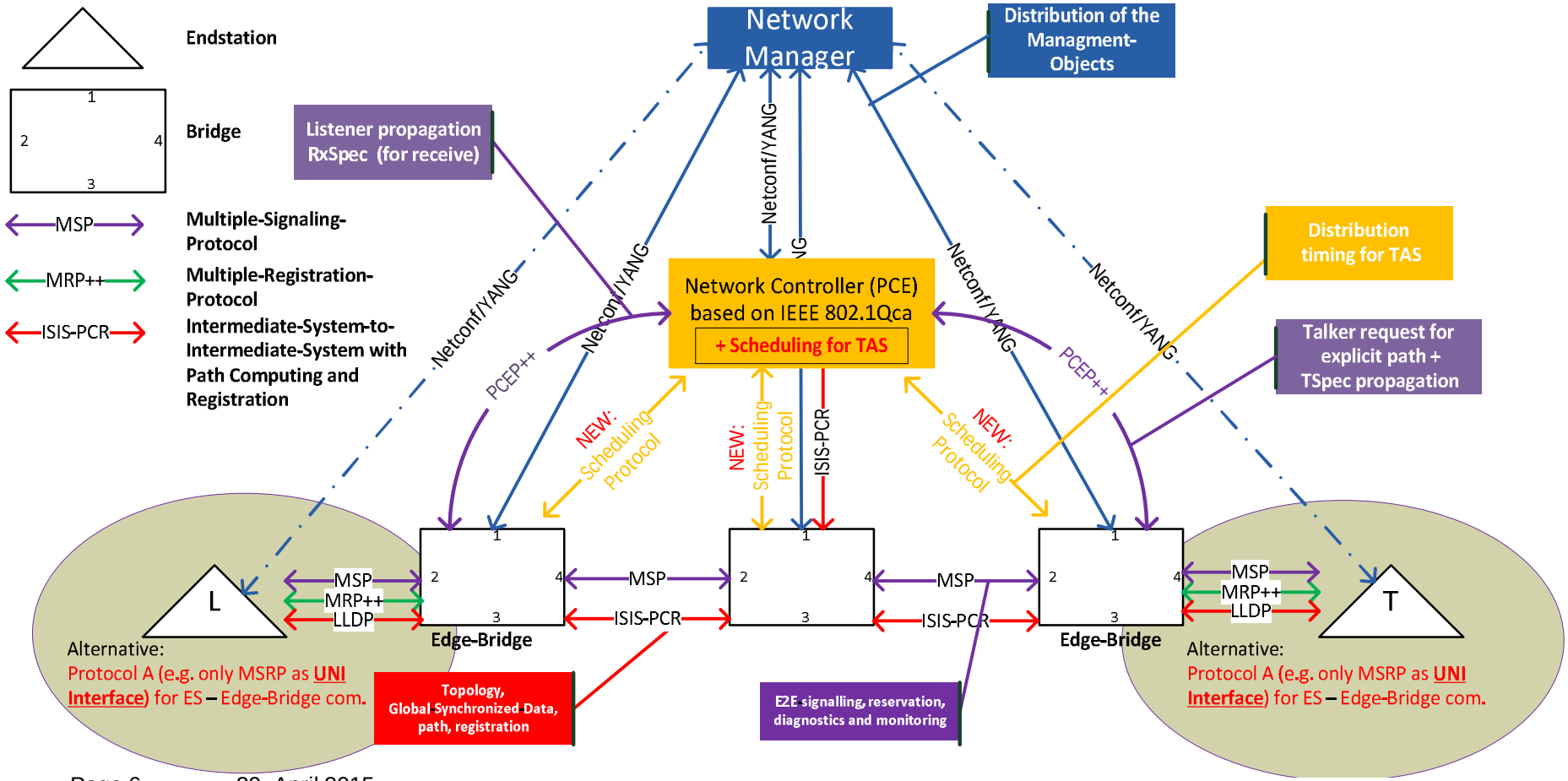
2b. NEW: Centralized Network *based on .1Qca* + *Scheduling* / Distributed User Model

Question: - Is MSP for e2e signaling required? "YES"
- Is PCEP++ for Layer 2 in scope?
- Is the Scheduling protocol in scope?



Current Discussion in .1Qcc for
Centralized controlled Network with Path Computation, Registration & Reservation

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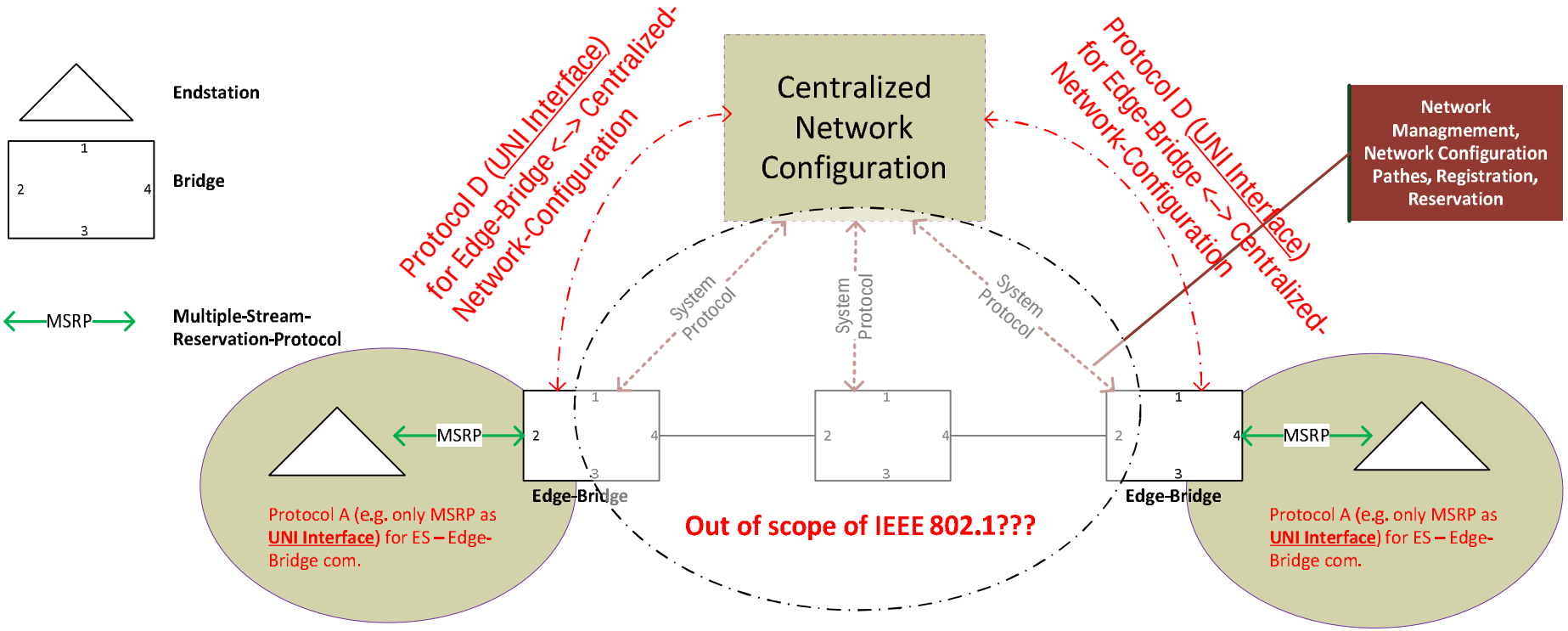
2c. Centralized Network *based on System Protocol* / Distributed User Model

Question: Is protocol D in scope of IEEE?



Applications in a fully centralized controlled Network with Path Computation, Registration & Reservation

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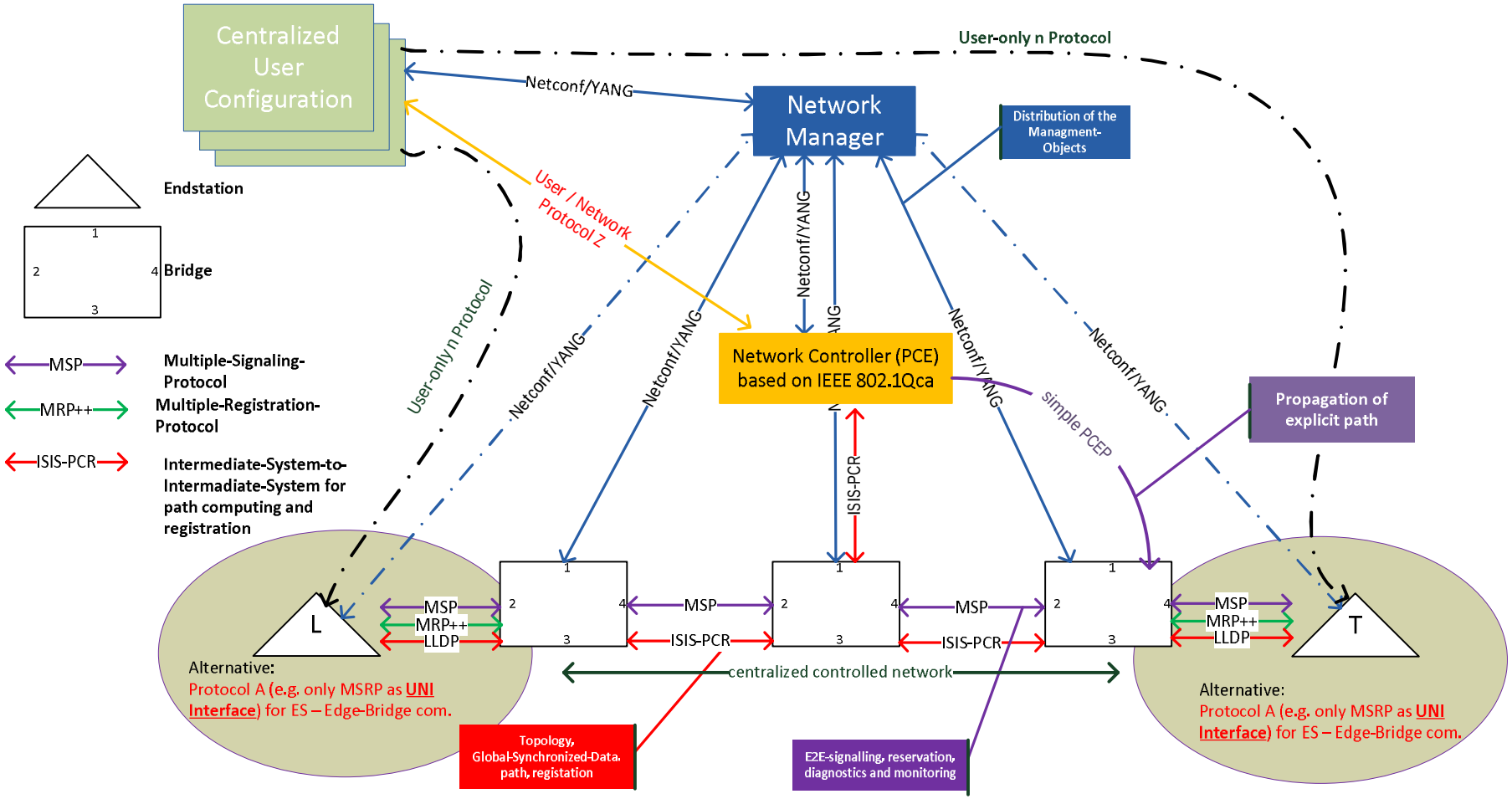
3a. Fully Centralized Model *based on .1Qca*

Question: - Is simple PCEP in scope?
- Is protocol Z in scope?



Applications in a fully centralized controlled Network with Path Computation, Registration & Reservation

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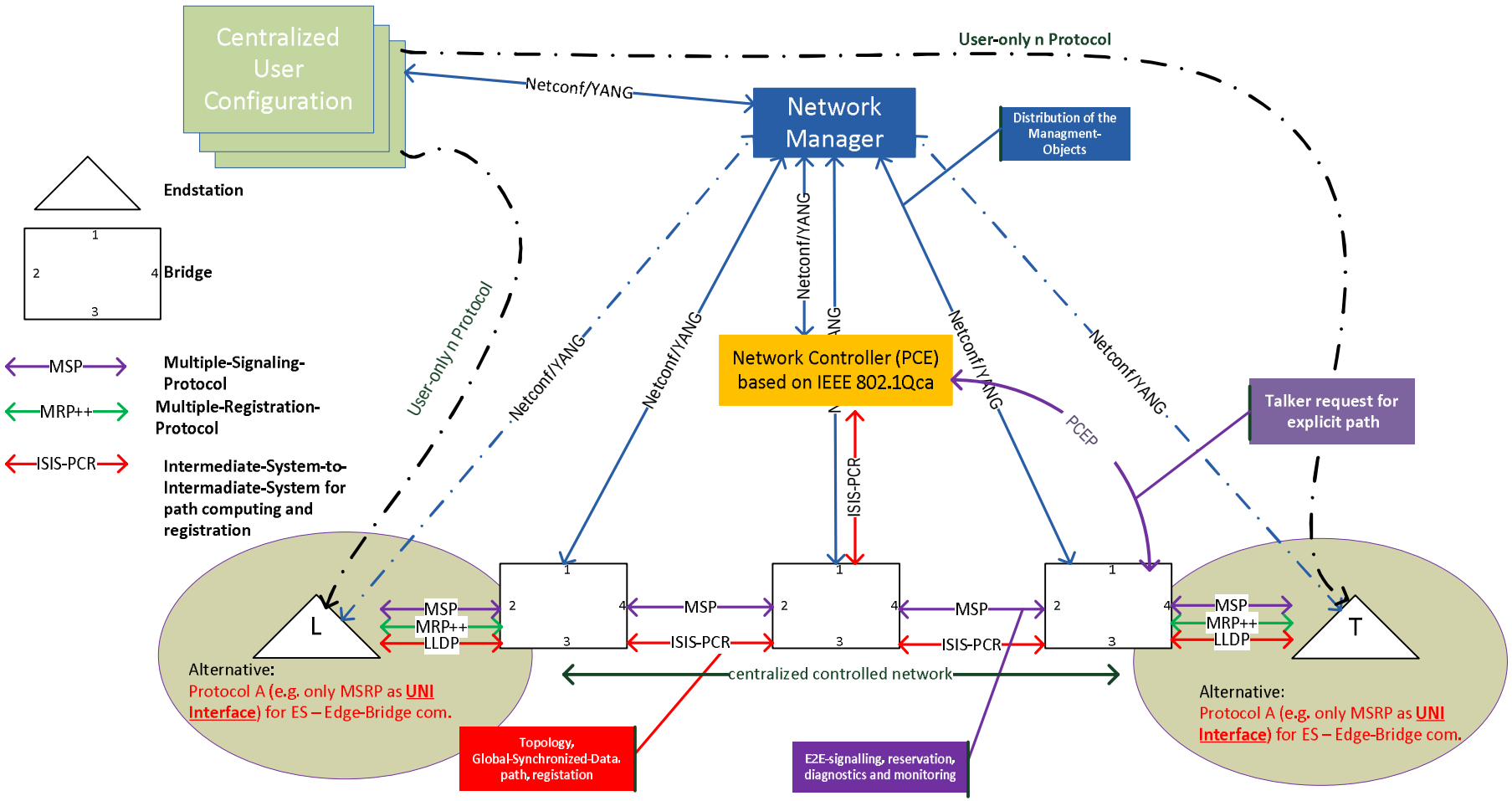
3aa. Alternative for fully Centralized Model *based on .1Qca (see use case 2a)*



Applications in a fully centralized controlled Network with Path Computation, Registration & Reservation

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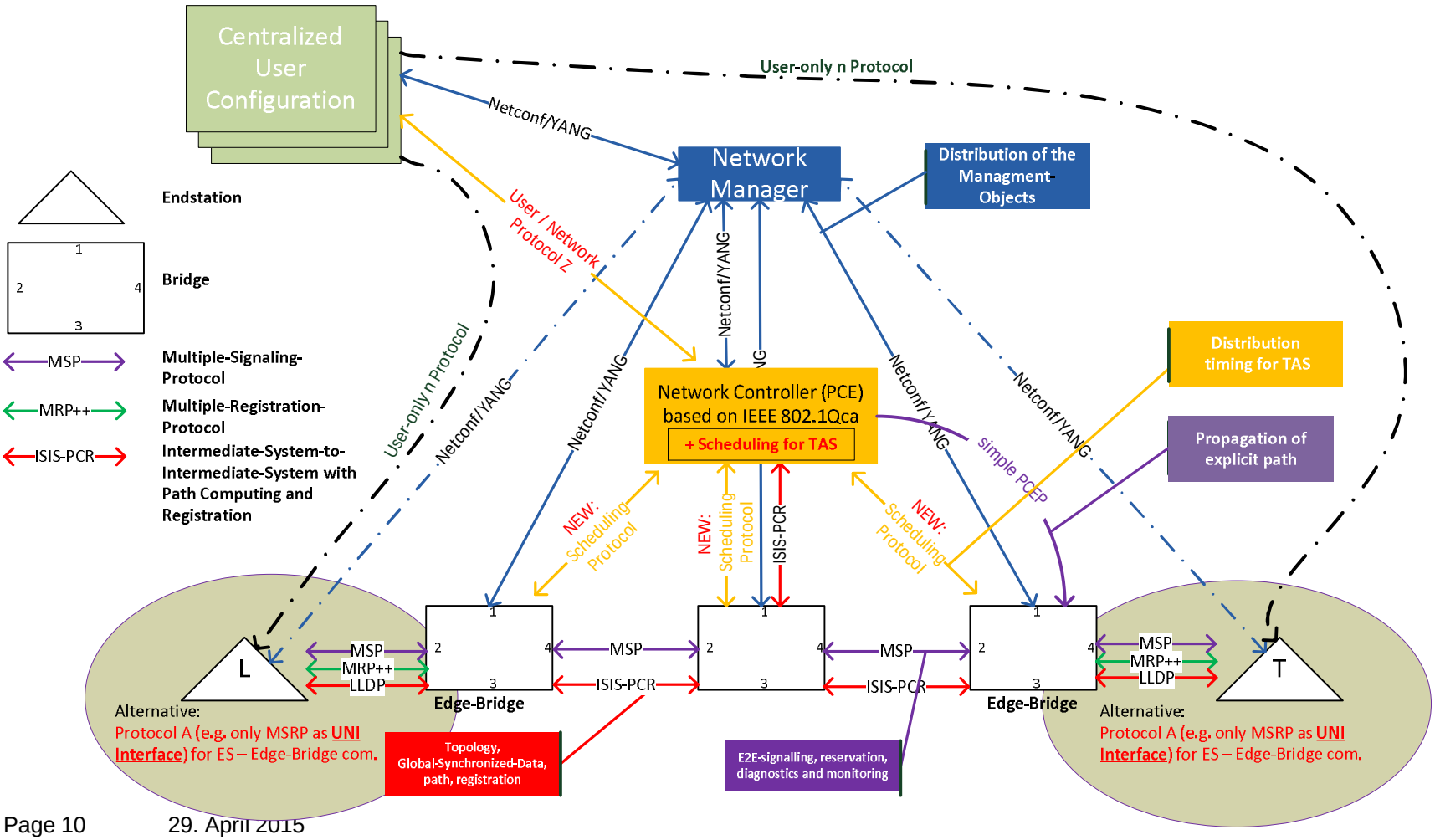
3b. NEW: Fully Centralized Model *based on .1Qca* + *Scheduling* *(see use case 2b)*

Question: - Is simple PCEP in scope?
- Is protocol Z in scope?



Applications in a fully centralized controlled Network with Path Computation, Registration & Reservation

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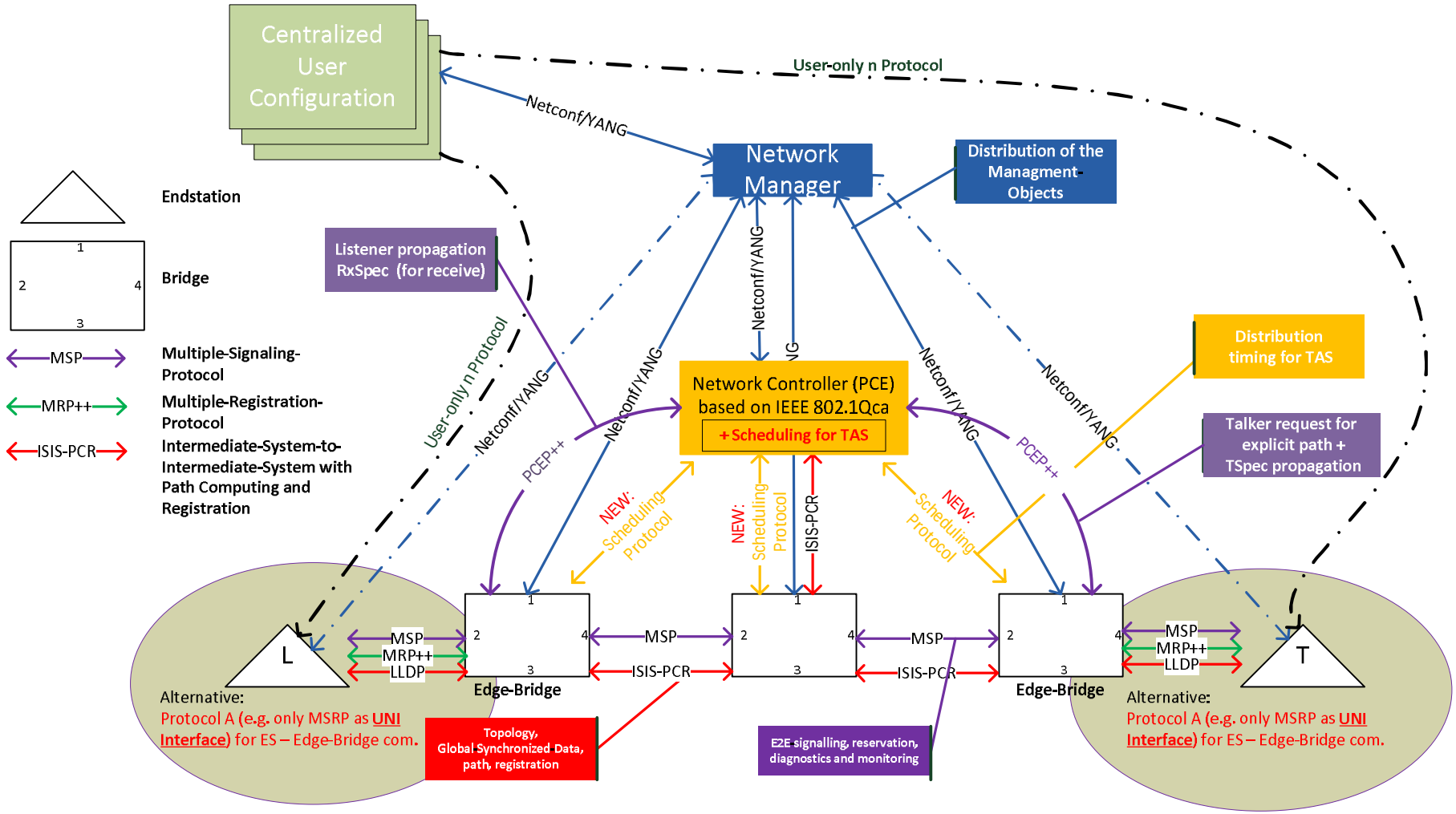
3bb. Alternative for a fully Centralized Model *based on .1Qca* + ***Scheduling*** *(see use case 2b)*



Current Discussion in .1Qcc for
(one) application in a centralized controlled Network with Path Computation, Registration & Reservation

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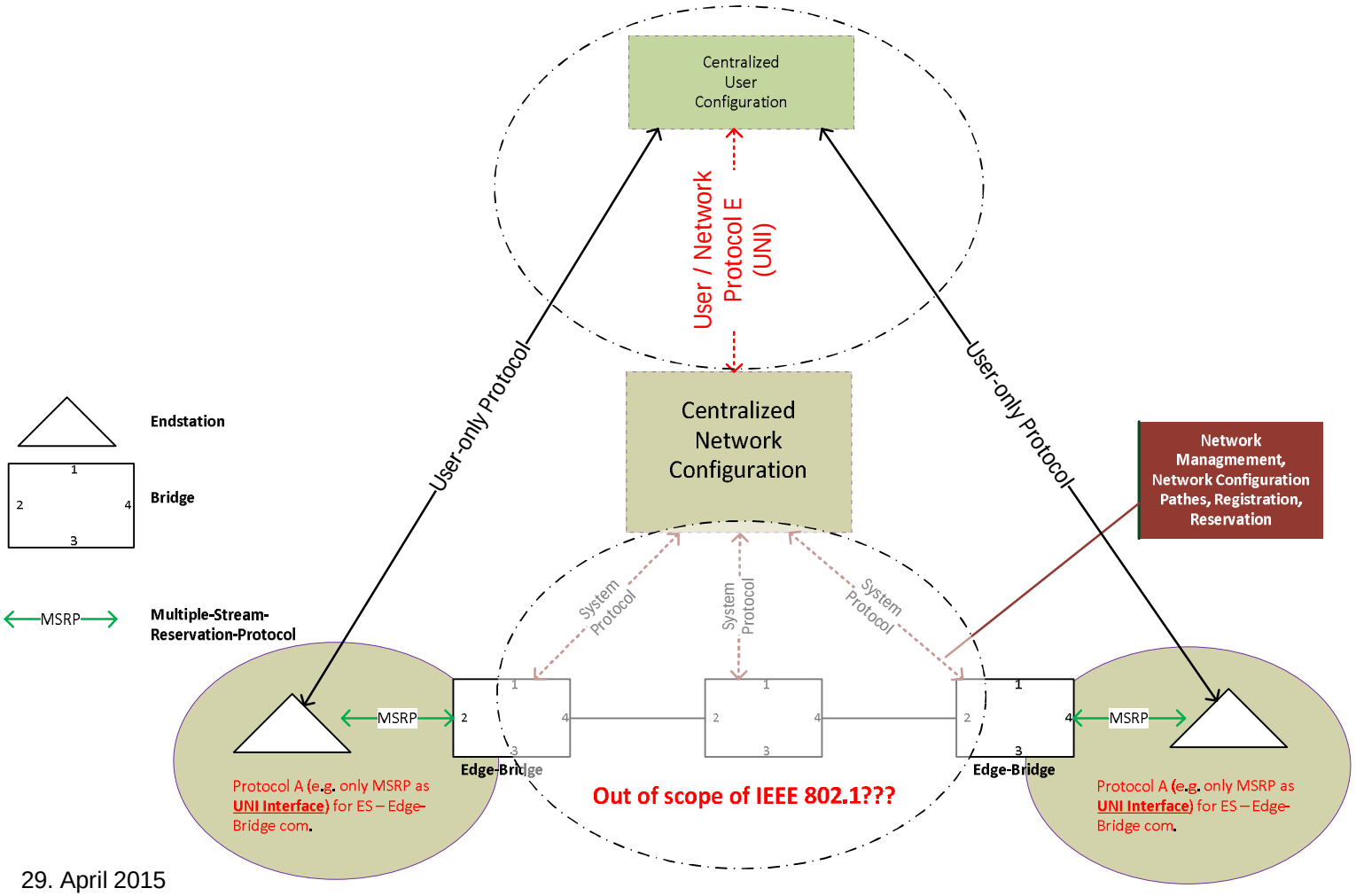
3c. Fully Centralized Model *based on System Protocol*

Question: Is this model and / or protocol E (User / Network) **in scope?**



What about the other parts of IEEE 802.1Qcc PAR

- Support for more streams. The current worst case limit is less than 500 streams; there are use cases that require two orders of magnitude greater than this.
- Mechanisms that allow Stream Reservation class (SR class) parameters to be configured
- Inclusion of additional parameters and mechanisms in the stream reservation protocol that support additional applications, such as higher reliability, latency requirements, and latency changes due to network reconfiguration.
- Support for higher layer streaming sessions, such as Real-Time Protocol (RTP)-based sessions.
- Deterministic stream reservation convergence.
- User Network Interface (UNI) for routing and reservations.

=> See PAR proposals on the following slides!

Motivation splitting Registration and Reservation in MRP++ (MRPv2) and MSP

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Motivation for V2 MRP (Multiple Registation Protocol) and V1 MSP (Multiple Signaling Protocol)

	MRP v1	**MRP v2** "transport-protocol" for applications like MVRP, MMRP, MSRP, ...
Pro (also Supported by new Version)	**Cons**	**Features**
Distribution of network attributes over context	No fragmentation - limits the number of attributes. This problem is partly solved by spending one seperate frame for each application or application instance. The disadvantige of the current solution that high computing power is required for serialization and dserialization.	'+' Support Fragmentation '+' One MRP frame for all applications (including all attribute lists and states) '+' Sperate checksum for each attribute list
One basic machnism for different applications (MVRP, MMRP,...)	Very complex and intransparent state machines -> difficult to synchronize implementations from different vendors	+' Simplified state machine and synchronization mechanism
Common architecture (aplication-->instance-->attribute)		
	MSRP combines registration and reservation, the attribute size (advertise) is very large and extended the MAP mechanism and introduced four packed events exclusiv for MSRP	+' MSRPv2 is only a registration protocol to register stream attributes (e.g. TSpec, TC, SR-DA, SR-ID, VID, ...)
	The pack mechanism form MRP is not practical (only for special use cases)	+' By introducing fragmentation the packed mechnism is no longer necessary
		+' Extending existing apllications (MVRP, MMRP, MSRP) to support redundancy and seamless redundancy on precalculated trees '+' If necessary add a new application like MRRP
		+' Optional suport for higher layers like IP (e.g. transport higher layer addresses, QoS specifier, ..) by e.g. using TLV's
		+' Managed Objects
		+' TLV's are used to specify the MRP attributes
		+' The mechanism to synchronize the attribute list on a link is compareable to the synchronziation mechanism used by ISIS (ISIS-like)
		MSP ("RSVP like") ("MSP is a seperate transport-protocol" for e.g. stream reservation)
	MSRP combines registration and reservation, the attribute size (advertise) is very large and extended the MAP mechanism and introduced four packed events exclusiv for MSRP	+' MSSP (Multiple Stream Signaling Protocol) is a applicaiton for MSP which is used for stream reservation, e2e signalling and diagnostic. The context, which is required for forwarding the signal / reservation, is either built by MRP or ISIS-PCR
		+' Optional suport for higher layers like IP (e.g. transport higher layer addresses, QoS specifier, ..) by e.g. using TLV's
		+' Managed Objects

Support for more streams. The current worst case limit is less than 500 streams; there are use cases that require two orders of magnitude greater than this.

Support for higher layer streaming sessions, such as Real-Time Protocol (RTP)-based sessions

Deterministic stream reservation convergence -> request for performance

Proposals for new PARs (1)

Today:

MRP – Multiple Registration Protocol
(framework for all MPR applications (e.g. MVRP, MMRP, ...) to register network attributes)

- **MRRP – Multiple Relation Registration Protocol**
  (used to register relation ID's and to nail down the path in combination with BLCE's)
- **MVRP – Multiple VLAN Registration Protocol**
  (used to register VID's – e.g. data plane for Streams)
- **MMRP – Multiple MAC Registration Protocol**
  (used to register MAC addresses or "Group Filtering Behavior")
- **MSRP – Multiple Stream Reservation Protocol**
  (used to register streams and make the reservation)

PAR- Proposal for .1Qcc

PAR 1: New definition of .1Qcc

- Maintenance for the existing MSRP protocol and creating YANG modules for Clause 12 specs and UNI Interface for ES <-> Edge-Bridge + ...

PAR- Proposals for MRP++ and MSP

PAR 2: MRP++

- **MRRP – Multiple Relation Registration application**
  (used to register relation ID's and to nail down the path in combination with BLCE's)
- **MVRP – Multiple VLAN Registration application**
  (used to register VID's – e.g. VID used for Streams)
- **MMRP – Multiple MAC Registration application**
  (used to register "Group Filtering Behavior" or to register MAC addresses)
- **MSRP – Multiple Stream Registration application**
  (used to register (no reservation) streams)

MRP++ - Multiple Registration Protocol
(Transport protocol for all MPR applications to register network attributes)

PAR 3: MSP

- **MSSP – Multiple Stream Signalling application**
  (used to Do stream reservation)
- **MRSP – Multiple Rate Constrained Traffic Signalling application**
  (used for service reservation – also required for a converged network like TSN)

MSP - Multiple Signalling Protocol (related to RSVP)
(Transport protocol for all MSP applications to do reservations)

Inclusion of additional parameters and mechanisms in the stream reservation protocol that support additional applications, such as higher reliability, latency requirements, and latency changes due to network reconfiguration

Data model for splitting the existing MSRP to MSRP on MRP++ and MSSP on MSP

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New
Static Information
Dynamic Information

MSRP on MRP

Talker Advertise		Talker Failed		Listener		Domain
StreamID	Talker Sys-ID	StreamID	Talker Sys-ID	StreamID	Talker Sys-ID	StreamClassID
	Unique-ID		Unique-ID		Unique-ID	StreamClassPriority
DataFrameParameters	Dest-Address	DataFrameParameters	Dest-Address	FourPackedEvent	Ready / ReadyFailed / AskingFailed / Ignore	StreamClassVid
	VID		VID			
Tspec	MaxFrameSize	Tspec	MaxFrameSize			
	MaxInterval		MaxInterval			
PriorityAndRank	DataFramePriority	PriorityAndRank	DataFramePriority			
	Rank		Rank			
AccumulatedLatency	portTxMaxLatency	AccumulatedLatency	portTxMaxLatency			
		FailureInformation	BridgeID			
			FailureCode			

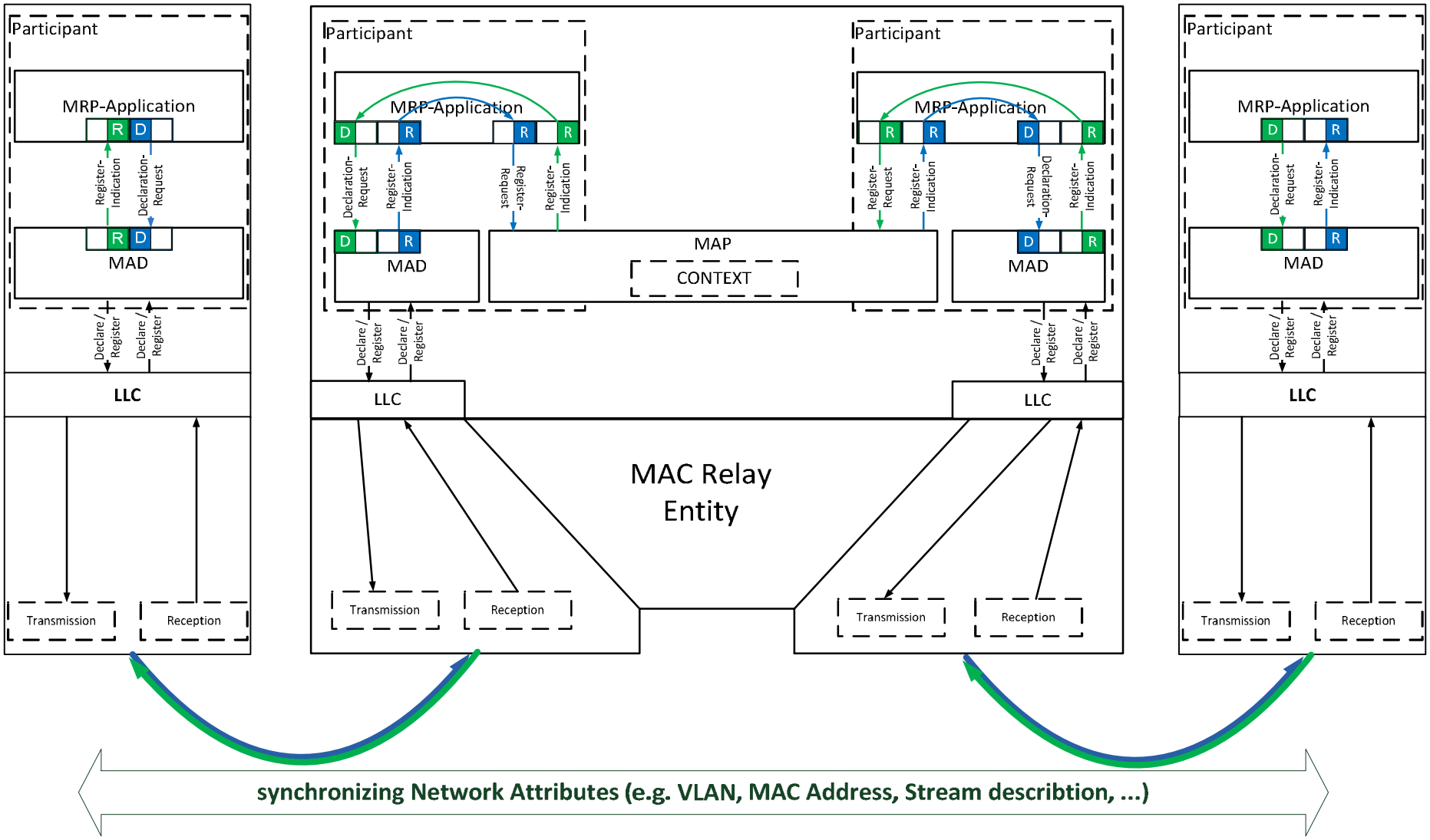
MSRPv2 on MRP++

Talker Advertise		Listener		Domain
StreamID	Talker Sys-ID	StreamID	Talker Sys-ID	StreamClassID
	Unique-ID		Unique-ID	StreamClassPriority
DataFrameParameters	Dest-Address	Rspec	MinRecvInterval	StreamClassVid
	VID	Listener ID	Listener Sys-ID	
Tspec	MaxFrameSize			
	MaxInterval			
PriorityAndRank	DataFramePriority			
	Rank			

MSSP on MSP

StreamID	Talker Sys-ID	StreamID	Talker Sys-ID	
	Unique-ID		Unique-ID	
AccumulatedLatency (Calculated downstream)	portTxMinLatency	RequiredLatency (Calculated upstream)	portRxMinLatency	
	portTxMaxLatency		portRxMaxLatency	
State	ok?	AccumulatedRspec	AccMinRecvInterval	
List<FailureInformation>	BridgeID	State	Ready / ReadyFailed / Failed	
	FailureCode	List<FailureInformation>	BridgeID	
			FailureCode	

MRP++ Architecture

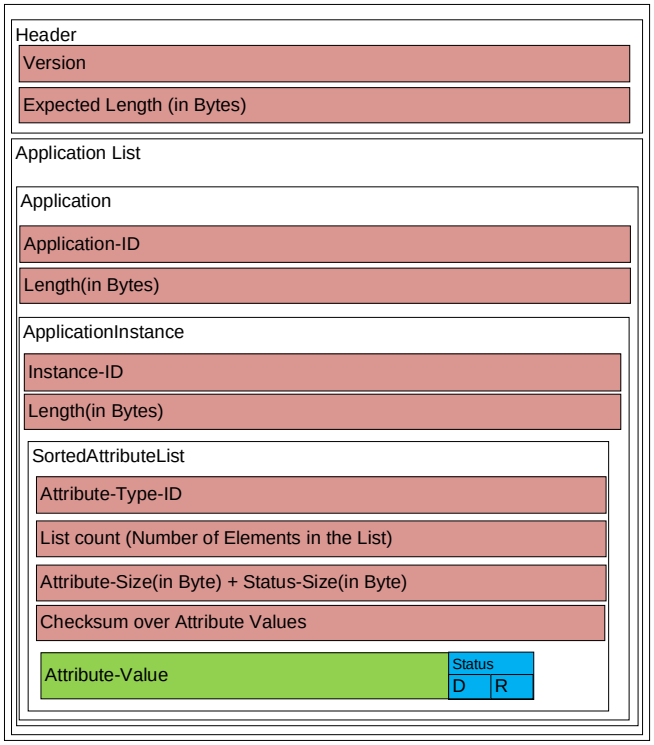


MRP++ States

State	R	D	Action	Discription
Empty	0	0	delete	No Attribute
Declared	0	1	---	Declare / annouce a "New Attribute"
Registered	1	0		"New Attribute" registered
Established (Registered & Declared)	1	1	ready	"Attribute" registered and declared

MRP++ Frame Format

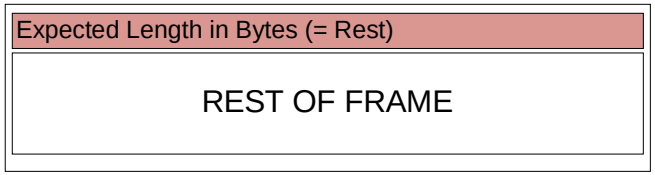
Frame:



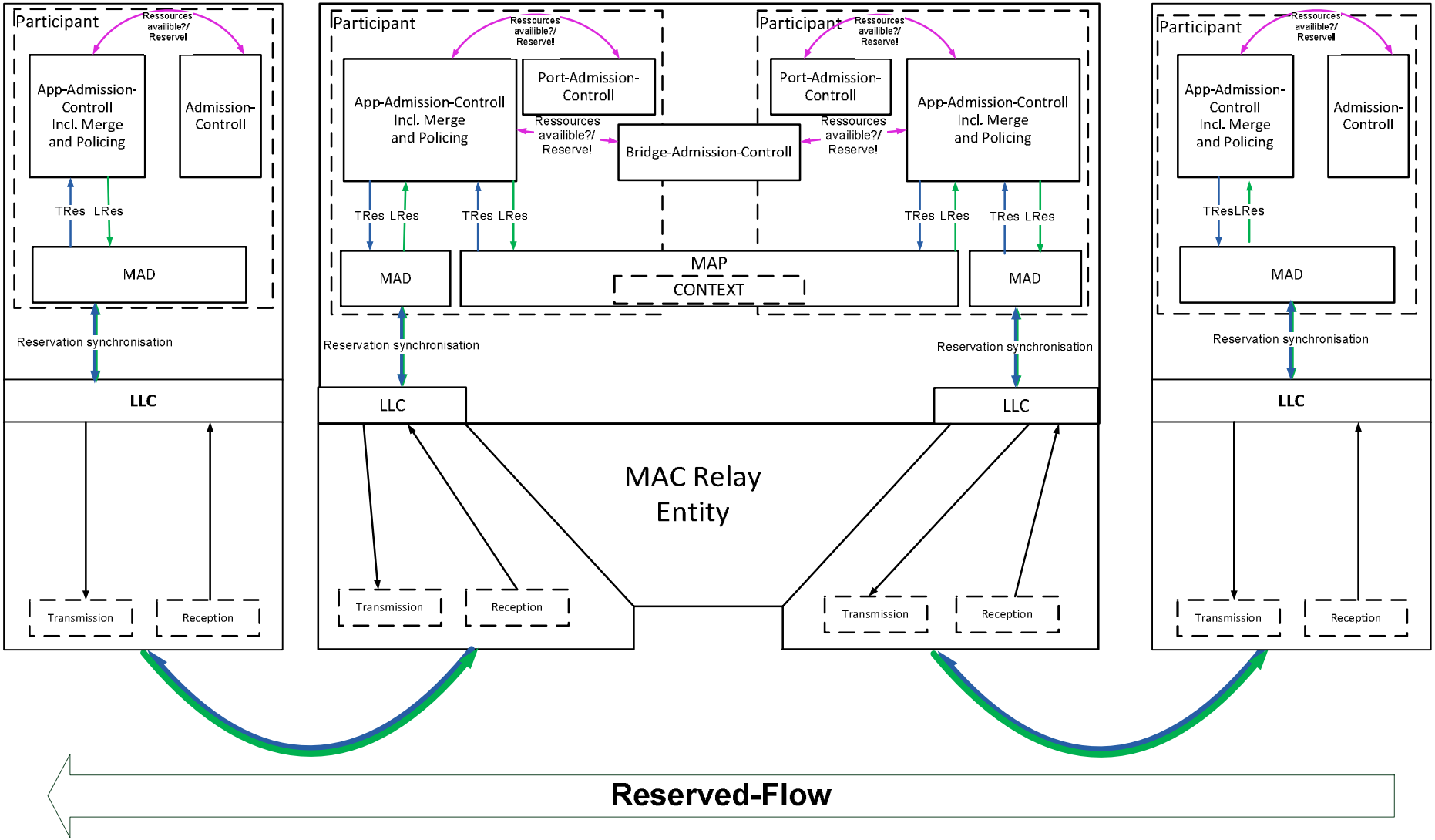
MRP-PDU	→ Header, ApplicationList
Header	→ Version, ExpectedLength
Version	→ UINT8
ExpectedLength	→ Length
Length	→ UINT16
ApplicationList	→ Application*
Application	→ ***ApplicationId***,Length,ApplicationInstance*
ApplicationId	→ ID
ID	-> UINT8
ApplicationInstance	→ InstanceID,Length,SortedAttributeList*
InstanceID	→ UINT16
SortedAttributeList	→ ListHeader,ListBody
ListHeader	→ ***AttTypeId***,ListCount,***AttributeSize***,Checksum
AttTypeId	→ ID
ListCount	→ UINT8
AttributeSize	→ UINT8
Checksum	→ Fletcher-16
ListBody	→ Attribute*
Attribute	→ Value,State
Value	→ ***Attribute value defined by Application***
State	→ Declarator, Registrar
Declarator	→ BIT
Registrar	→ BIT

Red: TBD(unsure)
Green: Defined By Application
**** := 0 - N***

Fragment:



MSP Architecture



END!

This presentation set is just a proposal to increase

- performance,
- supported number of streams,
- new features (like (seamless) redundancy, reduced latency, configurable traffic classes, …)
- performance of services (e.g. synchronization over redundant path),
- interoperability (to .1Qca, RSVP of IETF, implementations, …)

and to make more progress in the IEEE TSN project especially in .1Qcc project.

-> If there is no interest -> “Let it be!”

(Just for interest)
Proposals for other new PARs

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Other PAR-Proposals

PAR 4: „device level“ YANG modules

- „This specifies YANG modules for 802.1Q Clause 12. This is the bottom level YANG (per bridge).“

PAR 5: „service level“ YANG modules

- This is high level YANG (topology-wide)
- There is an IETF I-D on this topic:
  https://datatracker.ietf.org/doc/draft-clemm-i2rs-yang-network-topo
  If we assume this I-D will proceed to RFC, 802.1's role would be to specify an "augment" to this module for 802.1Q bridges. The augment should connect the top-level to the bottom-level.

Thank you for your attention!

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