

TSN-IA Use Case Proposal

Hierarchical Domain based Network

IEC/SC65C/MT9=IEEE802.1/JWG P60802

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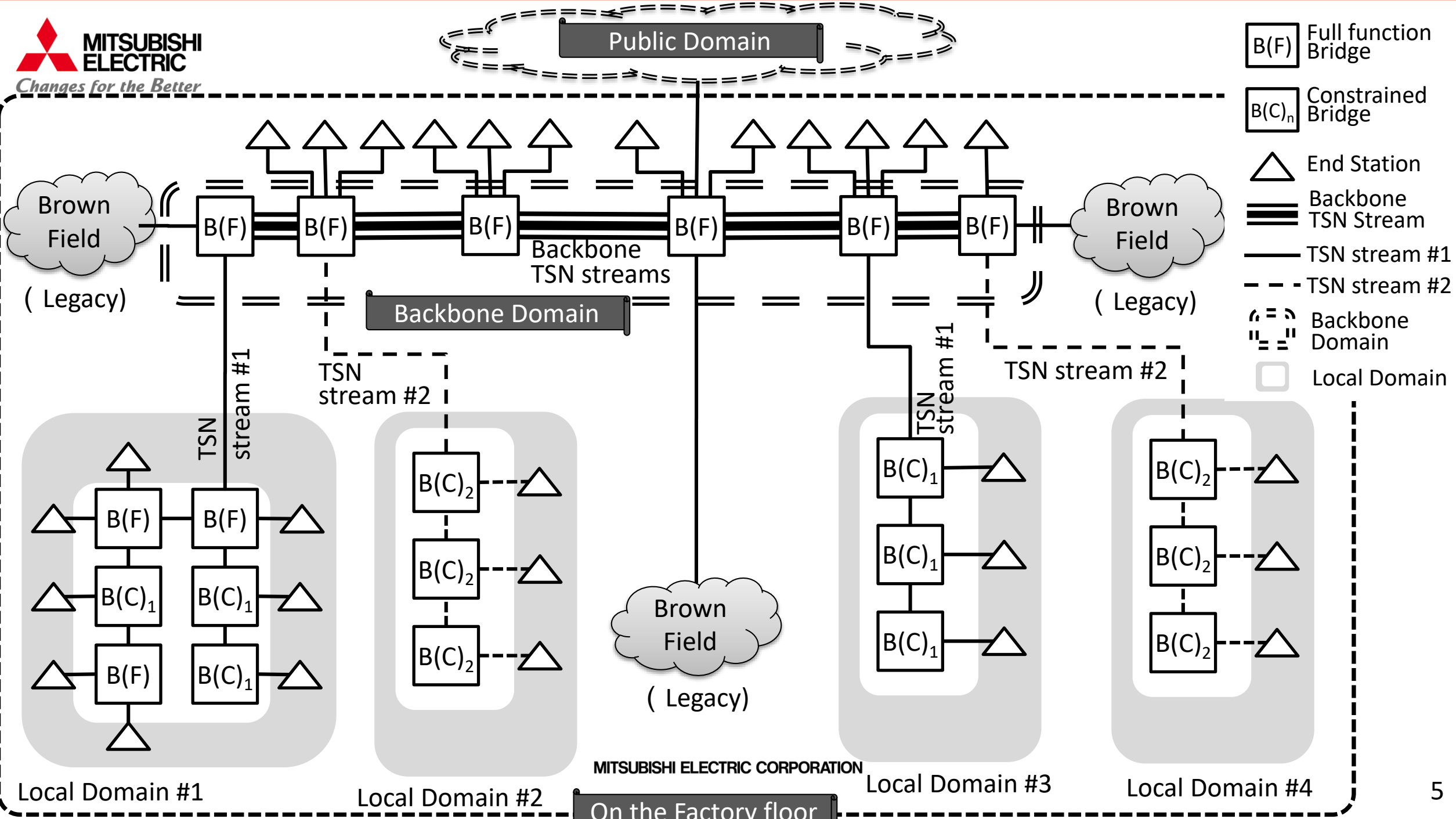
- Domains
- The Use case
- Bridges

Revision

- Terms
 - Revision
 - Domain definition
 - Backbone Domain ← Public Domain
 - Local Domain ← Private Domain
 - Public Domain
 - Brown Field
 - Bridge availability
 - Full functional Bridge B (F) ← FB
 - Constrained Bridge B (C) ← CB

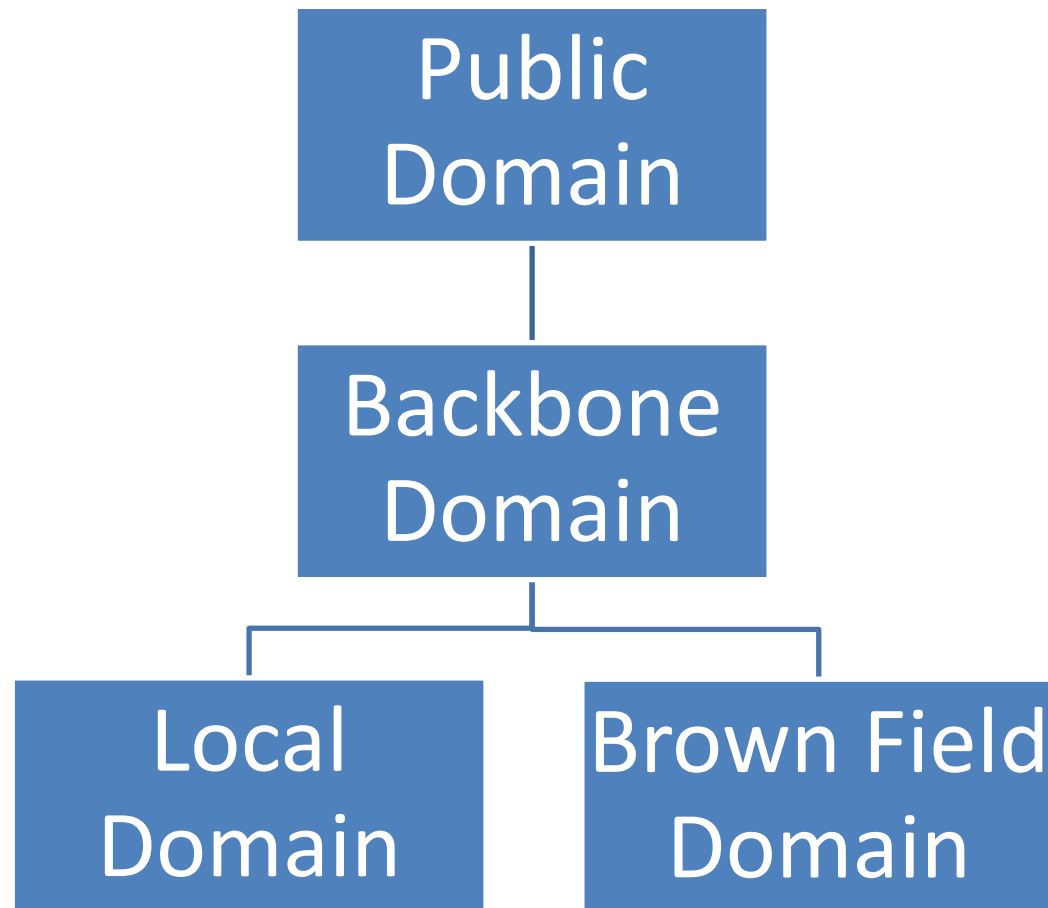
Overview

- A Hierarchical network system has
 - Local Domain: Closed Domain with TSN
 - Backbone Domain: Inter-domain connections including TSN
- This configuration is popular in the Factory Automation industry, which accounts for two-third of the Industrial Automation Network nodes.
- Local Domains offer concurrent development, multi-vendor purchasing and protection from fault interference.
- Backbone Domain interconnects between Local domains and/or brown field domains.
- Bridges
 - Full function Bridge : B(F)
 - It equips whole function of TSN which is defined in IEEE802.1 TSN specification.
See P22 in <<http://www.ieee802.org/1/files/public/docs2017/tsn-farkas-intro-0517-v01.pdf>>
 - Constrained function Bridge: B(C)
 - Subset of Full function Bridge
 - Minimum requirement and options for Industrial Automation



Domains

- Public Domain
- Backbone Domain
- Local Domain
- Brown Field Domain
(Legacy)



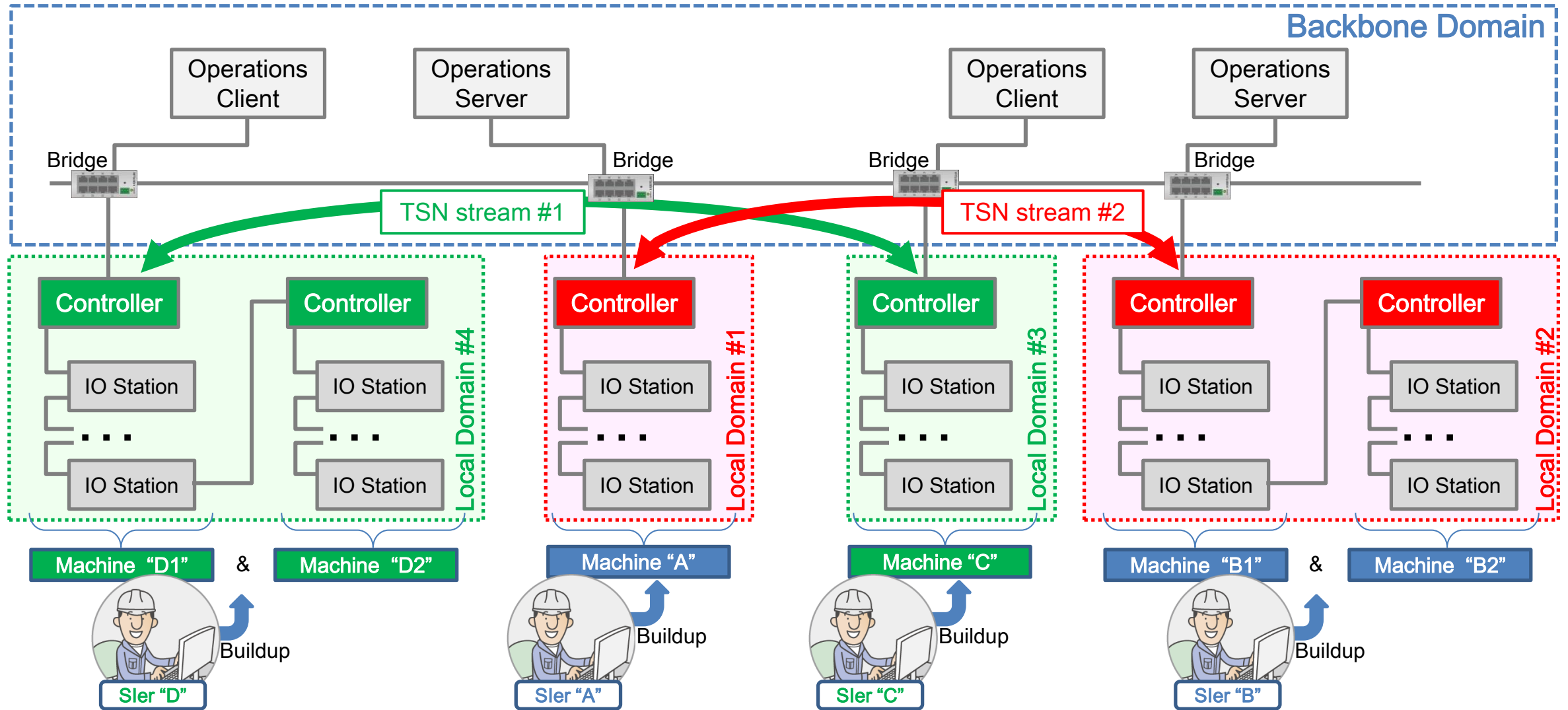
Local Domain

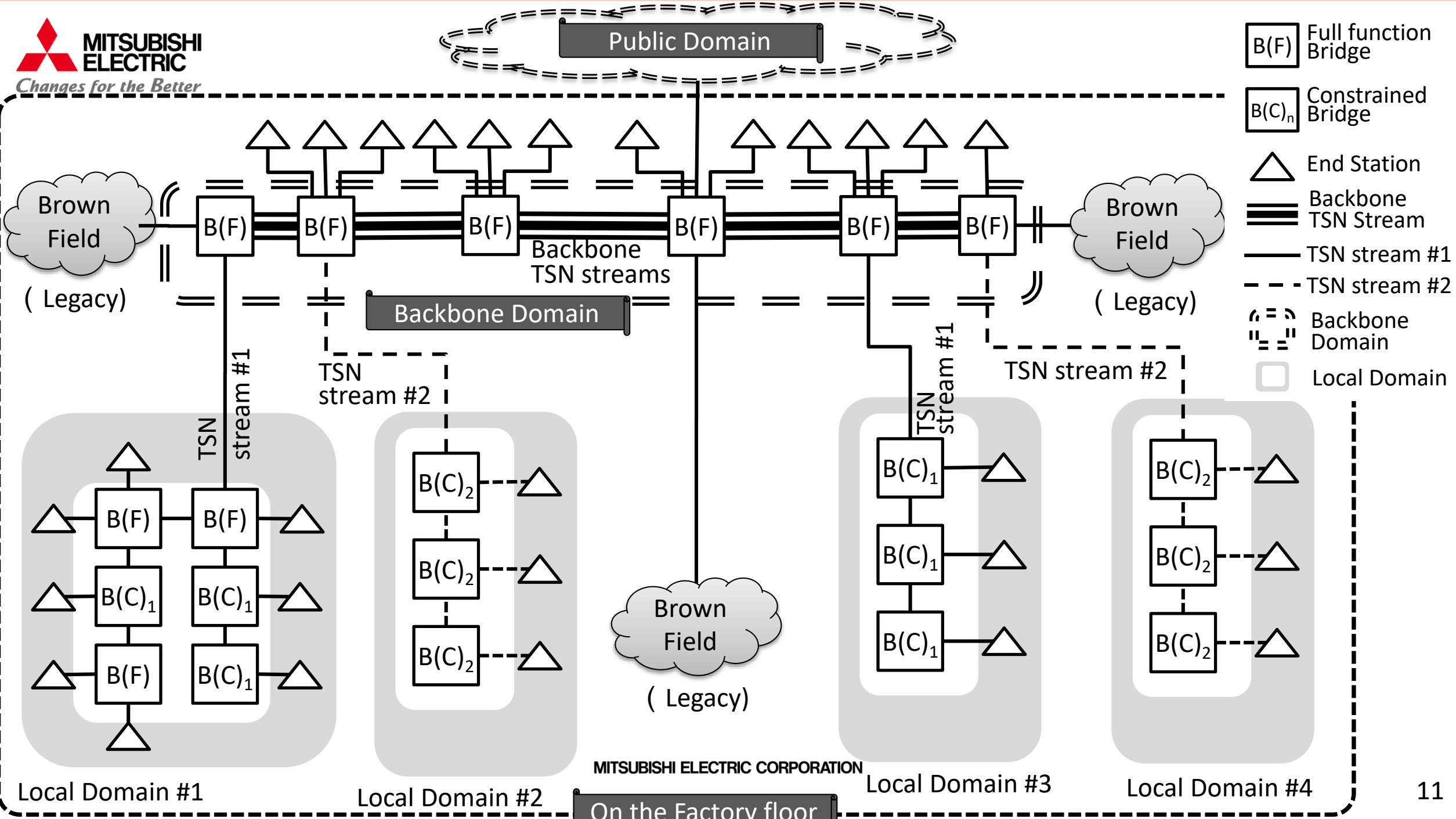
- Closed Domain with TSN
 - Closed Brand new domain with TSN
 - Some brown field may migrate to the Local domain to add TSN.
- Constrained access from outside
 - It connects with Backbone at dedicated interface(s).
 - Nothing can directly access local domain entities from outside.
- Predefined configuration.
 - Only designated communications including TSN streams run in the specified Local Domain.
 - Configuration is static and fixed, but may be allocated dynamically.

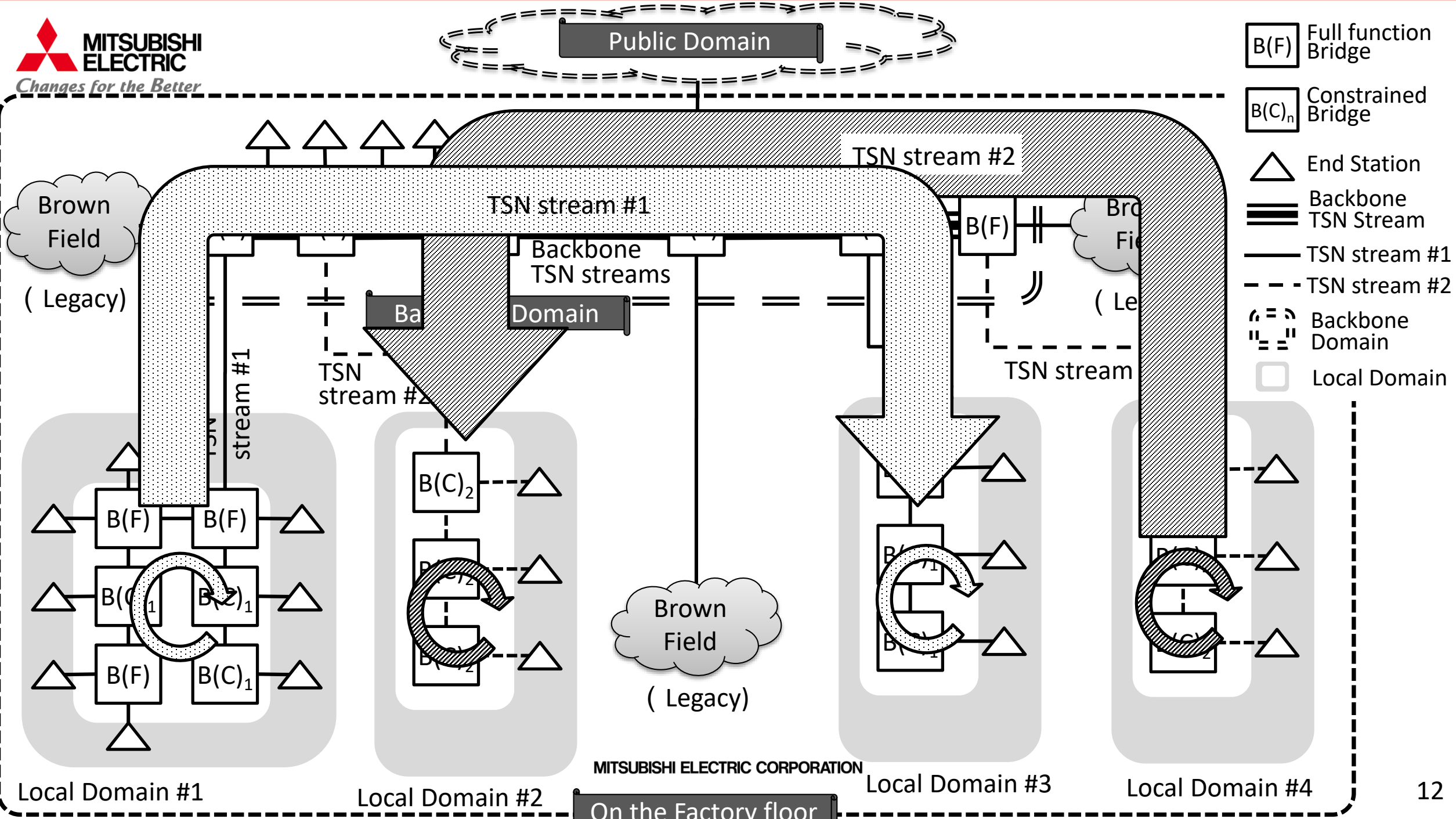
Backbone Domain

- Inter-domain connections including TSN
- Inter-domain access
 - It connects with Local Domains, but it may connect to the Public Domain and the other domains (ex. OA domains, etc.)
 - Anything can directly access backbone domain entities from outside.
- Dynamic configuration
 - Any communications including any TSN streams can run through them.
 - Configuration is allocated dynamically.

Multi TSN streaming in Use Case 1







- B(F) Full function Bridge
- B(C)_n Constrained Bridge
- △ End Station
- ≡ Backbone
- ≡≡≡ TSN Stream
- TSN stream #1
- - - TSN stream #2
- ⋈ Backbone Domain
- ⋈≡≡≡ Local Domain

Which Domain is the Project Scope?

- Backbone Domain only?
- Backbone Domain and Local Domains?
 - If so, we need more discussion about local domain.

Implication on the Bridge function

- The use case shows two different types of bridges are required:
 - Full function Bridge: B(F) to be used in the backbone domain and possibly in the local domain.
 - Currently defined in IEC/pre-CD 60802.
 - Constrained Bridge: B(C) adapted to the local domain applications and topology.

Constrained Bridge : B(C)

- possibly supports less than 8 TSN stream classes, including at least one stream class for isochronous/cyclic streams.
 - Including scheduled traffic
- supports time synchronization.
- supports predefined configuration.
 - with user specific configuration interfaces

Constrained Bridge : B(C)

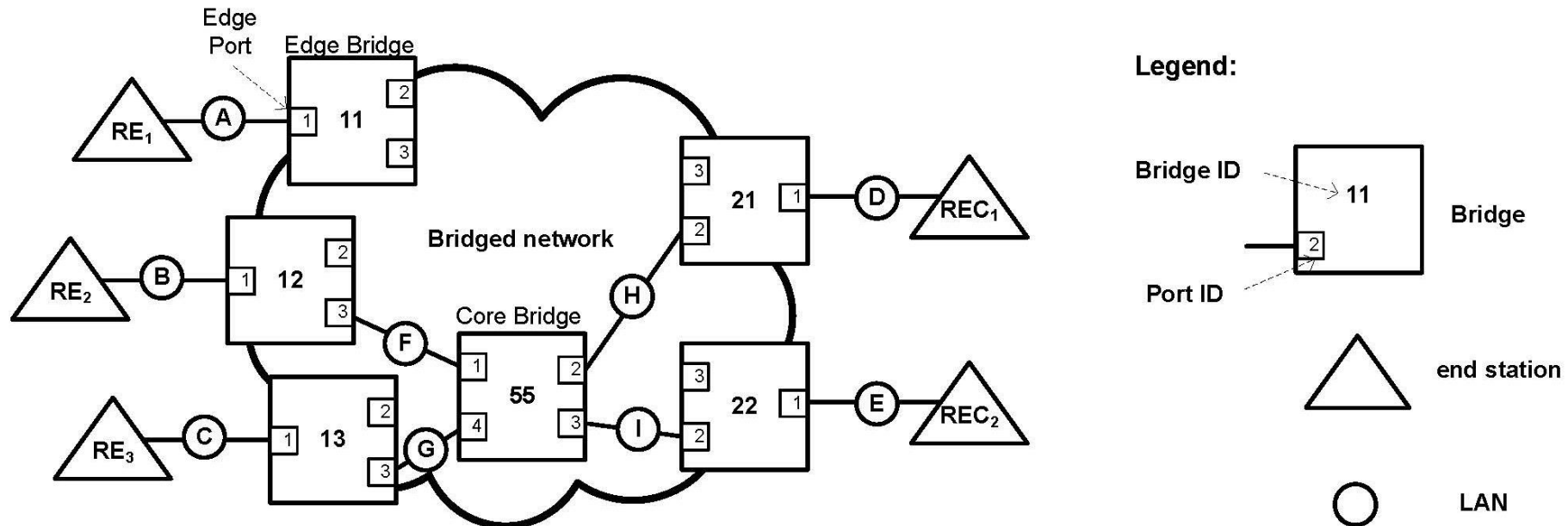
- Optional Features
 - Policing
 - Distributed configuration
 - Non scheduled traffic shapers
 - Preemption
 - Redundancy
 - Encryption

Bridges

Domains	Full function Brdg. B(F)	Constrained Brdg. B(C)
Public Domain	Applicable	Applicable
Backbone Domain	Applicable	Not Applicable
Local Domain	Applicable	Applicable
Brown Field	Applicable	Applicable

Proposal for the Use case specification

- Common representation of the network function in all use cases so that requirements can be more easily identified e.g.: 802.1CM Model from tsn-farkas-intro-1116-v02



Review of Use case 17

- Where are bridges?
- No Backbone domain?

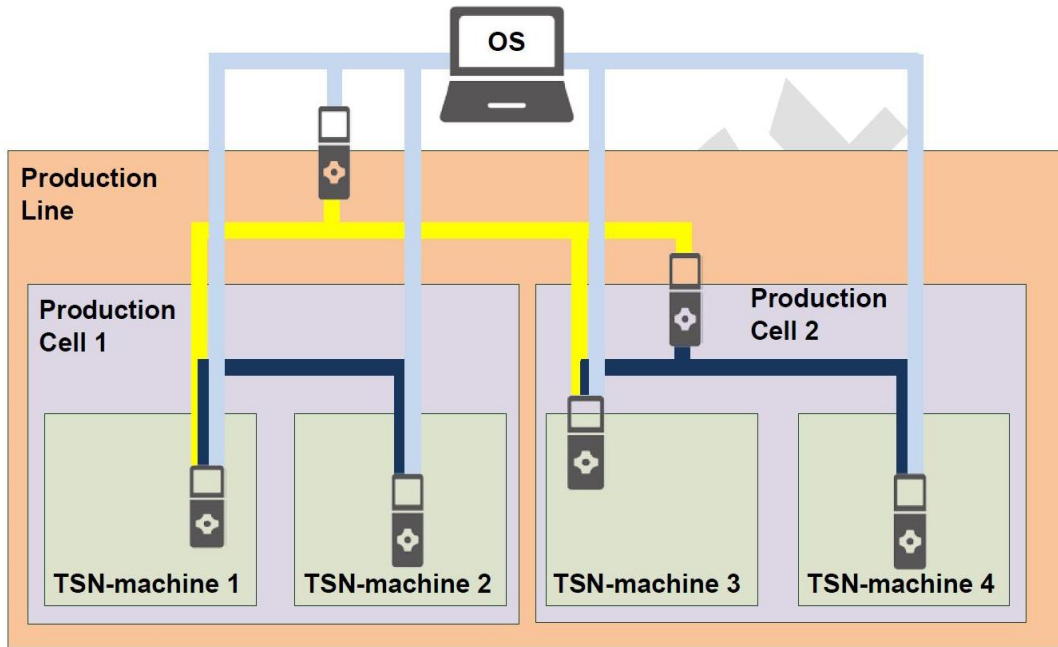


Figure 36 – M2M in hierarchical domains

