ommunications Base Train Control System (CBTC) in New York : interoperability issues and perspectives

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Aegis Semaly Inc.
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Plan

- New York Environment
- Phase I
  - Procurement phase
- Phase II
  - CBTC : the technical solution
- Phase III
  - Interoperability specifications
  - Qualification of potential suppliers

Background

- NYCT subway system : one of the world's largest
- Half of the signal system is more than 75 years old
- An extensive technology assessment conducted in the early 90s concluded CBTC is the best way forward for NYCT:
  - 20 year implementation strategy
  - A pilot system installation - Canarsie Line (L Line)
  - Multiple sources of supply for the system

New York City Subway

Key Characteristics:

1. Large and complex track network
2. Interconnected lines
3. Flexible service
4. Decentralized control
5. Manual operation

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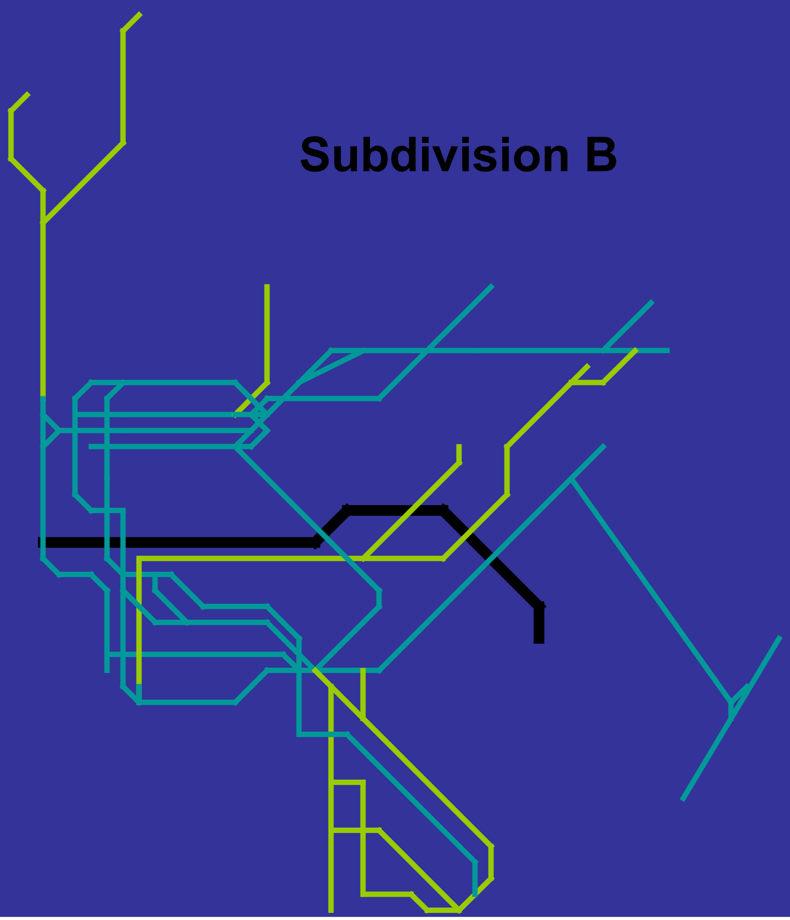
Canarsie Line CBTC Pilot Objectives

- A pilot project for future train control
- Establish new standards for future signal modernization based on CBTC technology, to allow future competitive procurement
- Establish NYCT procedures and working practices with new train control technology
- Resignal the Canarsie Line on schedule and with minimum disruption to revenue services

Needs

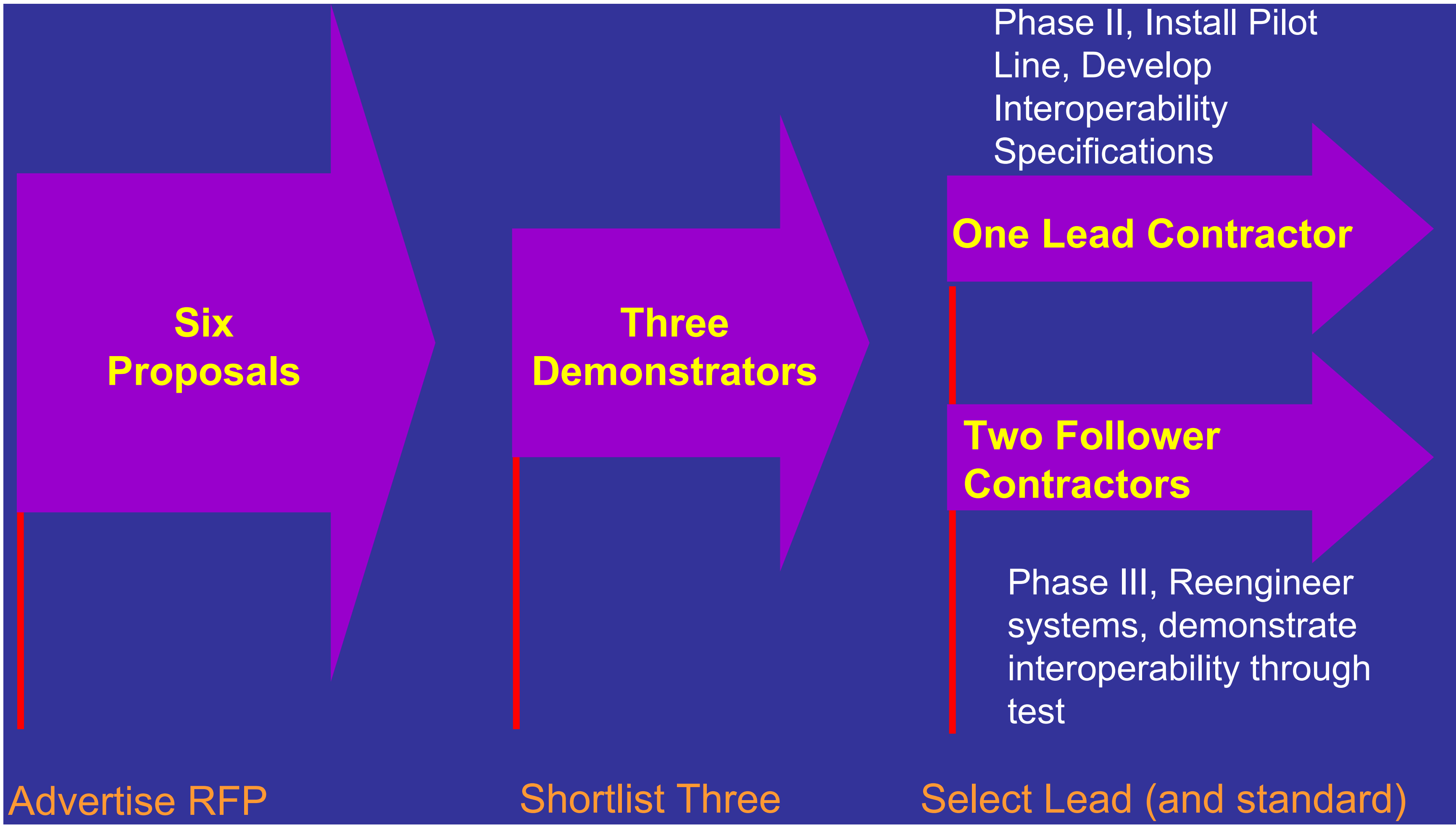


- Interoperability between lines permits a high degree of operational flexibility
  - Trains which normally run on one line, must also be capable of operating over other lines

Implementation Strategy

- System wide over a prolonged period (>20 years)
- Subway system is a highly complex set of interconnected lines
- Flexibility of operation between lines is of paramount importance
- Interoperability standards to permit flexibility at the same time as procuring from competitive sources are key to success

Pilot Project Procurement Strategy



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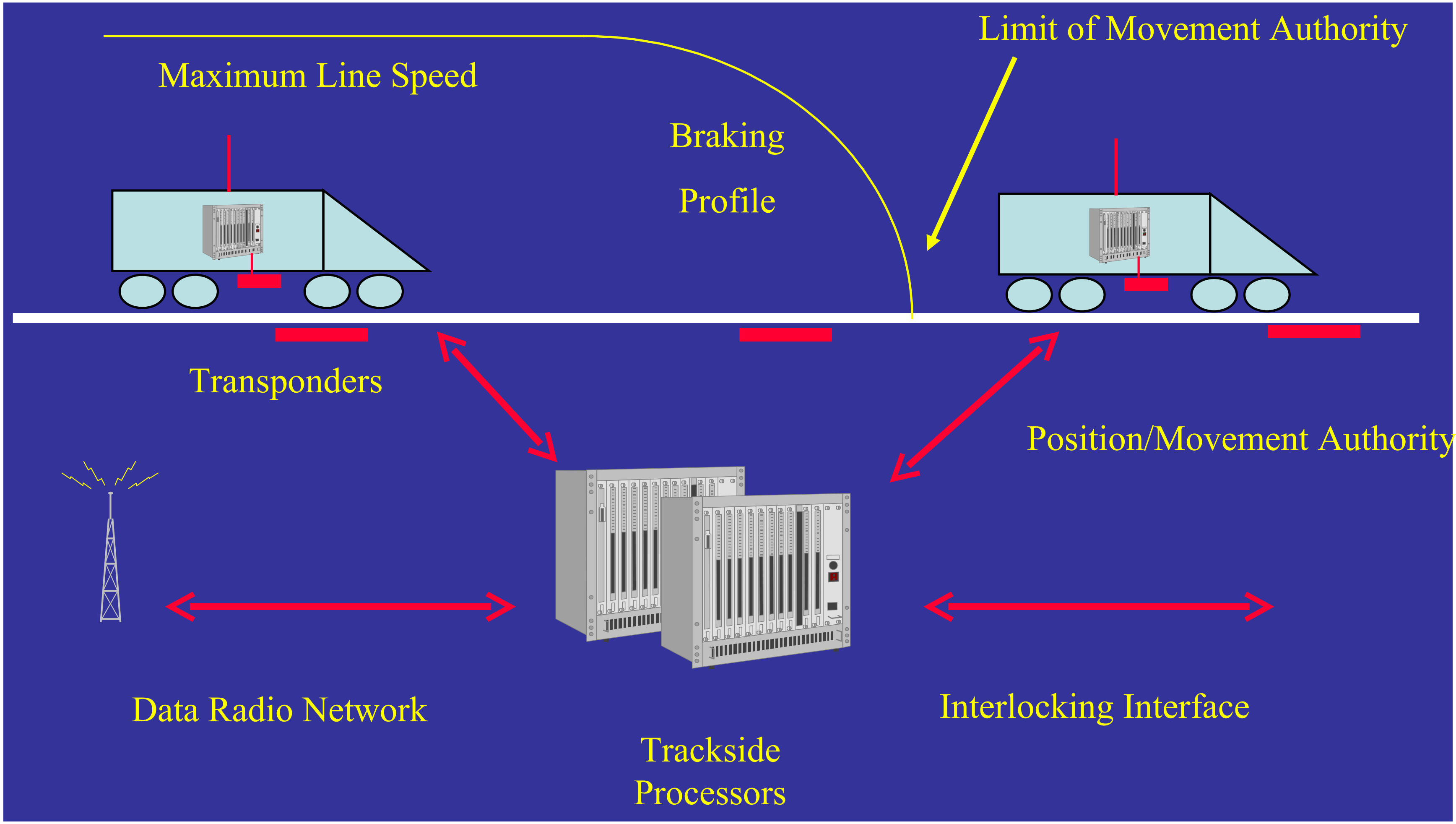
Key Milestones

- Award Phase II Contract
- First interlocking in service (Bway Jct)
- Advanced Design Review
- Preliminary Design Review
- Initial Shadow Mode Operation
- First Section of CBTC in Revenue
- Phases II "Core" completion
- Substantial Completion inc. Canarsie Yd

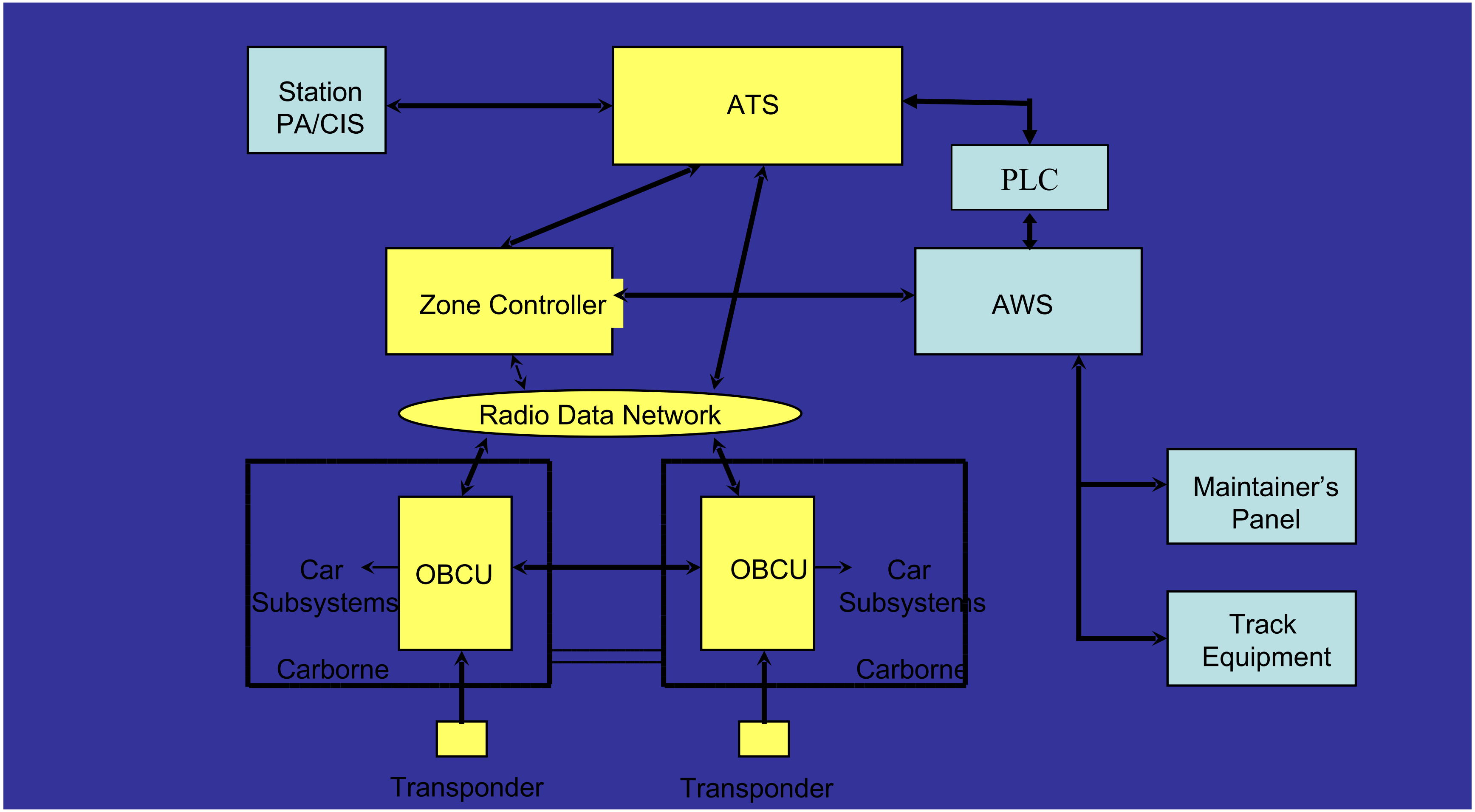
Why are the needs

- Provide safe train separation
- Provide closer headway
- Provide continuous overspeed protection, inc. curves & switches
- Provide for movements in both directions, inc. head-to-head
- Provide for programmed station stops & berthing
- Protection of work crews

CBTC Principles



CBTC Architecture



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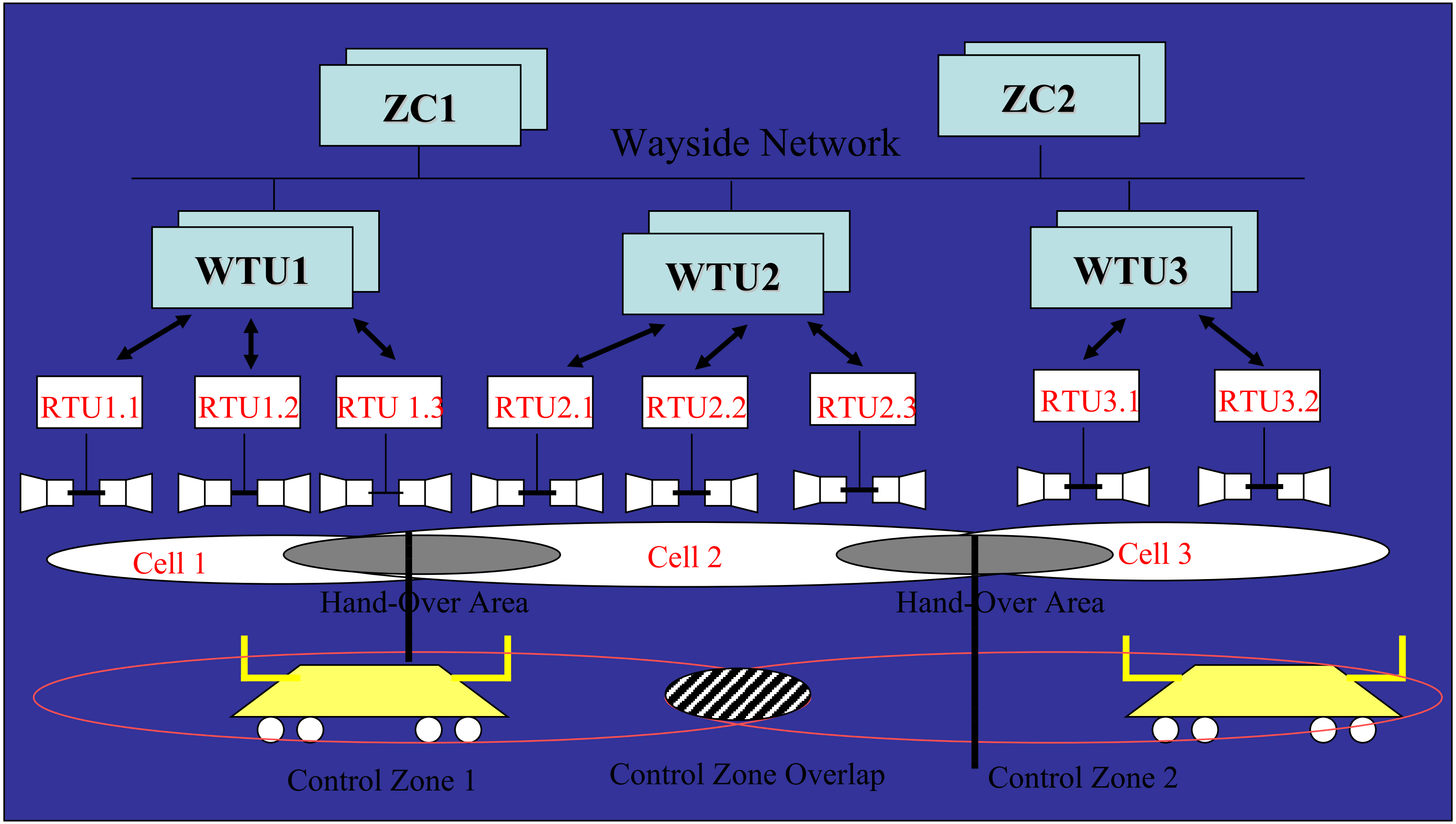
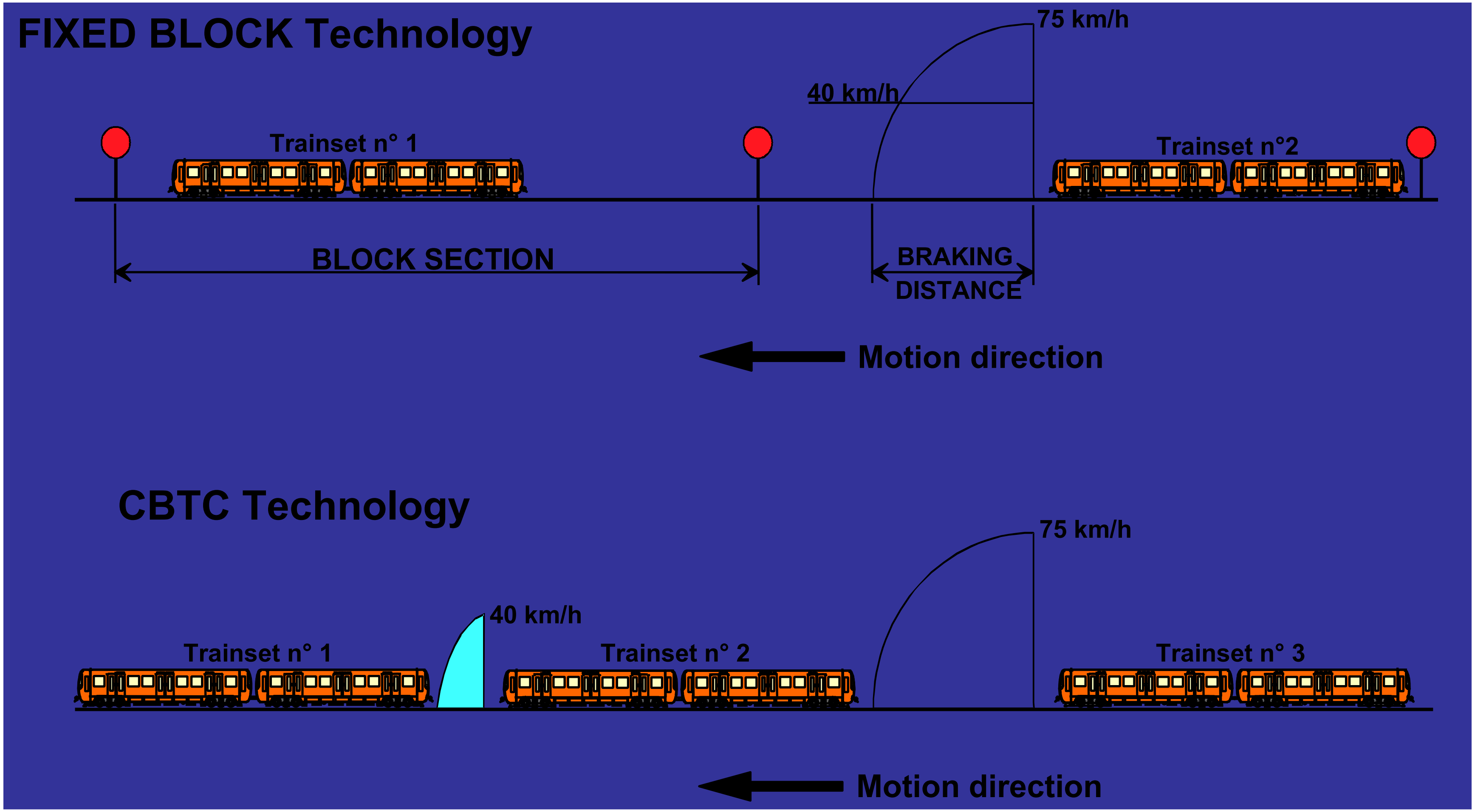
RF Data Network Subsystem



CBTC Advantages : shorter headways



Phase III : Interoperability

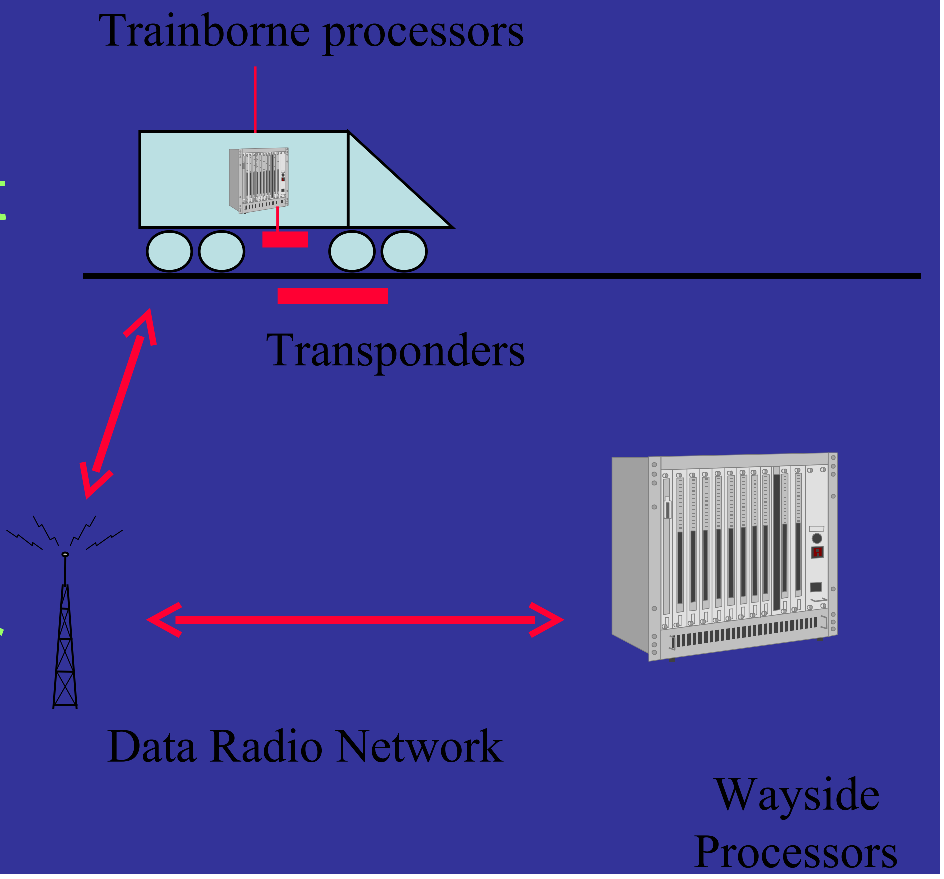
- Qualification of suppliers (followers) to supply CBTC Equipment
- Followers will have to comply with the interoperability requirements
- Followers will have to demonstrate their interoperability with the Leader (Culver Line)
- Phase III is not a competitive process (6 months duration)

Interoperability Objectives

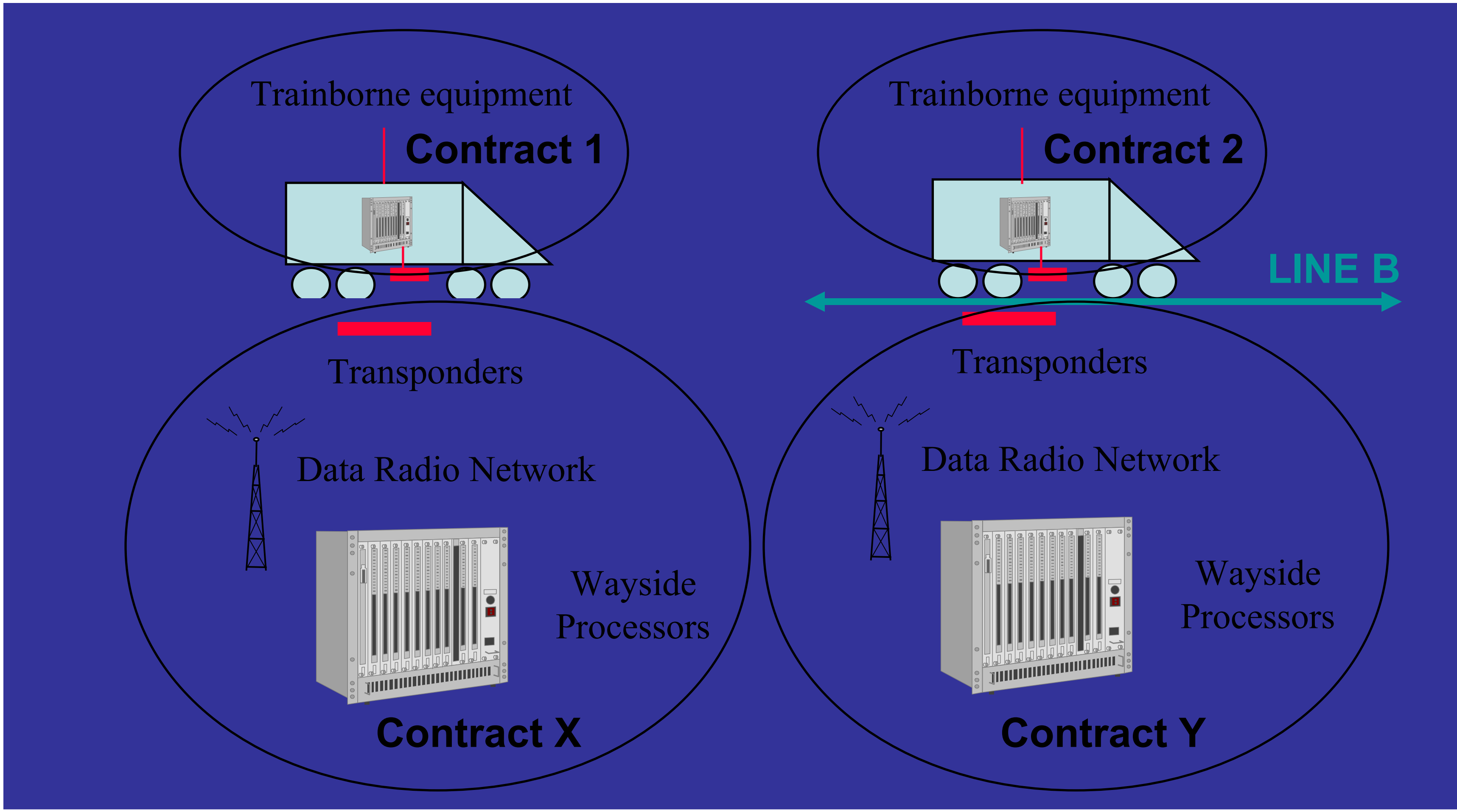
- Establishment of a “NYCT” Standard for future CBTC procurements
- Interoperability Specifications will be the baseline of CBTC procurement specifications
- Separate procured CBTC subsystems

Phase III : what is Interoperability

- Trainborne CBTC equipment provided by one supplier must be capable of operating with wayside CBTC equipment provided by a second supplier

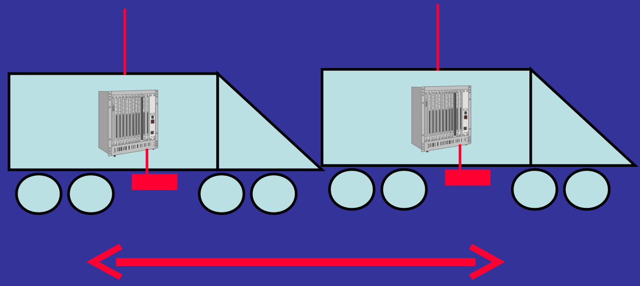


What is Interoperability



What is interoperability

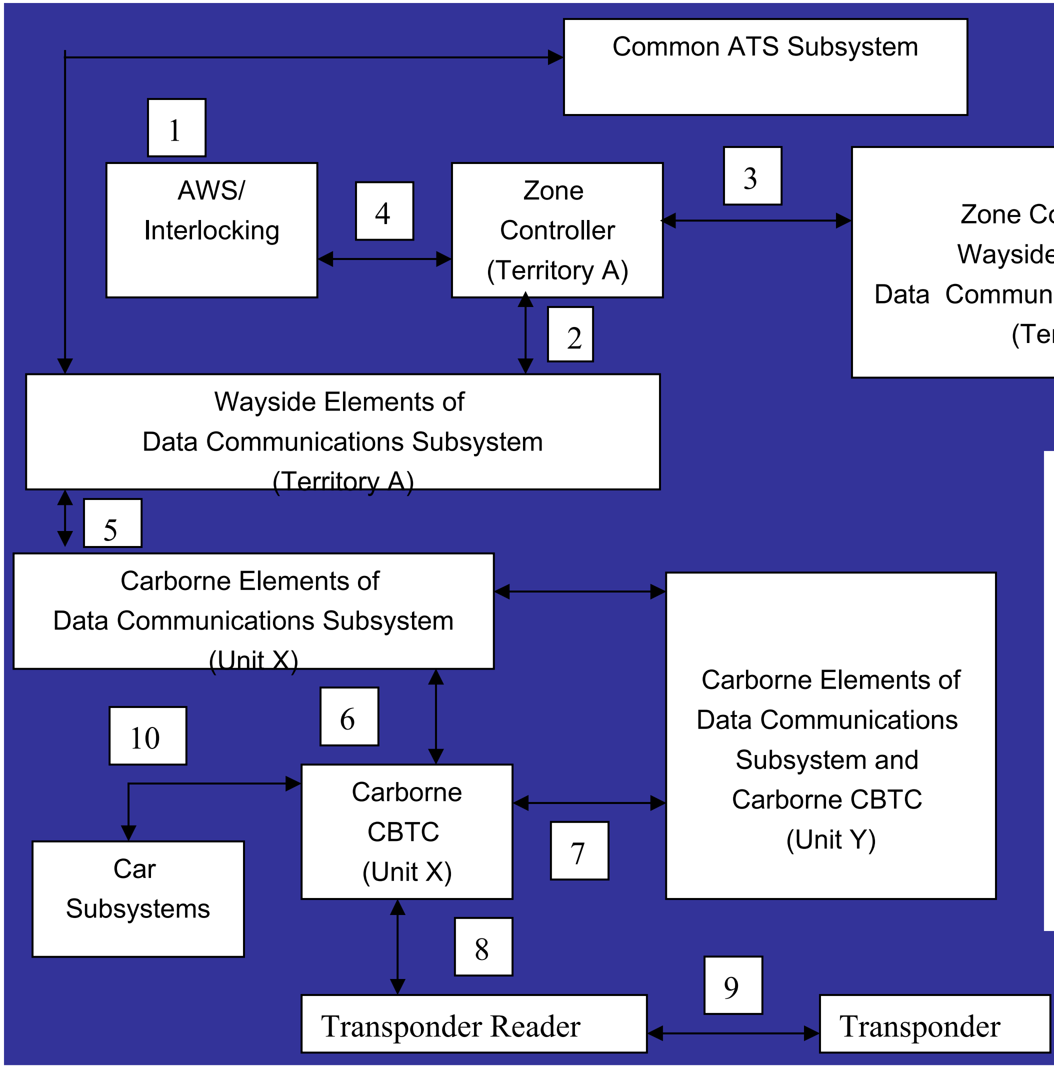
- Trainborne CBTC equipment from multiple suppliers must be capable of operating together within a train made up from a number of basic operating units



What is Interoperability

- Wayside CBTC equipment provided by one supplier must be capable of interfacing with wayside CBTC equipment provided by a second supplier at the border between two lines or two line segments

Interoperability Interfaces



1. Common ATS to/from Wayside DCS (includes data to/from Zone Controllers and Carborne CBTC)
2. Zone Controller to/from Wayside DCS
3. Zone Controller/Wayside DCS to/from Neighboring zone Controller/Wayside DCS
4. Zone Controller to AWS/Interlocking
5. Wayside DCS to/from Carborne DCS
6. Not interoperability
7. Carborne CBTC/DCS to/from Coupled Carborne CBTC/DCS
8. Not interoperability
9. Transponder Reader to/from Transponder
10. Carborne CBTC to/from Car Subsystems

Interoperability Specifications

- Interoperability Specifications will include:
  - System functional requirements
  - CBTC system architecture/principles of operation
  - Definition of Interoperability interfaces
  - Allocation of functions to CBTC subsystems
  - Interface definitions between CBTC subsystems
  - Interoperability interface test requirements
  - Specifications are not required to include details of design within each CBTC subsystem

Summary : Interoperability Approach

- Phase I : selection of the “best” supplier
- Phase II : definition of “Standard”
  - Establish system functional requirements
  - Establish “standard” CBTC system architecture
- Phase III : Interoperability issues
  - Define Interoperability interfaces
  - Develop Interoperability Interface Specifications
  - Develop Interoperable subsystems
    - *Alstom and Alcatel*

From New York to Paris

- New York, Paris, London :
  - same issue : modernization of their current signaling system
  - same interest : CBTC technology
- Three main suppliers :
  - Siemens (NY, Paris, Barcelone, etc.)
  - Alcatel (Paris, NY as follower)
  - Alstom (Ny as follower, Singapore)

Perspectives

- CBTC Standard : NYCT will be the reference
  - Identical architecture,
  - Customizable Component on the shelves :
    - Wayside Equipment
    - Carborne Equipment
    - Radiocommunication Part
    - SSI ?