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Association Québécoise des Transports - AQTr

4 Avril 2017, Montréal

Défis dans la conception et la construction de systèmes de train léger: Revue de projets réalisés au Canada.

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Agenda

- SNC-Lavalin Infrastructure
  - Organisation
  - Expertise Rail & Transports collectifs
- Projets réalisés et en cours
  - Projets complètés
  - Evergreen Line
  - Confederation Line
  - Eglinton Crosstown LRT
- Examples de défis fréquents dans la réalisation de projets
  - Gestion de projets
  - Construction dans un corridor existant et en milieu urbain
  - Intégration de systèmes
- Conclusion/Questions

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Infrastructure

We finance, design, build, operate and maintain crucial infrastructure and rail systems.

Infrastructure Sector Roadmap

Rail & Transit

- Railway Infrastructure
- Freight
- Major Projects in Urban Transit
- Transport Advisory
- Rolling Stock
- Control Systems
- High Speed
- Mainline

PERFECT DAYS

HSSE COMMITMENT

LEADERSHIP
ENHANCING SAFETY CULTURE
COMMUNICATION
TRAINING

Infrastructure Engineering
Infrastructure Construction
Operations & Maintenance

STRATEGY

STRENGTHEN COAST TO COAST CAPABILITIES IN CANADA

MAINTAIN LEADERSHIP THROUGH P3

GROW IN THE MIDDLE EAST

EXPORT RAIL & TRANSIT

DIFFERENTIATORS

END-TO-END P3 EXPERTISE

SMALL TO LARGE SCALE PROJECTS

SUSTAINABLE BUSINESS IN ACTION

- Keep SSE and Ethics top of mind
- Deliver quality work
- Be commercially astute
- Support One Company
- Share our expertise

General Infrastructure

- Ports & Marine
- Industrial
- Highways & Bridges
- Aviation
- Defence & Logistics
- Water & Waste Water
- Real Estate Services
- Buildings & Facilities
- Municipal Infrastructure
- Environment & Geoscience

PREVENT DETECT RESPOND ETHICS

48% ENGINEERING
35% OPERATIONS & MAINTENANCE
16% CONSTRUCTION

+8,000 PROFESSIONALS IN 23 COUNTRIES

Questions :
Infrastructurecom@snclavalin.com

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Infrastructure expertise

Rail & Transit

- Vehicles
- Major projects
- Infrastructure
- Transport advisory
- Rail control systems

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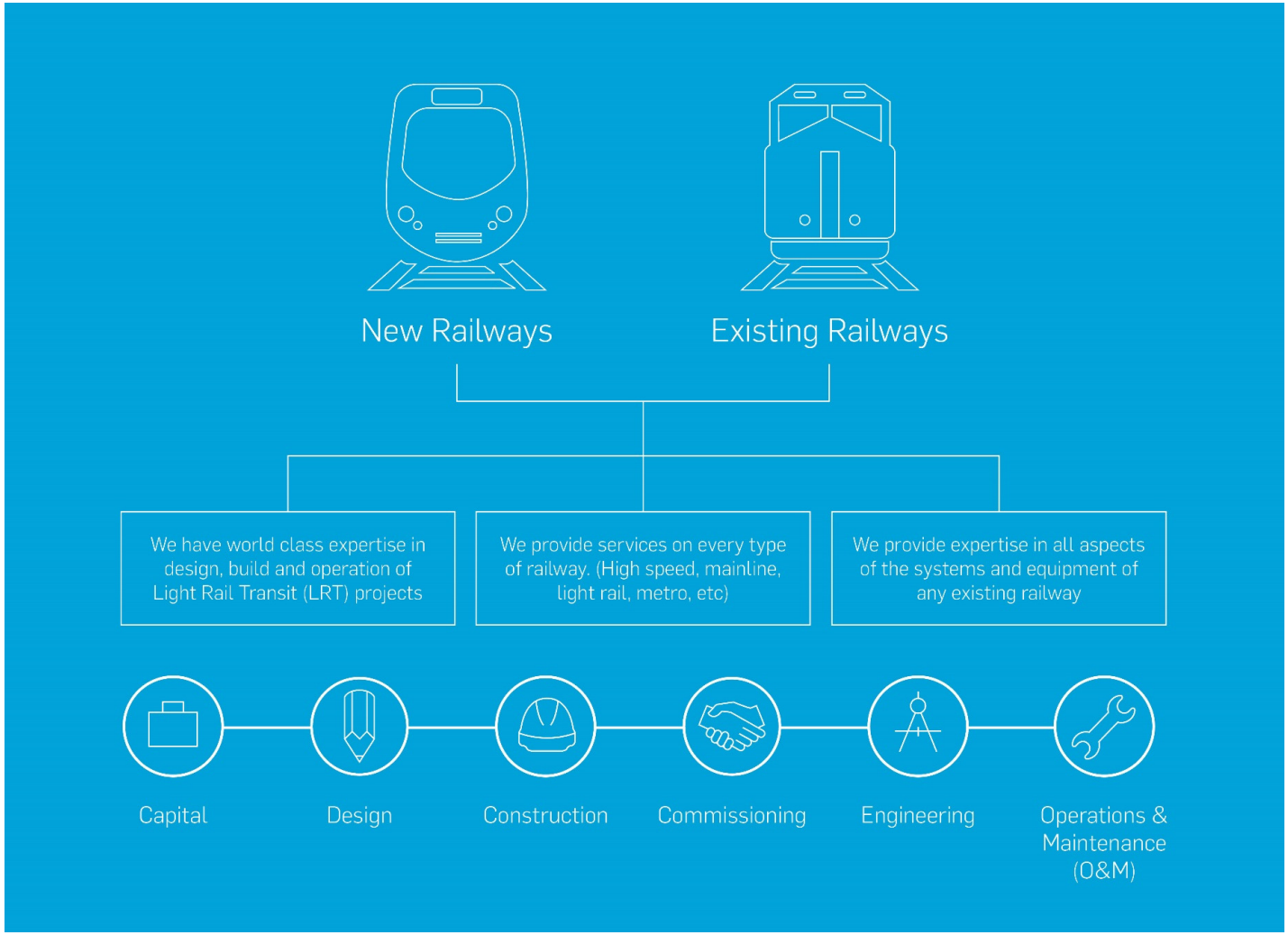
SNC-Lavalin LRT Projects Performed

Canadian Projects	City	Type	Project scope	Year of completion
Montreal Metro Extension	Laval	EPCM	5 km / 3 stations	2007
Canada Line Rapid Transit	Vancouver	DBFOM	19 km / 16 stations	2009
Calgary West LRT	Calgary	DB	8 km / 6 stations	2012
Edmonton North LRT Extension	Edmonton	CM	3 km / 3 stations	2015
Evergreen Line Rapid Transit	Vancouver	DBF	11 km / 7 stations	2016
Eglinton Crosstown LRT	Toronto	DBFM	20 km / 15 stations	On going
Confederation Line	Ottawa	DBFM	12 km / 13 stations	On going

International Projects	Country	Type	Project scope	Year of completion
Ankara Metro	Turkey	DBF	14 km / 12 stations	1997
Kuala Lumpur	Malaysia	DB	29 km / 24 stations	1999
Reims Metropole	France	DBFOM	11 km / 22 stations	2011
Puy-de-Dôme	France	DBFOM	5 km / 2 stations	2012

SNC-Lavalin Rail & Transit



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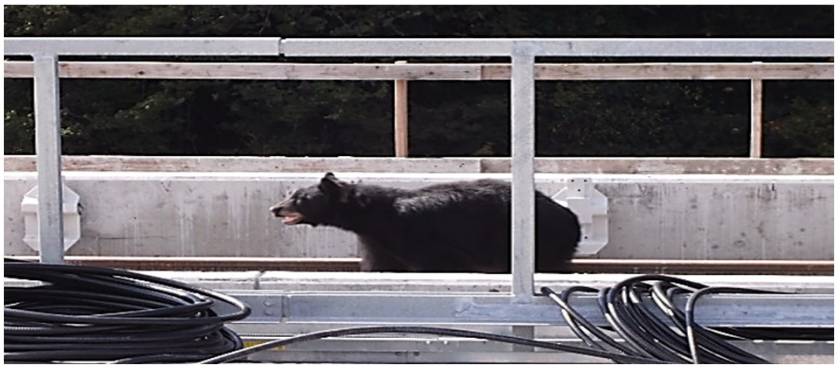
CURRENT PROJECTS

EVERGREEN LINE, Vancouver
CONFEDERATION LINE, Ottawa
EGLINTON CROSSTOWN, Toronto

Evergreen Line, Vancouver

- Approximately $1.4B to build
- 10.9 km extension consisting of 6 new stations and upgrades to one current station
- Service commenced in December 2016
- The expansion will integrate bus and other transit facilities for pedestrian, vehicle and bicycle access



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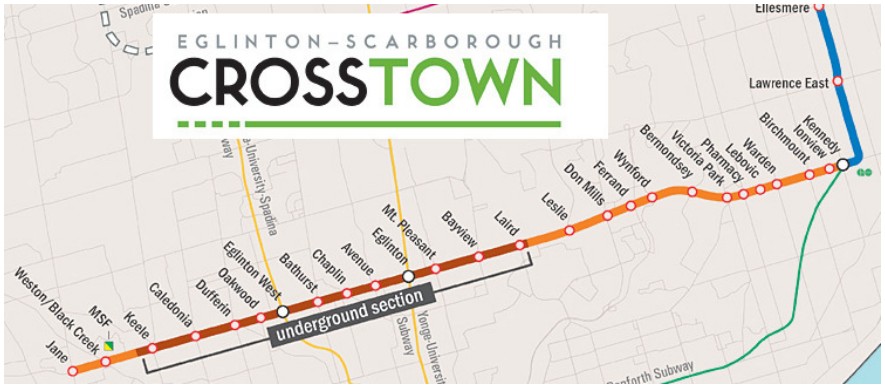
Eglinton Crosstown LRT, Toronto

- Approx. $5.3B to build
- P3, Expected Completion 2021
- 19.7 km of light rail transit
- 10 km tunnel, 9.7km at-grade
- 74-month construction and 30-year maintenance
- New Maintenance and Storage Facility
- 15 Underground Stations, 10 At-Grade Stops



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Confederation Line, Ottawa

- Approximately $2B to build
- Expected Completion 2018
- From Blair Station to Tunney's Pasture in approx. 24 minutes
- 5-year DB and 30-year maintenance
- Nation's Capital – Signature Project
- 13 Stations, 10km Guideway, 2.5km Tunnel, Low floor Vehicles and Systems, Maintenance and Storage Facility, Highway 417 Widening (Construction only)

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FREQUENT CHALLENGES IN TRANSIT PROJECTS

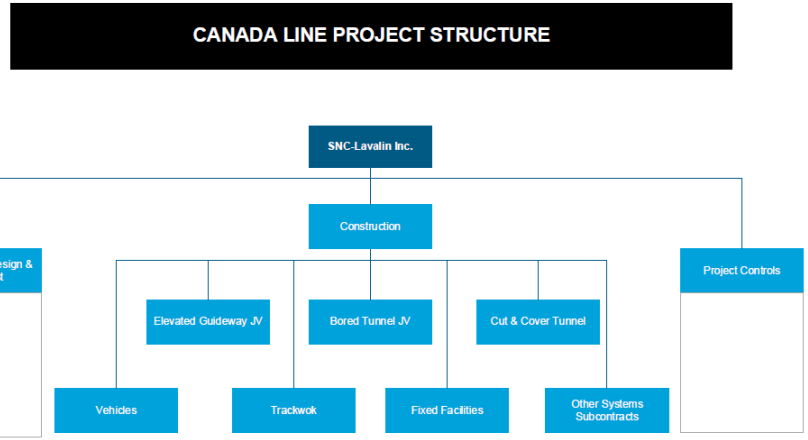
1 .PROJECT MANAGEMENT

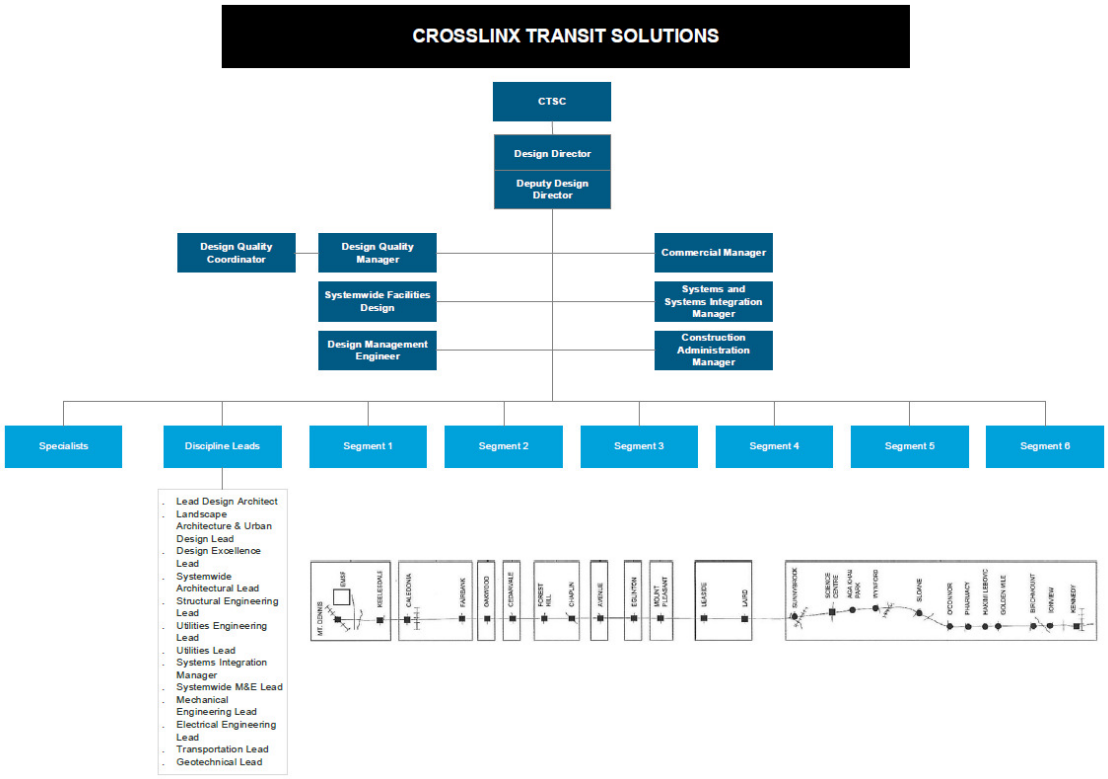
2. BUILDING IN EXISTING CORRIDOR & URBAN ENVIRONMENT

3. SYSTEMS INTEGRATION

1. Project Management

- Multiple activities & tasks
- Schedule and sequencing
- Design/Engineering management
- Procurement





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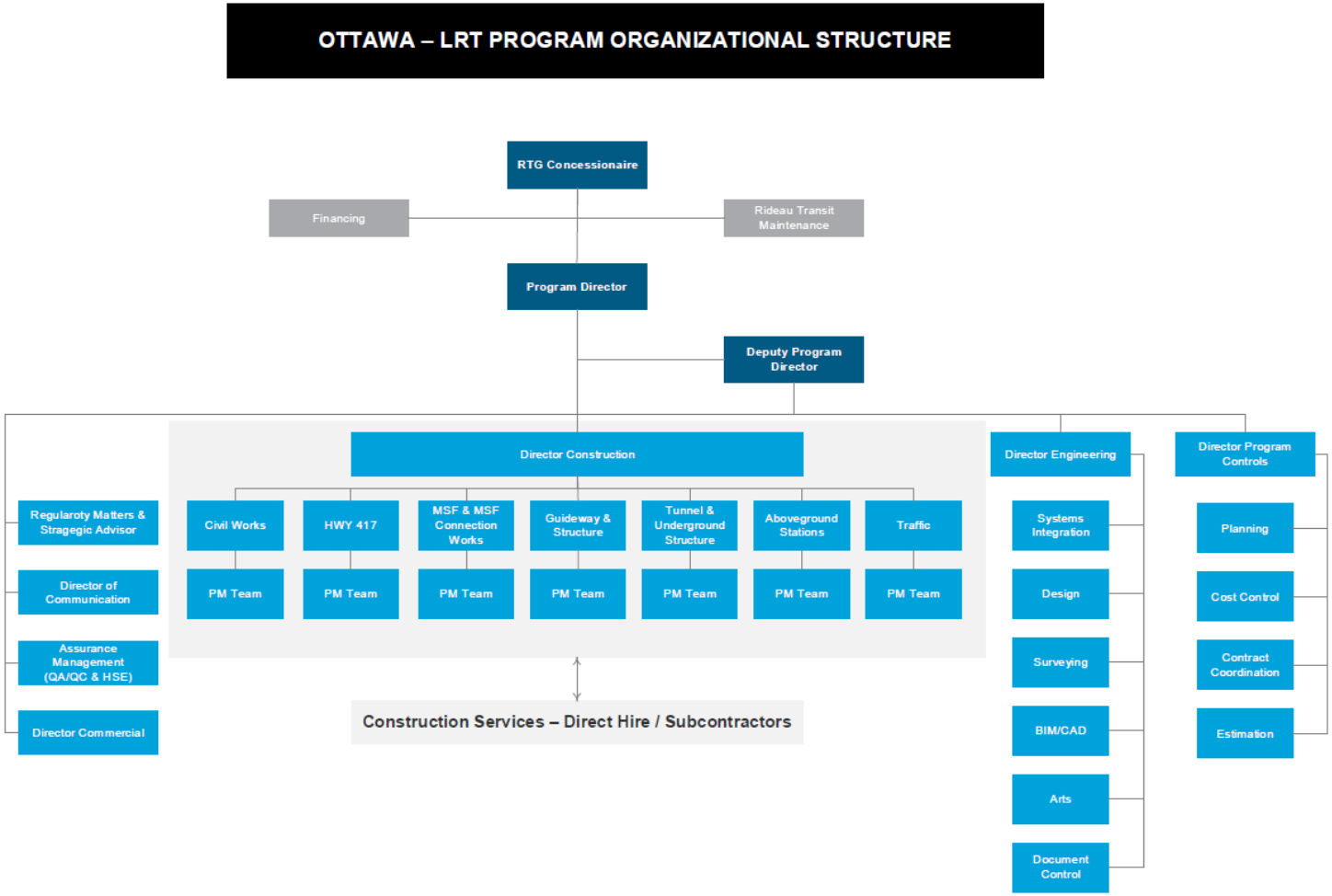
1. Project Management

- Construction planning & Execution
- System integration
- Commissioning
- Risk Management



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2. Building in an Existing Corridor & Urban Environment

- Planning & Management the project with partners in the corridor
- Partners and public communication management
- Management of underground and above ground utilities intervention: water/wastewater, electricity, gas, others
- Traffic management, re-routing and impacts mitigation
- Maintenance of existing services or offer of alternative services
- Construction of new infrastructure or modification of existing one.

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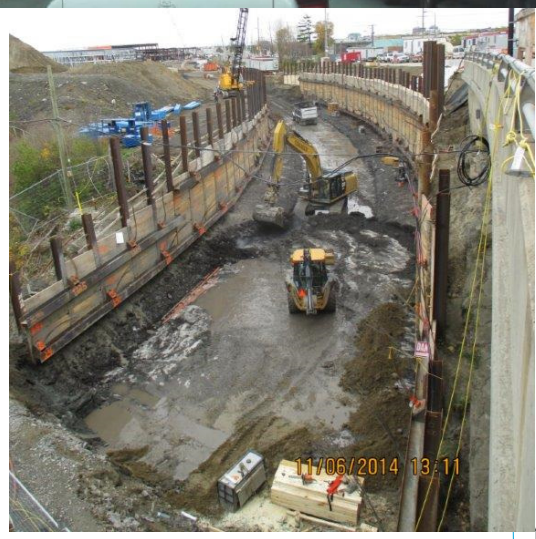
2. Building in an Existing Corridor & Urban Environment

- Use of innovative approaches and new technology to minimize impact
- Maintenance of high health safety conditions for workers, partners and the public
- Management of environmental impacts and specific corridor elements (historical building, healthcare center, critical infrastructures)
- Constant tracking of conditions and adjustment of impact mitigation measures if required.
- Commissioning and deployment of the new service
- Schedule and financial management



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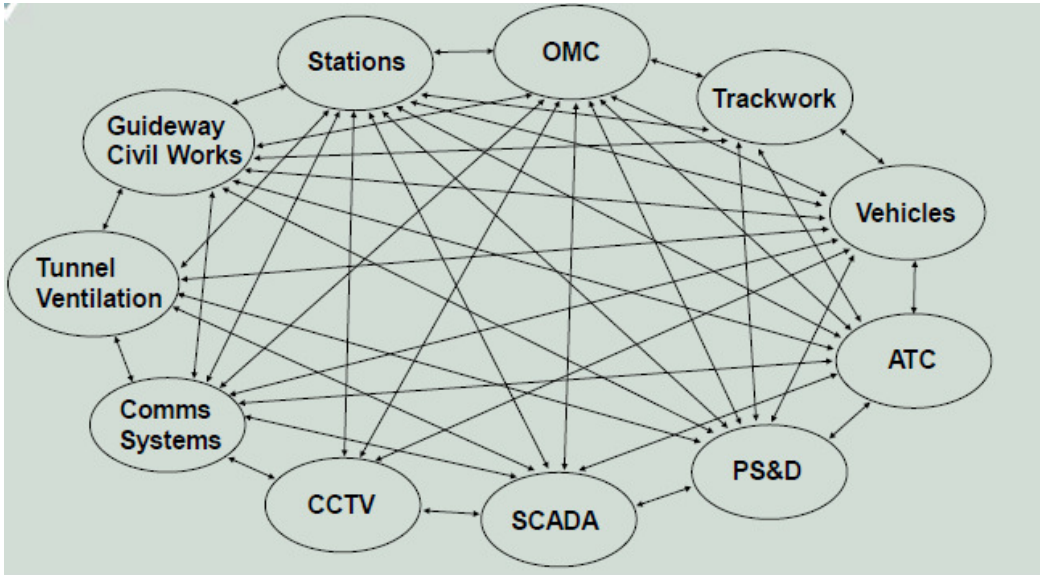
3. Systems integration into civil/stations Infrastructure

- Systems integration & commissioning team
- Management of interfaces
  - Software
  - Interference & electro-mechanical compatibilities
  - Power planning management
  - Physical integration
  - QA/QC
  - Testing
  - Maintenance
  - System evolution

Systems interaction – Conceptual Level



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3. Systems integration into civil/stations Infrastructure

- Systems plan and installation management
- Systems reception and acceptance
- Testing during construction
- Systems integration tests
- Demonstration tests
- Risk management
- Commissioning

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Conclusion / Questions