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OPEN NETWORKS USAGE FOR RAILWAY SYSTEMS

Derel Wust

Managing Director,

4Tel Pty Ltd

My Background

- I live in Queensland, Australia
- I own a company that builds, deploys and maintains systems using interoperable methods
  - Will share our experience in developing interoperable systems for specific rail use, including safety applications
  - Will briefly talk about GSM-R in Australia
  - Also about the use of public mobile telephone networks for train radio

Train Radio Systems

- Private GSM-R systems for capital cities

- Public mobile system for the Interstate Network, using Telstra NextG (3G)
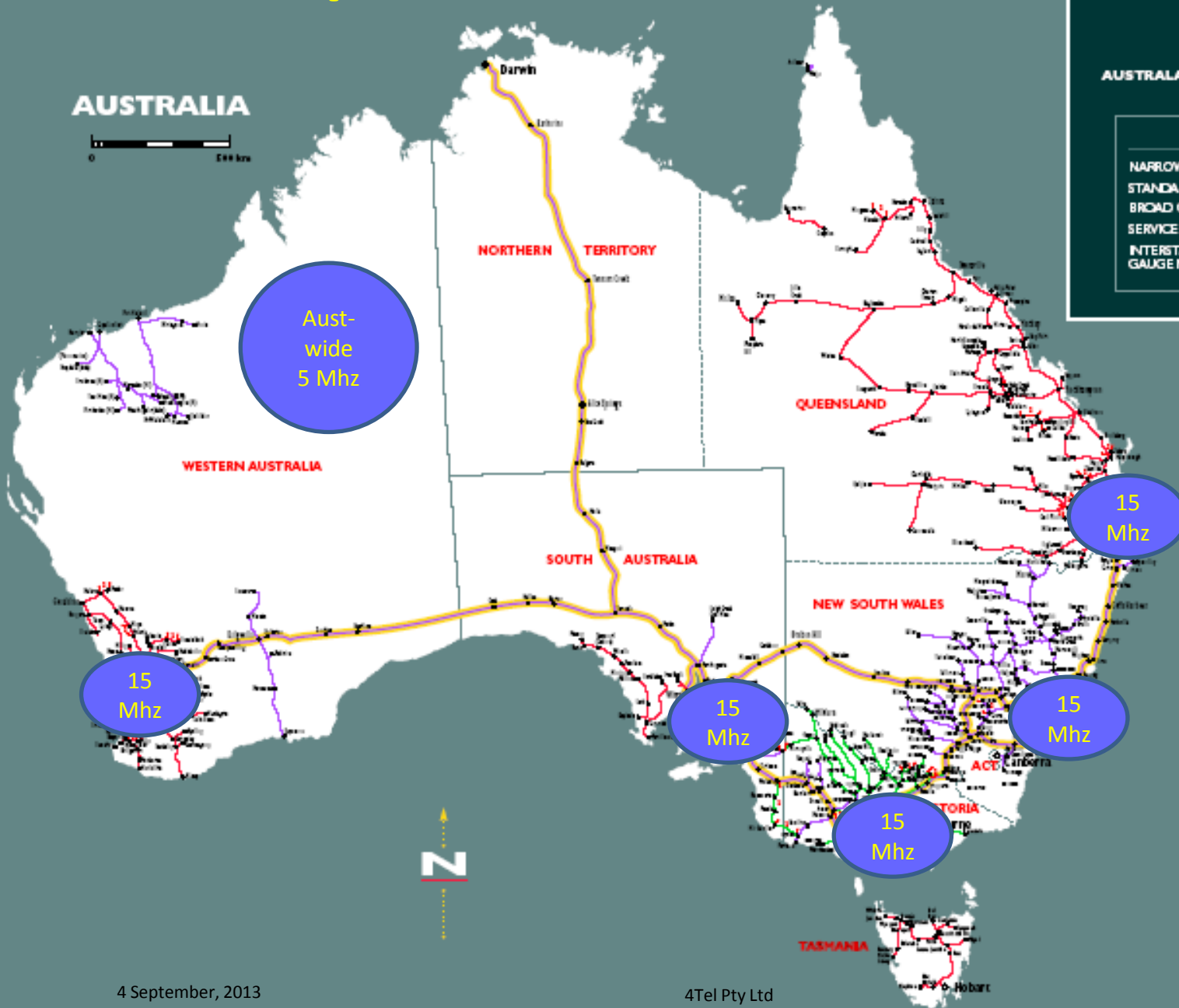
- UHF-FM narrowband radio as a common mode

GSM-R/Spectrum Status

Interstate Rail - ARTC

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ARTC

The Australian Rail Track Corporation (ARTC) created as a result of the Commonwealth and mainland State Governments Inter-Government Agreement in 1997

Tasked to establish a 'one-stop-shop' for rail operators seeking access to the interstate standard gauge rail network between Brisbane and Perth.
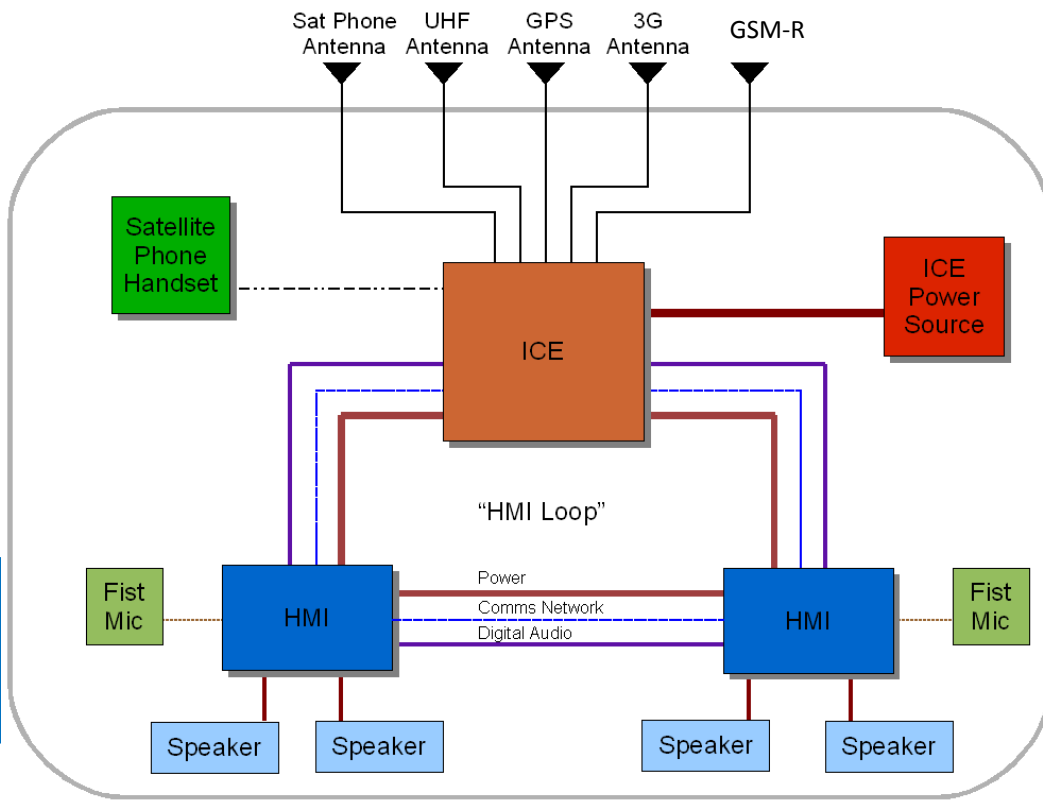
Commenced operations on 1 July 1998.

Rights to sell access   Leased network   Owned

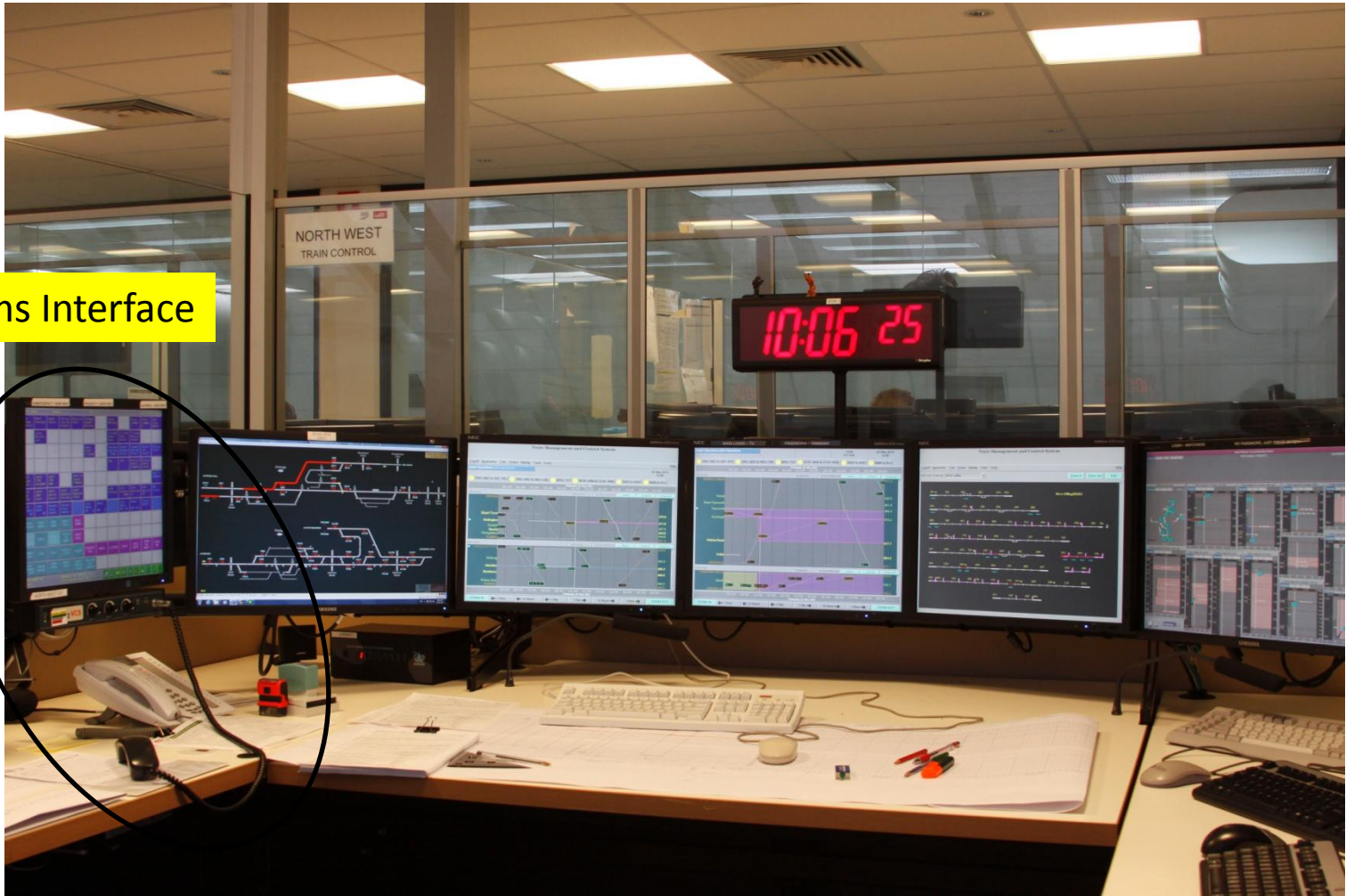# Extra TELSTRA 3G Sites

Some 90 'rail' sites installed

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In-Cabin Equipment (ICE) Train Radio

Control Centre Comms Interface

Comms Interface

Interoperability Versus Harmonisation

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- Harmonisation
  - The preferred railway systems approach
  - 'One way' lowers standardisation and deployment risks
  - BUT creates monopoly rents and stifles innovation on new ways of doing things

- Interoperability
  - Is demanding on standards & certification
  - BUT allows trade-offs & innovation

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OUR EXPERIENCE IN OPEN SYSTEMS ON THE NSW COUNTRY REGIONAL NETWORK (CRN)

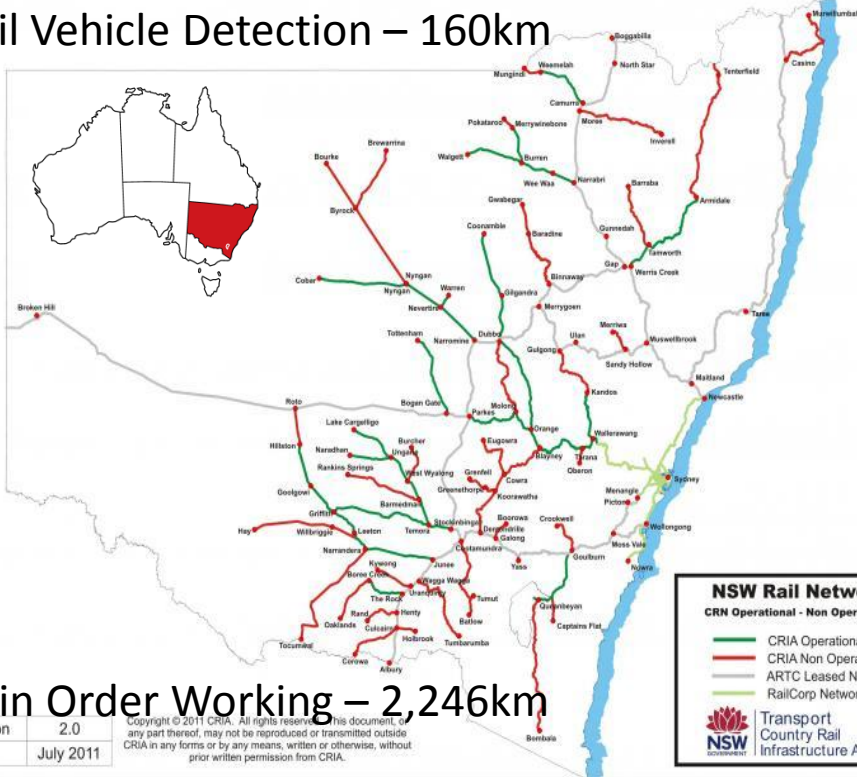A new train control centre in Australia commissioned January 2012

Country Regional Network (CRN)

The NSW Government has contracted JHR to operate and maintain the CRN for 10 years – all fully outsourced

Rail Vehicle Detection – 160km

Train Order Working – 2,246km

NSW Rail Network
CRN Operational - Non Operational
- CRIA Operational
- CRIA Non Operational
- ARTC Leased Network
- RailCorp Network

Transport Country Rail Infrastructure Authority

4TEL has the technology Design, Construct and Maintenance (DCM) role for the Network Control Centre

Monitoring Infrastructure

Can monitor any infrastructure or mobile device for operating data

Tracking Trains, Vehicles and Staff

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Web Browser View

IPhone View

Use "Best of the Internet"

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- The Internet and mobile telephone networks are the biggest open networks on Earth and they are not Harmonised
  - Exploit the $Billions invested into public networks to select technologies of use to rail operations
  - Use defined interface methods – "Interoperability"
  - Allow integration of multiple sources of data
  - But needs different skill-sets to normal rail skills
- Operate on the secure side of firewalls to manage security

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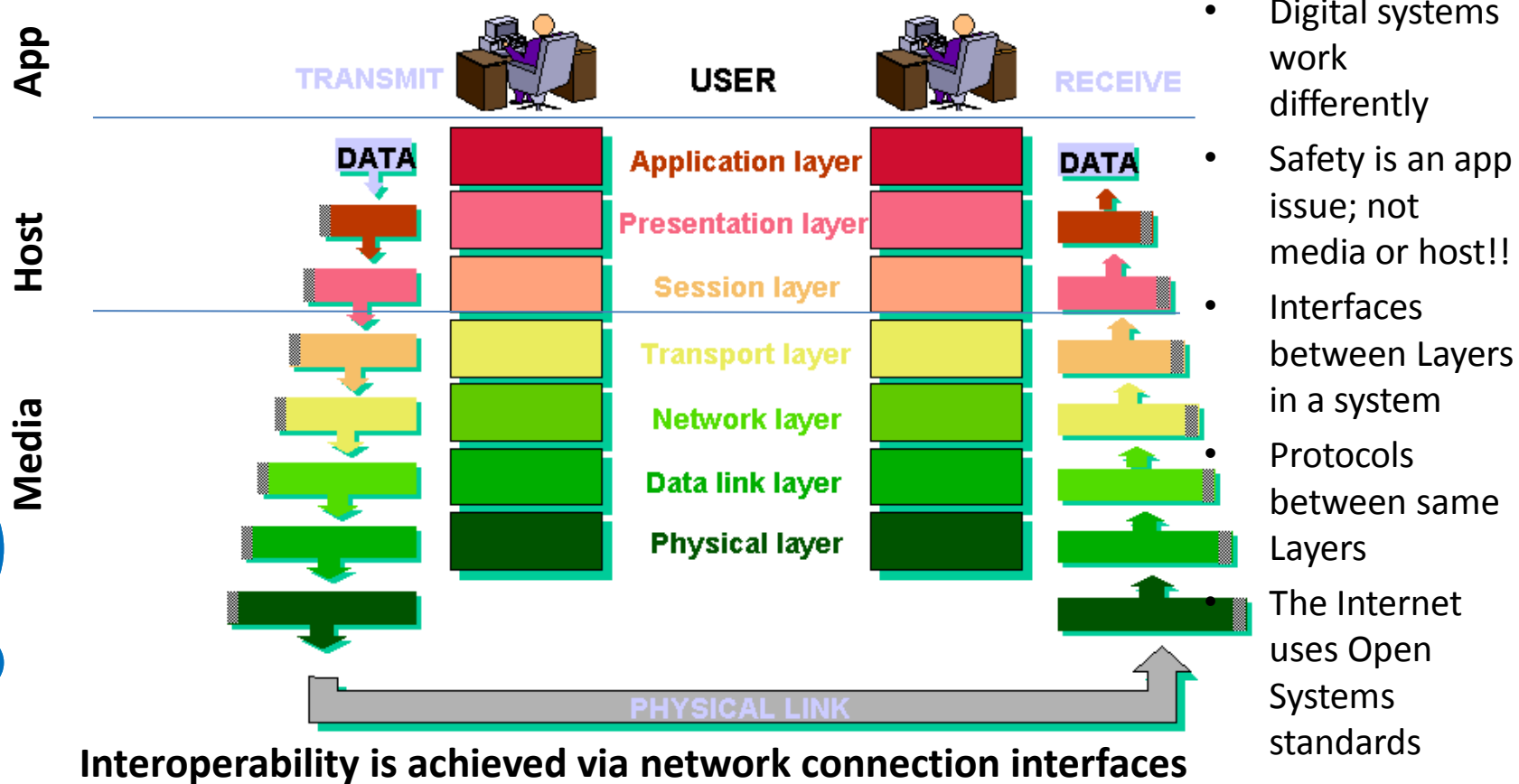# Interoperability in Open Systems

- Three core elements are needed to achieve interoperability between systems:
  - Defined network connection methodology
  - Defined methodology for describing data consistently
  - Defined methodology for achieving security and operational integrity

Defined Network Connection Methodology

Defining the Interfaces

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THE 7 LAYERS OF OSI

App

TRANSMIT   **USER**   **RECEIVE**

Host

Media

DATA

- Application layer
- Presentation layer
- Session layer
- Transport layer
- Network layer
- Data link layer
- Physical layer

DATA

PHYSICAL LINK

Interoperability is achieved via network connection interfaces

- Digital systems work differently
- Safety is an app issue; not media or host!!
- Interfaces between Layers in a system
- Protocols between same Layers
- The Internet uses Open Systems standards

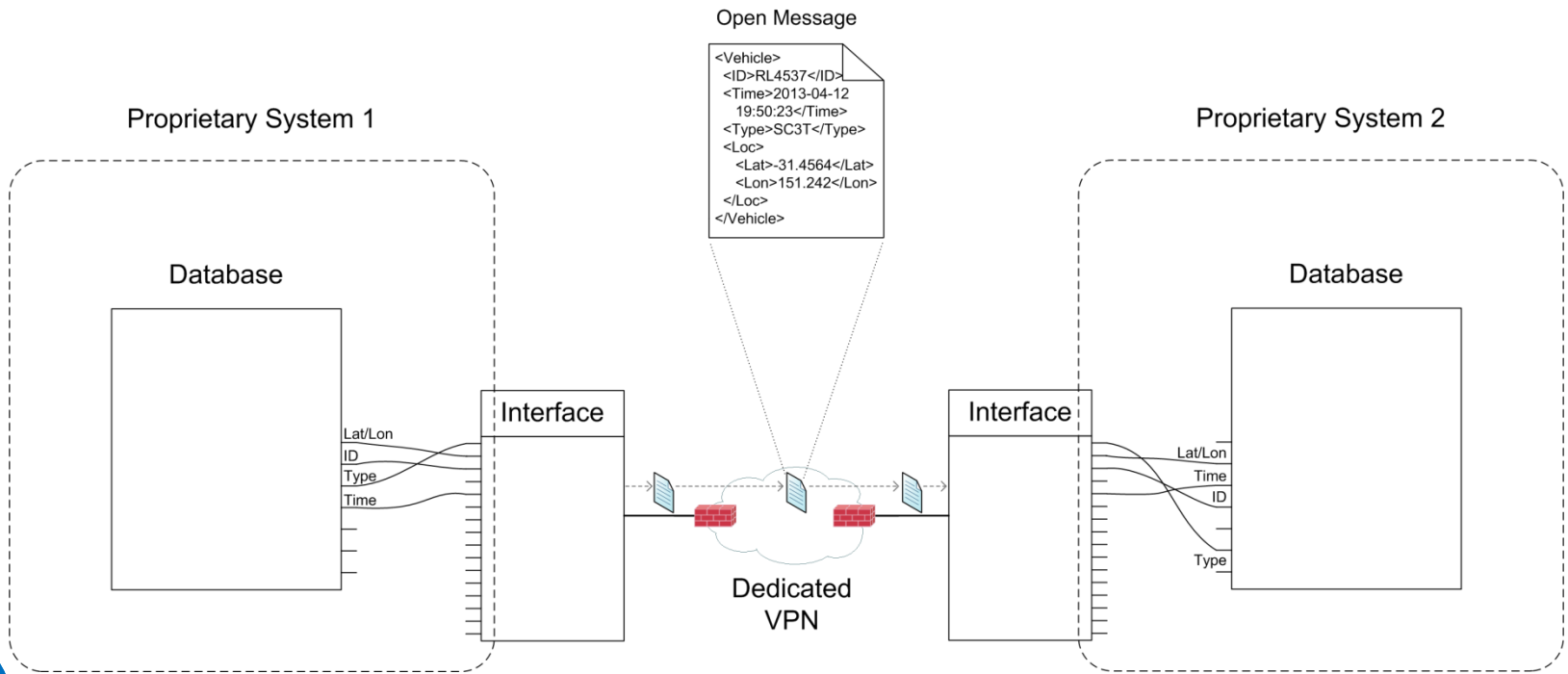# IP Network for the CRN
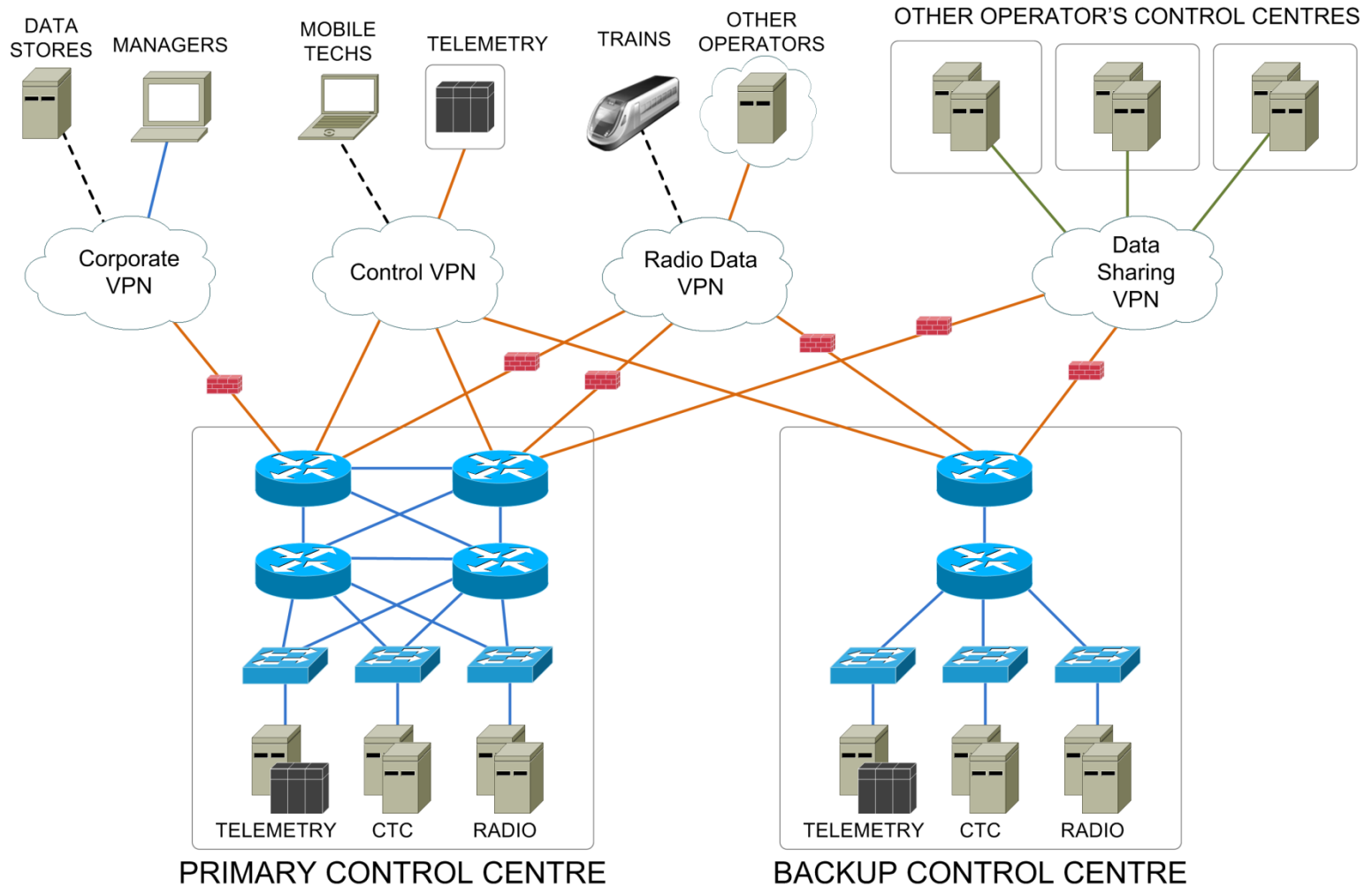
Defined Methodology for Describing Data Consistently

Define the Data

- All rail operations require similar data
  - Core data can be defined
  - A process to allow user specific data can also be defined
- Use an interface process to separate applications, from data, from networks
- Well proven Internet methods exist

Standardise Interfaces, not Systems

Open Message

```
<Vehicle>
 <ID>RL4537</ID>
 <Time>2013-04-12
  19:50:23</Time>
 <Type>SC3T</Type>
 <Loc>
  <Lat>-31.4564</Lat>
  <Lon>151.242</Lon>
 </Loc>
</Vehicle>
```

Proprietary System 1

Database

Lat/Lon
ID
Type
Time

Interface

Dedicated
VPN

Proprietary System 2

Database

Lat/Lon
Time
ID

Type

Interface

Proprietary Systems allow innovation
to improve services & value-for-money

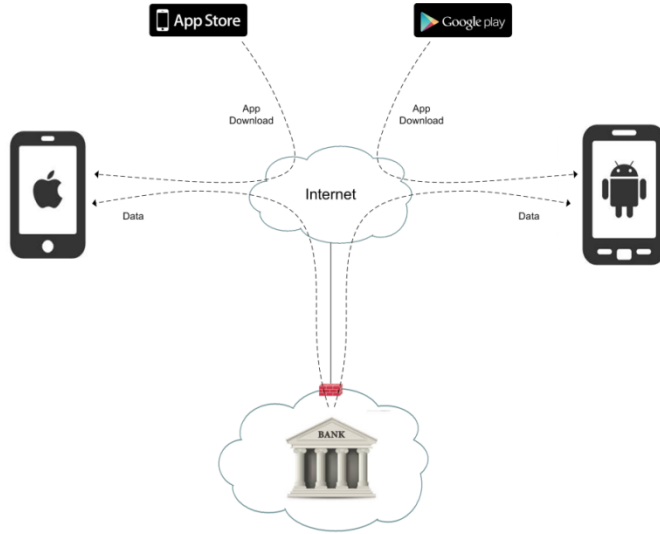Harmonised Systems can stifle innovation
& create monopoly rents
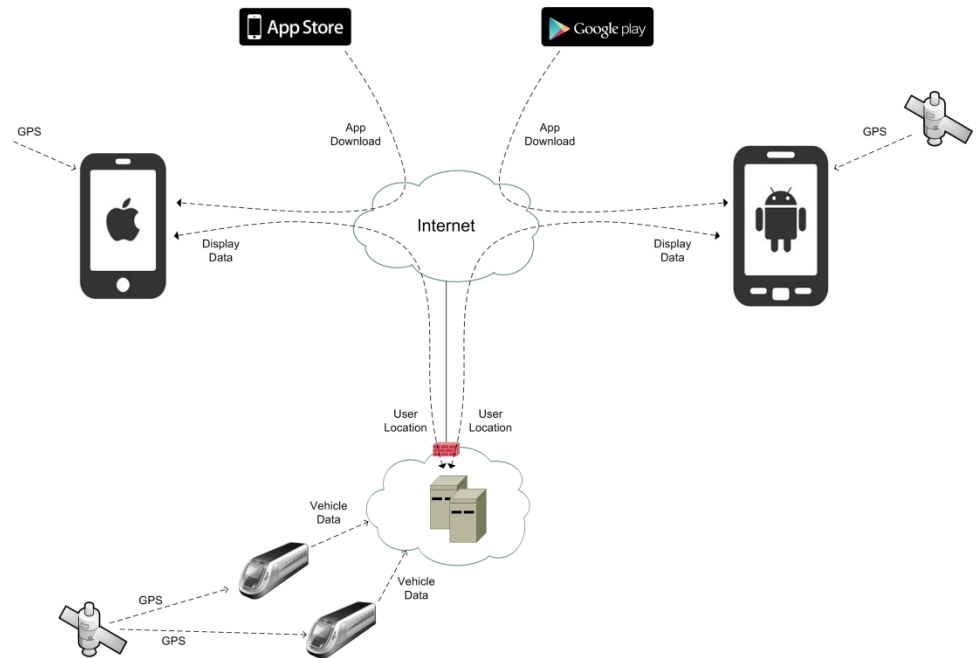
Interoperable Data on the CRN
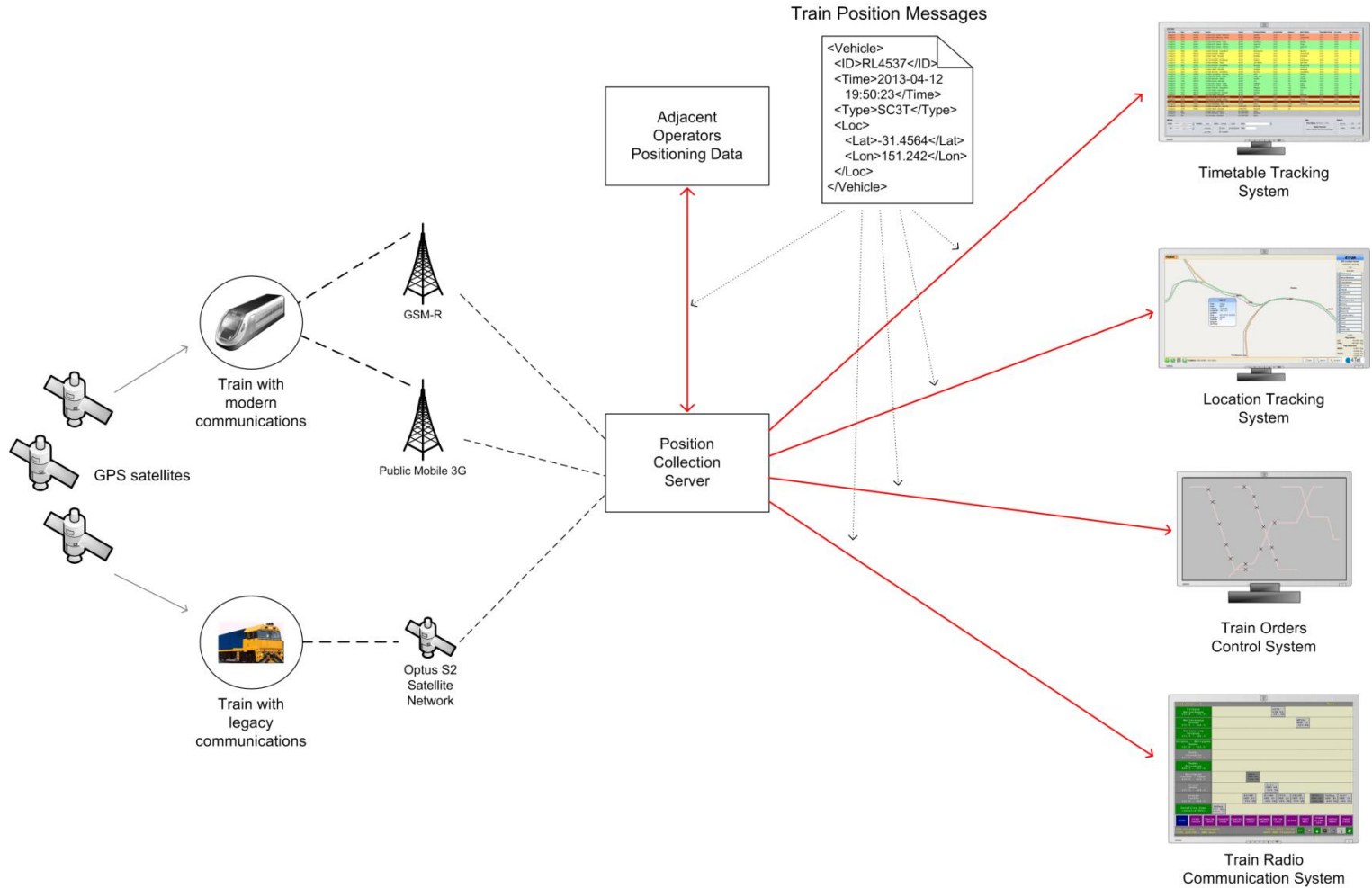
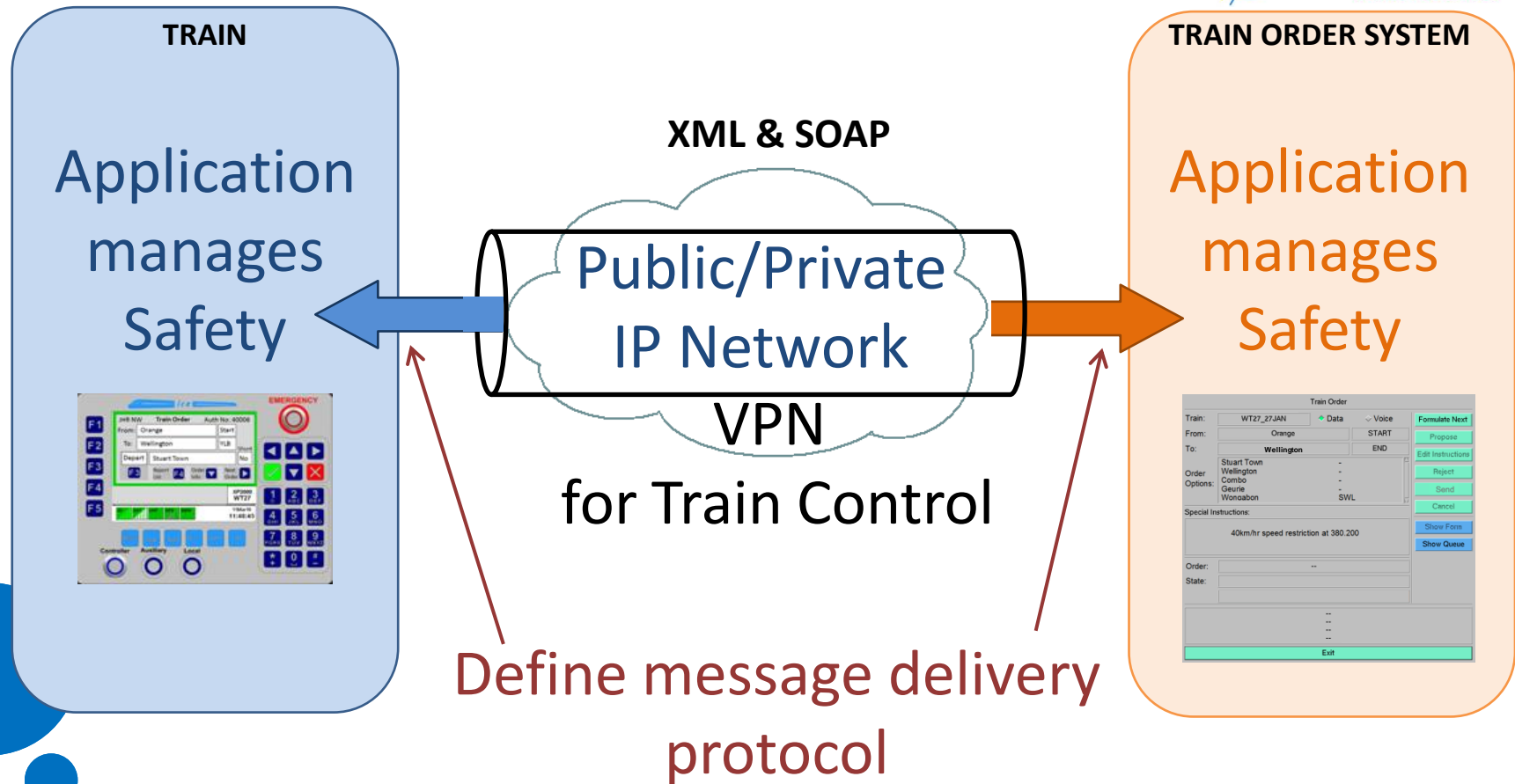# Defined Methodology for Achieving Application Security

Use Banking Methodology

Applied to RAIL

BANK Example

Safety is managed in the Application

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TRAIN

Application manages Safety

TRAIN ORDER SYSTEM

Application manages Safety

XML & SOAP

Public/Private IP Network
VPN
for Train Control

Define message delivery protocol

XML - http://en.wikipedia.org/wiki/XML   SOAP - http://en.wikipedia.org/wiki/SOAP

SUMMARY

- Three core elements are needed to achieve interoperability between systems:
  - Methodology for network connections
  - Methodology for describing data
  - Methodology for achieving security and operational integrity
- Interoperability is <u>NOT</u> Harmonisation
- The rail industry needs to invest in interoperability skills development

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