PARK SIGNALLING
a Unipart Rail Company

Virtual Lineside Signalling Type: VLS

Summary Business Case

What

Virtual Lineside Signalling (VLS) provides lower-cost centralised signalling with affordable operational enhancements primarily suited to, but not exclusively for, secondary and rural lines. This is achieved by an innovative combination of existing techniques such as asset tracking, sensor fusion and image encryption, enabling it to make use of COTS (commercial off-the-shelf) equipment within a safety-related system. Train detection and ATP are replaced by RFID (radio frequency identification) tags and readers. Image encryption to replace line-side signals with cab signals based on in-cab displays and COTS mobile devices.

Why

VLS offers the functionality of conventional signalling systems at a fraction of the cost associated with the supply and installation of conventional key components such as signals, cabling and power supplies. The large reduction in trackside infrastructure also decreases ongoing maintenance costs as fewer items of trackside equipment, cables and power supplies cut down the rate of inspections, repairs and cable thefts.

The benefits of VLS should be considered where there is a need to upgrade signalling that requires upgrading to enhance performance and/or capacity, or when the existing signalling is unreliable causing operational difficulties and costly repairs. VLS provides a reduced cost option, or will allow more track to be upgraded for the budget, or will enable upgrading where the cost of adopting conventional techniques would be prohibitive, preventing upgrade.

Cost savings

There are ca 2,200km of secondary and rural track in the UK network much of which would not normally attract enhancement investment. VLS would save somewhere in the region of £120,000 per kilometre in investment costs and £1,200 per kilometre annually on maintenance costs.

Based on a cost breakdown for signalling in 2004, produced by Franklin & Andrews (The Little Black Book 2004), a reasonable estimate of the savings possible under VLS is shown below:

Refurbishing 1/5th of (UK) of secondary & rural lines; first 5 year savings are:

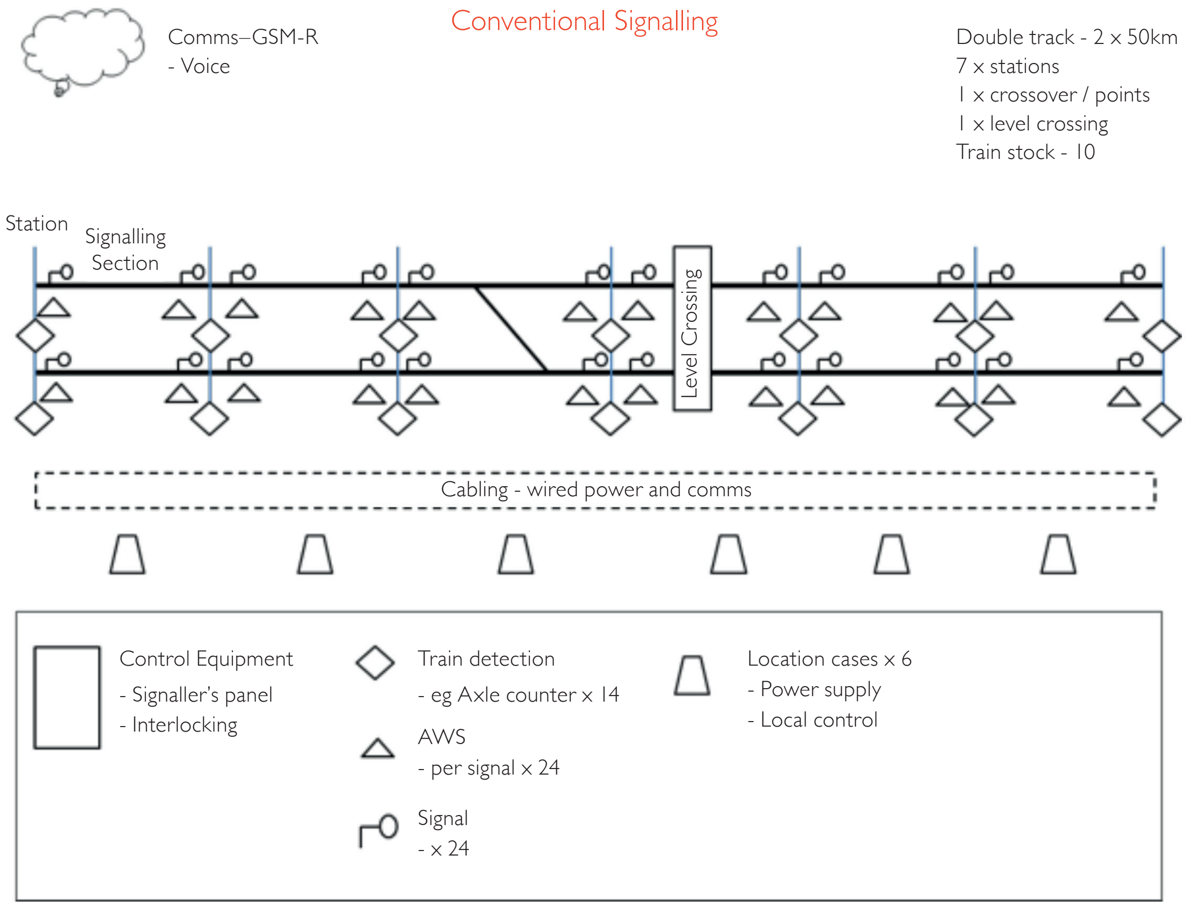
Direct investment savings	£53.3m
Maintenance savings	£2.6m
Reduced losses from theft	£1.4m
Total	**£57.3m**

Based on use of VLS on a typical line (50km) over a 5 year period the equivalent savings would be:

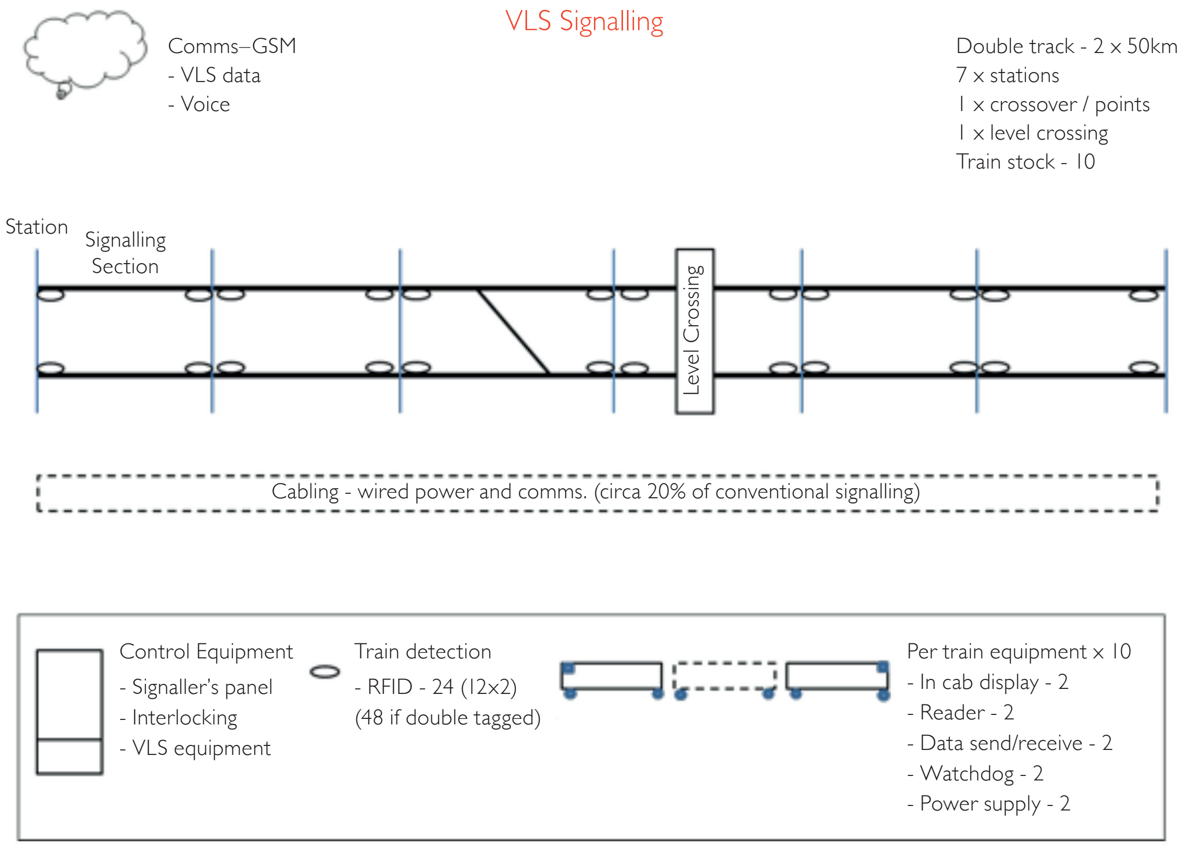
Direct investment savings	£3.5m
Maintenance savings	£150k
Reduced losses from theft	£135k
Total	**£3.8m**

£K per km	Cost		Savings
	Non VLS	VLS	
Contractors' Preliminaries	41,500	41,500	
Contractor's Design	25,000	25,000	
Enabling works	3,000	3,000	
TPWS	40,000		40,000
Equipment/Signals	115,000	86,000	29,000
Control Centres	12,000	12,000	
Cable Routes	6,000	2,000	4,000
Cabling	90,000	68,000	22,000
Power supplies	75,000	55,000	20,000
Level crossings	217,000	217,000	
Contractor's testing and commissioning	17,500	12,500	5,000
Stripping out and removals	105,000	105,000	
Recoveries/conversions	12,000	12,000	
Total	759,000	639,000	**120,000**

Conventional Signalling



VLS Signalling



VLS's independence from conventional powered, wired trackside infrastructure yields further benefits in terms of application flexibility and resilience. By enabling signalling block sections to be set up or modified more easily than is possible with existing systems, VLS can be applied in different ways. For example, better support for block restructuring can reduce the cost of increasing the traffic capacity of a line, either before or after the time it is refurbished. A more extreme version of this is the ability to rapidly support interim or degraded mode operation.

Avoiding obsolescence

COTS technology and equipment has benefits including a greatly reduced end-user cost due to economies of scale in development and production. A design objective of VLS from its inception has been to make system design choices that allow maximal use of COTS equipment but with minimal dependence upon it, both now and in the future. Two examples of this are train location and cab display.

Innovation award

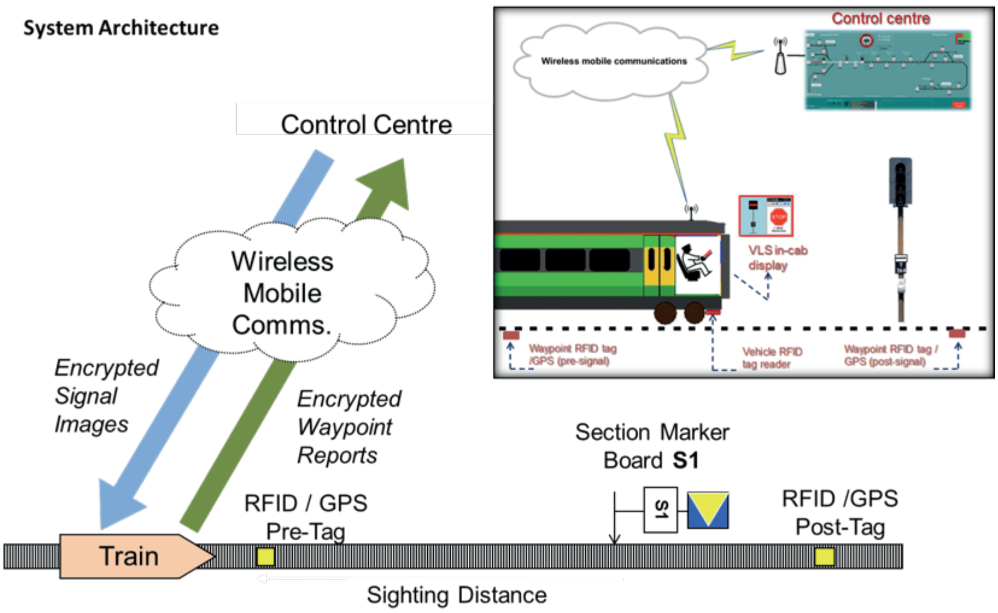
In March 2012 a joint, collaborative bid by PSL (Park Signalling Ltd) and Frazer-Nash won the inaugural RIA/RSSB innovation competition. The resulting funding award from RSSB enabled FN to produce an independent safety analysis of VLS and allowed PSL to develop a novel central interlocking interface.

The safety analysis work was split into three stages: proof of safety; train cab unit safety and interlocking interface design safety, each of which concluded that VLS could form a demonstrably safe signalling system.

Site trials

Following early trials of a prototype VLS system on a heritage railway line in the UK, VLS has since been demonstrated on Network Rail infrastructure. The RFID train location and wireless mobile communications systems, both of which are based on COTS equipment, have been successfully demonstrated at Network Rail's RIDC Test Track and subsequently onboard in-service trains on the Yorkshire Wolds coastline.

System Architecture



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