

IBBT Tr@ins project TRAIN IP Network Services

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IBBT: Demand driven ICT research



Tr@ins project

- Apr 2006 Mar 2008
- Tr@ins = TRAin IP Network Services
- Focus on

RRT

- Technical
 - Broadband Internet
 - Onboard mobility support
 - Uninterrupted Internet
 - Quality of Service
- Economical
 - User studies
 - Business model







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Technical

Business model

Conclusions













Onboard network

Horizontal handover

- From Access Point to Access Point
- Switch in < 50 ms for VoIP</p>







Trackside network: WLAN Fast Handover

















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Flowchart business case







Forecasting







Technology assignment







Technology mapping

None - UMTS – HSDPA – WiMAX Vlissingen Borsele Einanover _____ €∋ 0 0 0 Map Satellite Hybrid 2008 Woensdreck Veldhover 0 Krefeld Heist A12 Turnhout Sluis 0 \mathbf{V} Terneuzen Hulst Nettetal O A21 Meer Weert Leudal Viersen / Antwe + pen 0 0 Oostend Brugge E34 A11 E34 Be Mönchengladbach o Neuss 2009 A13 Koksijdeo A18 Erkelenz Gen Dunkerque 0 Geleen echelen o AZ Heerlen Grande-Synthe AZ Beraheim O A14 Izeaem Roeselare 44 2010 Maastricht= Kerne Wareger Kerkrade A17 Brusse Sint-T 0 Anderlec uxelles Düren O Aacheno Hazebrouck Stolberg Gera shergen He 0 Roubaix Bailleul (Rheinland) A3 Armentières Euskiro 2011 LilleooVille A4 Béthune O Kal 0 0 E42 A15 Auchelo A54 Aywaille A7 QCarvin A23 1.0 0 utenne Bruay-la-Buissière ens La L Hénin-Beaumont Malmedy A27 00 ons Binche 2012 Liévin o A21 Valencienn Charleroi Durbuy A26 20 Deutsch 0 Doual Somain O SE OMette Belgischer 6 Maubeuge Denain no-0 Naturpark Arras Sankt à Walcourte **o**Florenn Hautmont Cambrai 0 Philippevillep 26 0 A4 /e-Avmenies Caudry **O**Fourmie 0 Amiens Corbie A26 Bitburg 0 ne 0 Saint-Quentin -sur-Meuse E46 oBer 0 ONO UMTS + Charleville-Mézièreso Har OSedar E17 Tergn WiMAX Montdidier POWERED 110.0 Luxembourg Google Beauto Noyon 0 /into Map data @2008 Tele Atlas -





Cost parameters

			Wireless data networks	Mobile networks	Satellite networks
CapEx	Train equipment	Outdoor antennaIndoor network	+	+	+++
	Network equipment	Trackside networkNOC	+++	+	+
OpEx	General costs	 Helpdesk Sales (billing) Marketing 	++	++	++
	Operations	 Maintenance and repair Network management License costs 	+++	+	++
	Network connection	Outdoor link	+	+++	++





Revenue schemes

Ticket types

- Prepaid cards per hour (e.g. hotspot service)
- Monthly subscriptions
- Ticket price
 - Dependent on offered service: €2.9 €3.9 (5 55 kbps)
 - Service of 30 kbps: Prepaid: €3.4 / Subscription: €18

Two revenue scenarios

- Both first and second class paying
- First class free Internet, second class paying
 - → Modal switch from 1st to 2nd class!!!











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BCN intec broadband communication networks



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Sensitivity results

BBT





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When more bandwidth is guaranteed to the customer:

UMTS cases

- Only UMTS: Problems \rightarrow No QoS
- Combination with WiMAX: QoS can be guaranteed
- Pre-installation WiMAX: more optimized network rollout
- WiMAX case:
 - Only interesting for large bandwidth
- Satellite cases:
 - UMTS as gap filler: bandwidth problems
 - IWay Satellite: uplink bandwidth problems (UMTS)
 - 2Way Satellite: less dependent of bandwidth





Summary 2

Combination of technologies required

- Dense railway network: UMTS + WiMAX
- Rural railway network: Satellite solutions

Business case

- Positive case in Belgium is possible
- Influenced by many factors
 - User forecasting, rollout scheme, offered bandwidth
- Business models
 - Role and participation of the partners important





Thank you!





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