BHLS – Bus with High Level of Service

BRENDAN FINN

ETTS LTD, IRELAND

Spectrum of Bus-Based Transit

High performance, high capacity BRT

- Major infastructure, rapid service, intensive services
- Up to 1 million passengers/day
- Bogota, Guangzhou, Istanbul, ...

High-performance, moderate capacity BRT

- Major infastructure, rapid service, strong service
- Range 100-250,000 passengers/day
- Brisbane, Ottowa, Beijing, Mexico City, ...

Bus with High Level of Service (BHLS)

- Moderate/little infrastructure, focus on reliability and quality
- Range 25,000-65,000 passengers/day
- Amsterdam, Gothenburg, Paris, ...

Presentation overview

- Part 1: What is BHLS?
 - Why Europe has "BHLS" rather than "BRT"
 - Extent and technical characteristics
 - Images of BHLS systems Nantes, Amsterdam, Cambridge
- Part 2: ITS Practice in European BHLS
 - Main ITS systems used in European BHLS
 - Images: AVM, Traveler Information, TSP, Fare Collection, ...
- Part 3: How is ITS used for BHLS Quality Improvement?
 - Quality standards and targets
 - Operations management techniques
 - Mode of use and evidence of BHLS-led innovation

Information source: COST TU603

- EU-supported action (2007-2011)
 - Networking, information exchange (no money for work!)
 - Focus on BHLS state-of-the-practice
 - Participants from 14 European Countries, 25 systems visited
- Four working groups
 - Infrastructure
 - Vehicles
 - Operations (including ITS)
 - Social, Economic Conditions and Networking
- Final report (plus CD-ROM) in late-2011
- Info at <u>www.bhls.eu</u> (soon also on UITP website)

Part 1: What is BHLS?

What is BHLS?

• BHLS?

- Derives from French term 'BHNS', maybe later another name
- Generic term for a wide range of quality bus systems

• Is it BRT?

- Not exactly, a different product in the spectrum of bus priority
- Focus more on reliability/quality than on speed/capacity

Holistic approach

- Improved operating environment reliability, better speed
- Higher quality vehicles with better comfort and image
- Improved passenger facilities stops, terminals, ...
- Branding, marketing, 'repositioning the product'

BHLS role in Europe

• European Context is different:

- Mass transit is often already well provided by metro and tram
- Bus is rarely assigned the 'mass transit' role
- Constraints of space, roadwidth and alignment in city centres

European cities have a different focus:

- Restore reliability and operational effectiveness to bus
- Enhance image of bus, reposition the product
- High focus on quality of vehicles and stopping places
- In France, focus on "urbanism" improve host environment

Strategic motivations for BHLS

- Mostly to upgrade quality and ridership of existing bus lines
- Sometimes alternative to tram/LRT, especially if finances tight

BHLS in Europe

Country	Cities with BHLS
England	Cambridge, Crawley, Dartford, Leeds
France	Lille, Lorient, Lyon, Nantes, Paris, Rennes, Rouen, Toulouse
Germany	Essen, Hamburg, Oberhausen
Ireland	Dublin
Italy	Brescia*, Pisa, Prato
Netherlands	Alkmaar, Almere, Amsterdam, Eindhoven, Twente, Utrecht
Spain	Barcelona*, Castellón, Madrid
Sweden	Gothenburg, Jönköping, Lund, Stockholm

Technical Performance of BHLS

- Peak and daily ridership are comparable to many tram systems, rarely operating at full <u>system</u> capacity
 - \circ 1,000 2,500+ pphpd
 - 23,700 65,000 px/day
- Commercial speed and frequency are good
 - 16 35 kph (10-22 mph)
 - o 12-40 vehicles/hour
 - equal to or exceed that of European street tramways
- Seating ratio at peak is medium to high
 - 34-84%
- Investment cost of facility is low and quite affordable
 - \$3-16.5 million/km

BRT Running Way - Nantes



Nantes —city centre stops



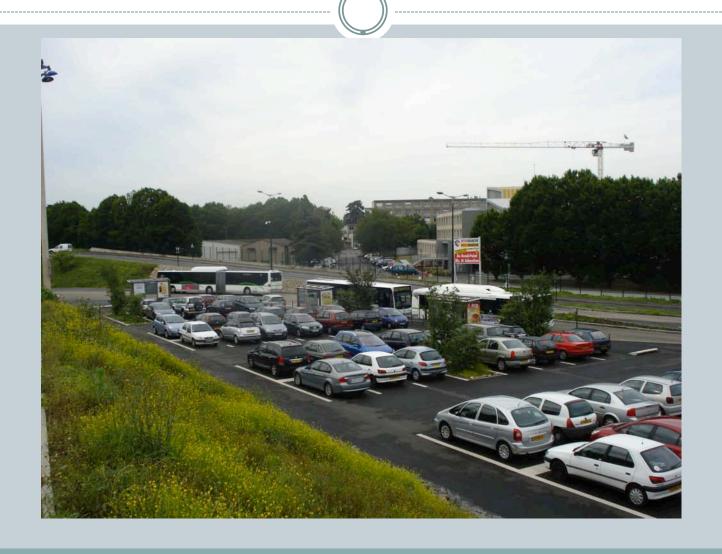
Nantes - vehicles



Nantes – Precision docking



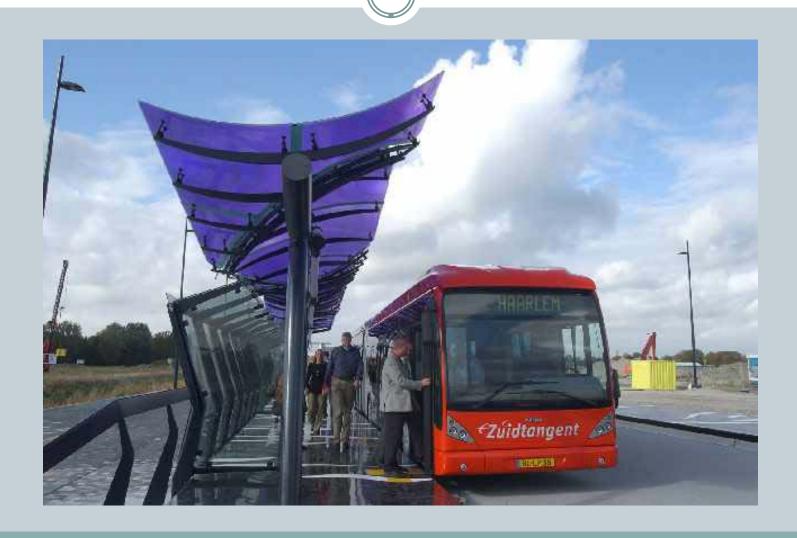
Nantes-park'n'ride



Running way - Amsterdam



Station - Amsterdam

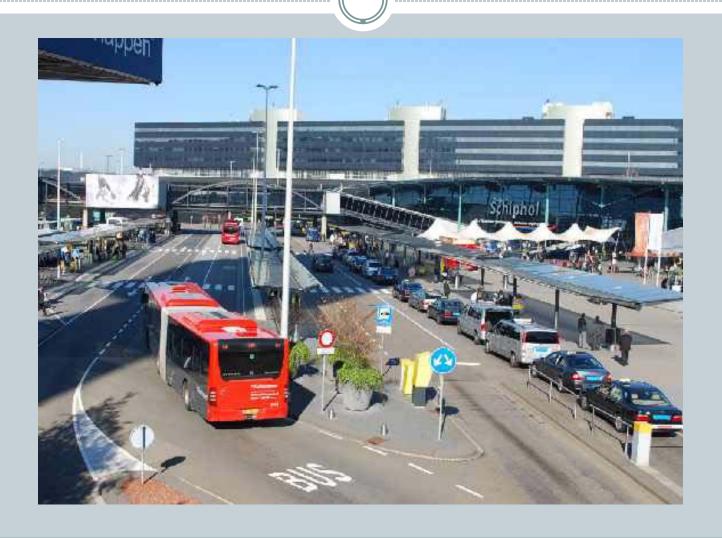


BRT running way - Amsterdam



Source: David van der Spek, Stadsregio Amsterdam

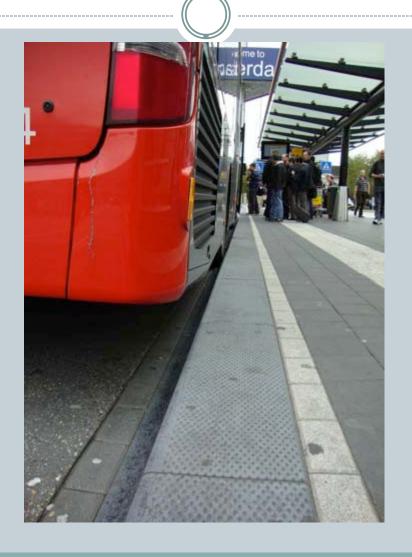
Zuidtangent at Schiphol Airport



BRT Vehicle – Amsterdam



Precision docking – Amsterdam



BHLS - Bicycle facilities



- Bike'n'Ride
- Extensive bike parking
- Amsterdam, Almere
- Bike on bus is rare



Cambridge: Busway



Source : Cambridgeshire County Council

Cambridge: Busway track



Cambridge : Vehicle



Source: Cambridgeshire County Council

Cambridge: Guide wheel for Busway



Source : Cambridgeshire County Council

Cambridge: Park'n'Ride



Source : Cambridgeshire County Council

Part 2: ITS practice in European BHLS

ITS practice in European BHLS

ITS is used extensively in European BHLS

- o ITS is 'standard' for urban bus operations in Europe anyway
- Many cities/operators have long experience of ITS
- Tend towards integrated approach, attention to architecture

Used for a wide variety of functions

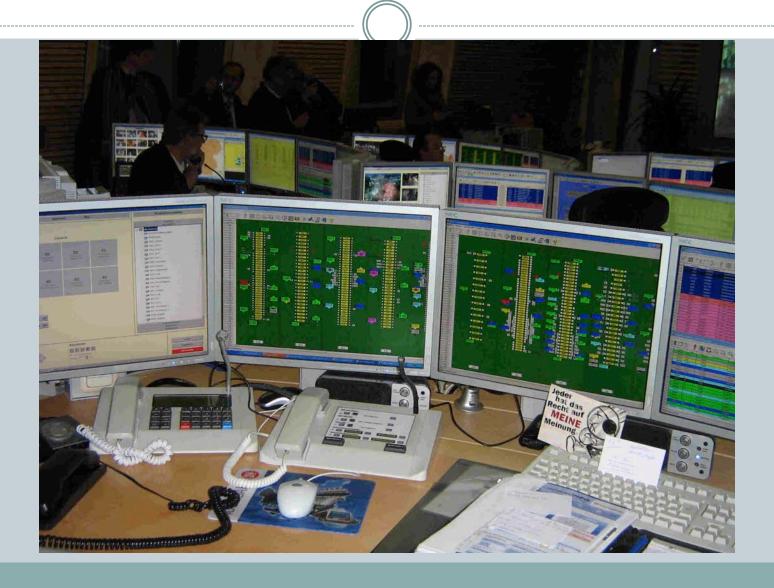
- o AVM, dispatching, operations management, incidents, ...
- Traffic signal priority, traffic management, ...
- Traveller information, web, mobile, at-stop, in-vehicle, ...
- Fare collection, 'conventional', EMV, mobile, NFC, ...
- Security, CCTV, incident response, enforcement ...
- Resource planning, optimisation, management,
- Service/quality monitoring, contract mgt., payments, ...

AVM, Operations Management, Control Centres

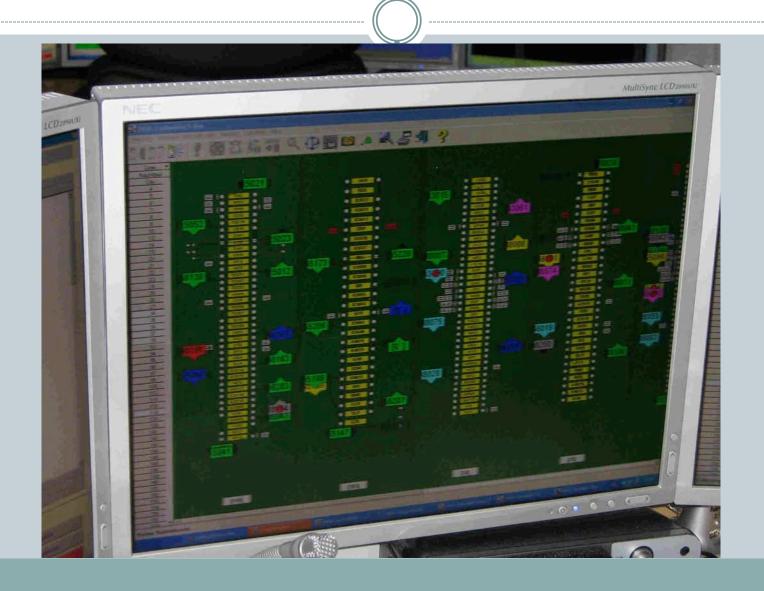
Hamburg – AVM Control Centre



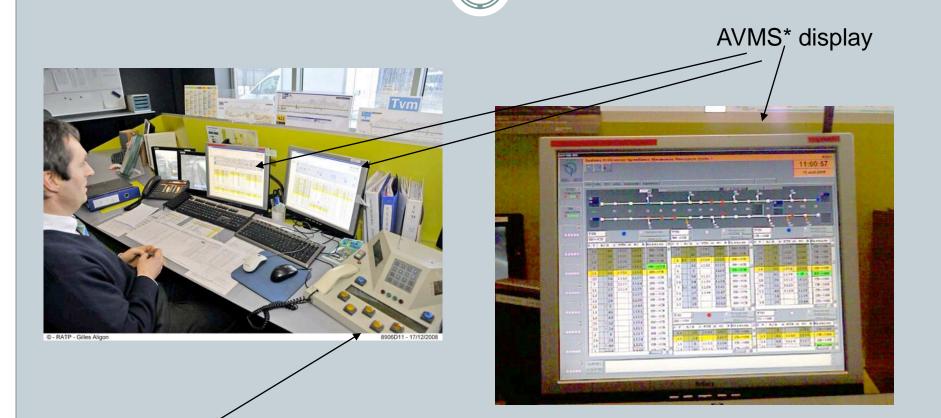
Hamburg – AVM work station



Hamburg – AVM – route screen



Paris TVM – AVMS and Ops. Mgt.

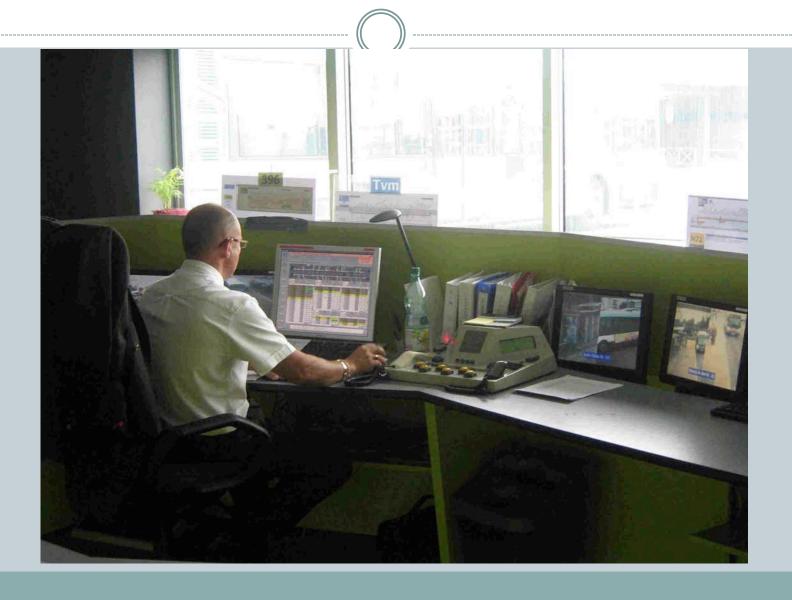


radiophone

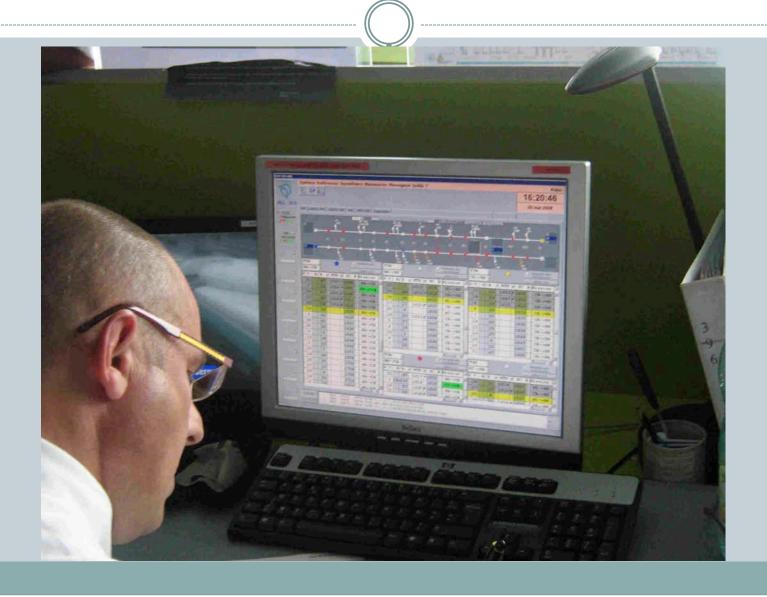
*Advanced Vehicle Management System

Source: RATP

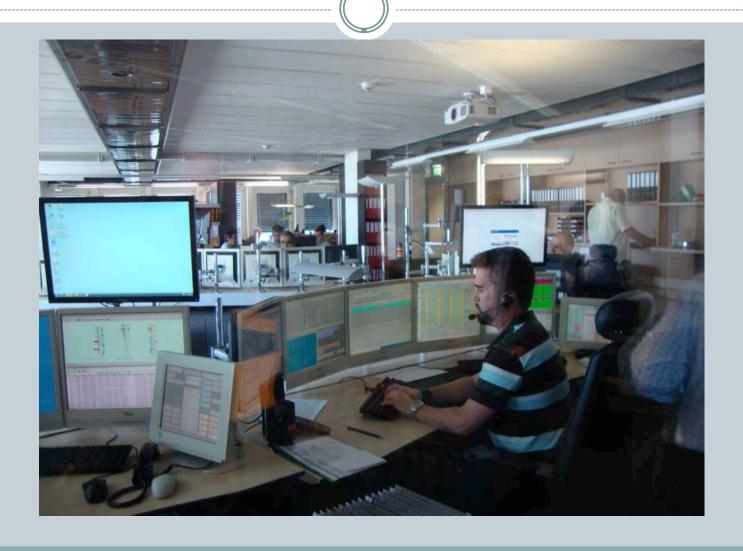
Paris TVM – AVM control centre



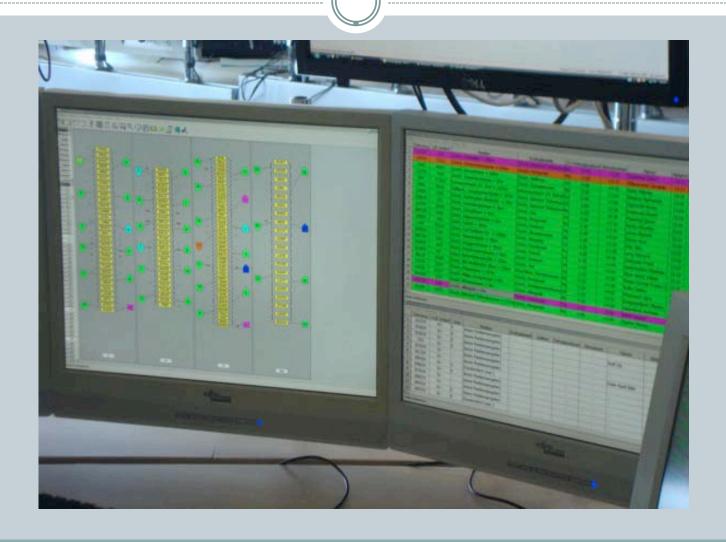
Paris TVM – control center – the basic unit!



Zurich – AVM Control Centre



Zurich – **AVM** information screens



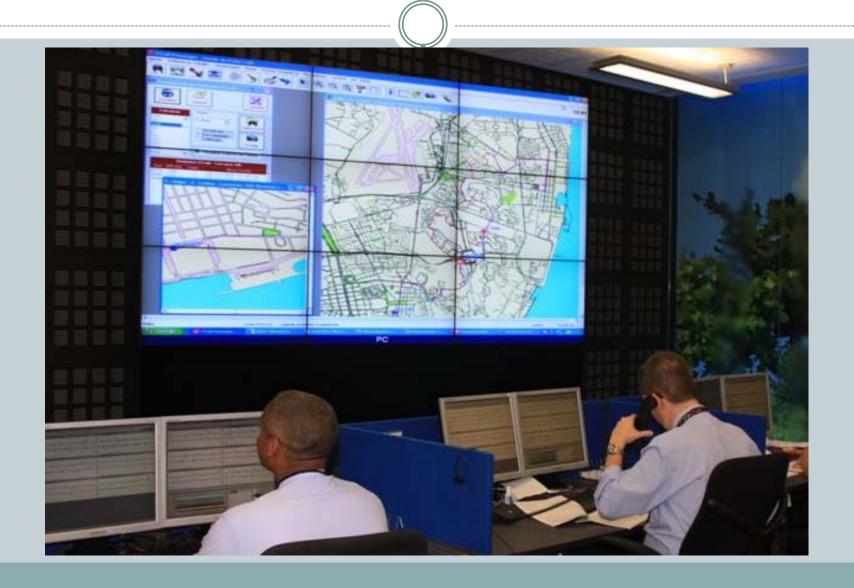
Prague – AVM Control Centre



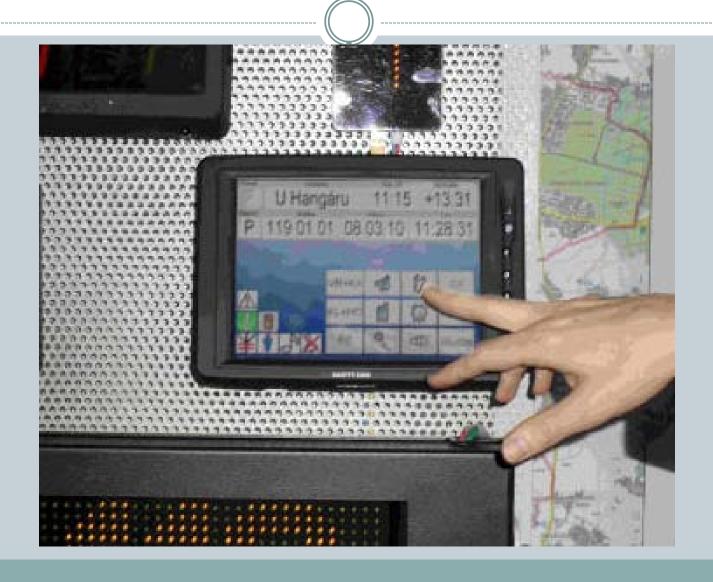
Oberhausen, Germany – Control Centre



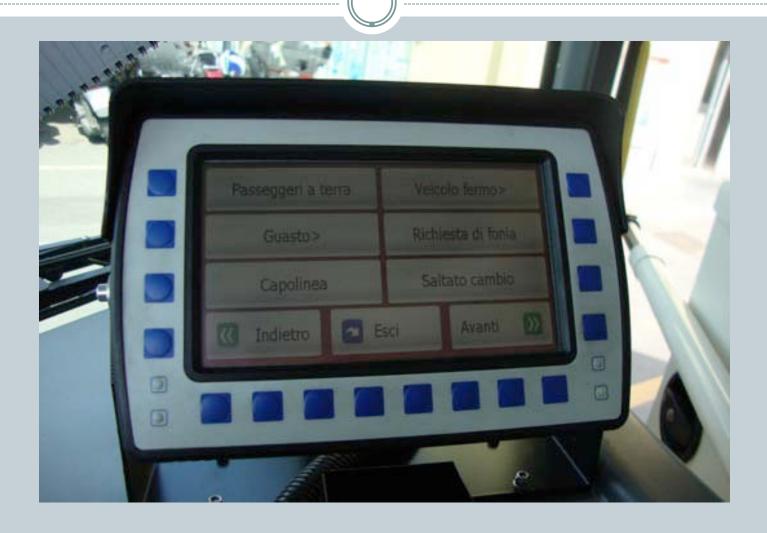
Lisbon – AVM Control Centre



Prague – in-vehicle driver's unit



Florence – driver's console



Operations Support systems

Rouen, France – optical guidance system



Castellon, Spain- Optical Guidance system





Traveler Information

BHLS - Real-time information — at stops





Zurich – RTPI at bus-stop



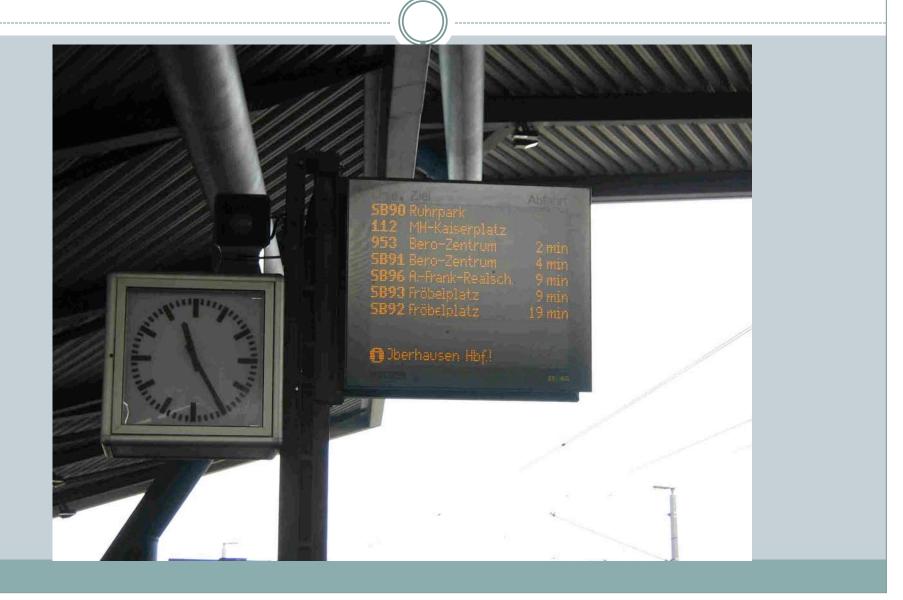
Nantes – RTPI at bus stop



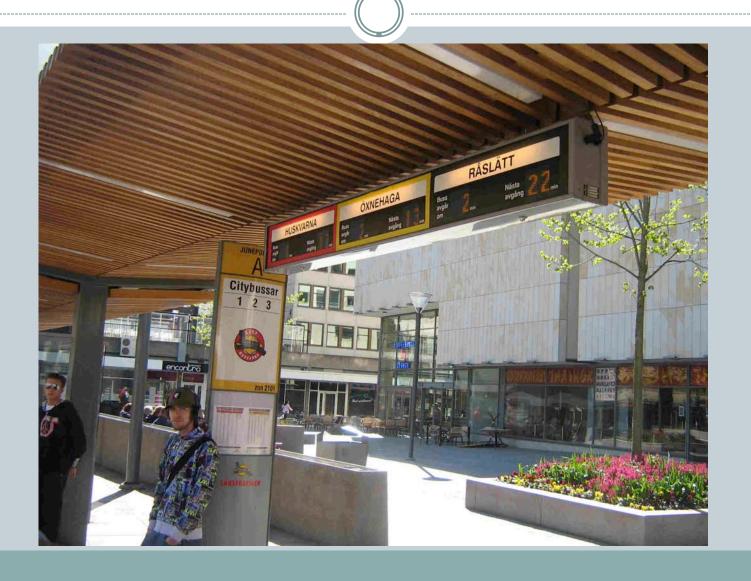
Hamburg – RTPI at bus stop



Oberhausen, Germany – RTPI at bus stop



Jonkopping, Sweden – RTPI at bus shelter



$Oberhausen,\,Germany-RTPI\,at\,station$



Amstelveen, NL - RTPI at bus station



Source: David van der Spek, Stadsregio Amsterdam

Enschede, NL – RTPI at bus station



Stockholm – destination sign



Nantes – in-vehicle RTPI



Oberhausen, Germany – RTPI in-vehicle



Zurich – RTPI – in-vehicle



- Next stop
- Transfer routes, times
- Announcements



Paris TVM – Passenger Information



Real time passengers information on display at bus stop

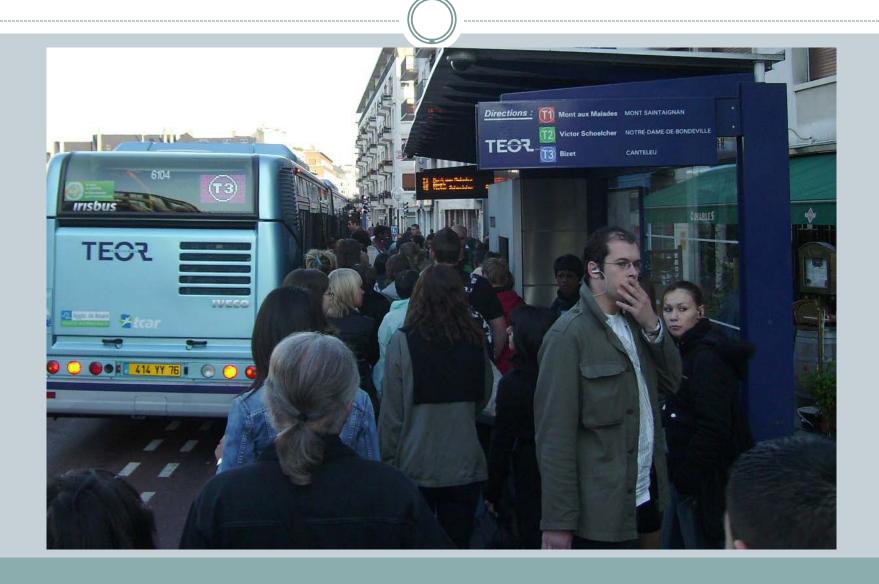


RATP – Paris: flash codes have been implemented on all tram and bus stations, you can memorize the link into your mobile

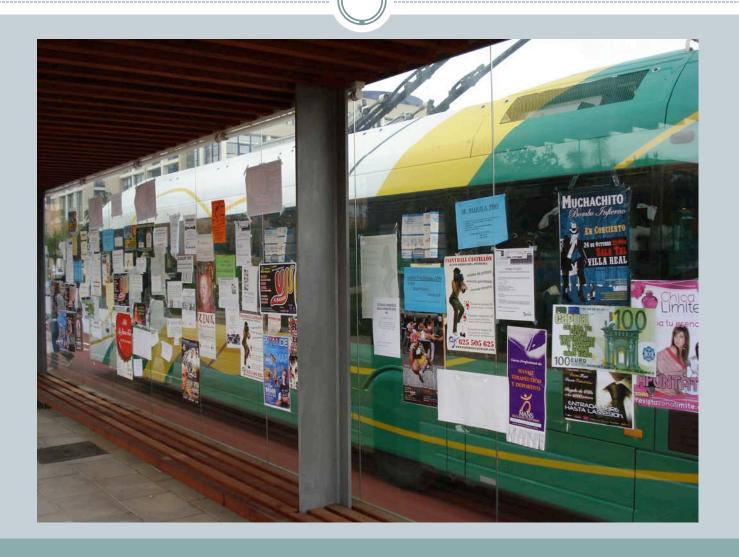


Source: RATP

Rouen, France – RTPI in real conditions



Castellon, Spain – the real info?



Lund – train information at bus exit



Fare Collection

Stockholm – on-street ticket vending



Kent, UK – ticket vending machine



Oberhausen, Germany – self-service TVM



Zurich – Ticket Vending Machine



Nantes – at-stop ticket vending machine



Paris TVM – Ticket Vending Machine



Ticketing Vending Machine: to buy ticket (magnetic technology) to reload your pass (contactless tecnhology)

8089409 - 21/06/2007

Paris TVM – ticket vending machine



Paris – ticket vending machine

Ticket vending machine at bus stop

Reloading pass (contactless)

Means of payment bank card or coins



Slot for the ticket(magnetic ticket) and receipt

Source: RATP

$Manchester-ETM\ at\ entry$



Dublin – smart card 'target' on ETM



Stockholm – ETM and SCV at entry



Stockholm – smart card reader



Stockholm – smart card 'target'

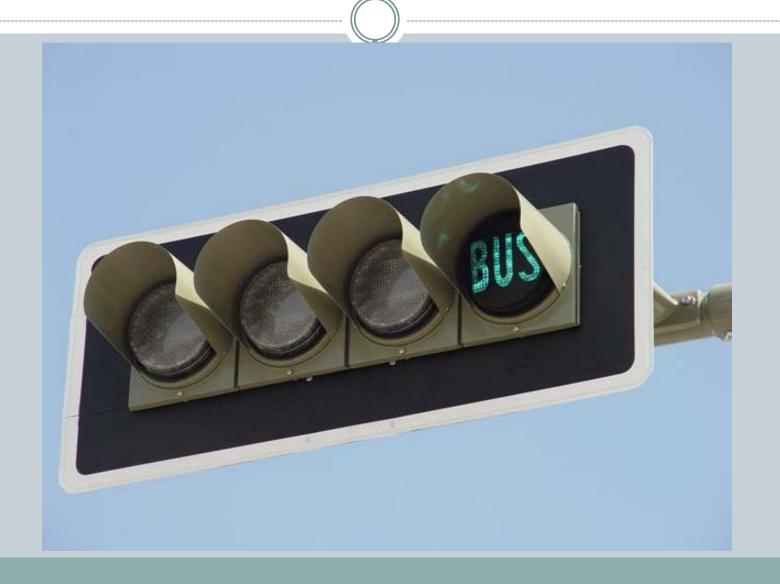


Florence – smart card reader



Traffic Signal Priority, Traffic Management

Lisbon – traffic signal



Stockholm – signal aspect for bus



${\bf Zurich-traffic\ signal}$



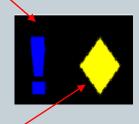
Nantes – traffic signal priority



Paris TVM – Traffic Signal Priority

Priority announcement helping driver to adapt the speed of the bus at cross road

Effective taking into account when it is flashing





Announcing a change of phase when it is flashings



Bus running and car stopped

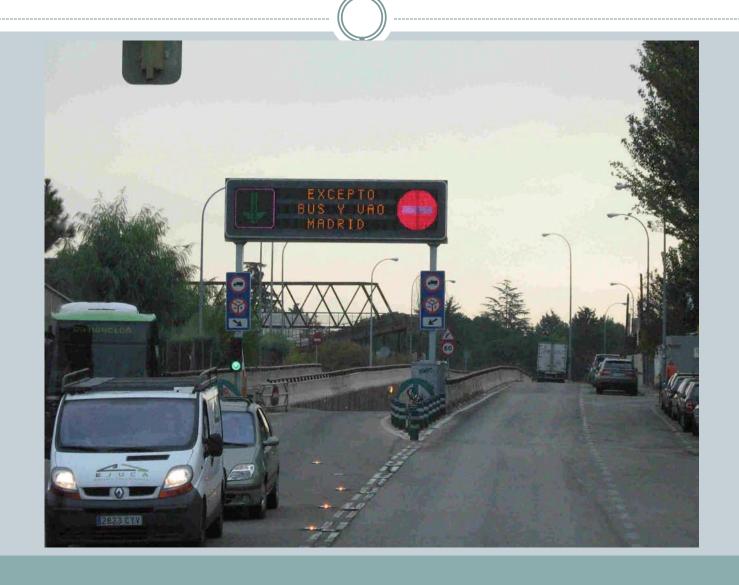


Source: RATP

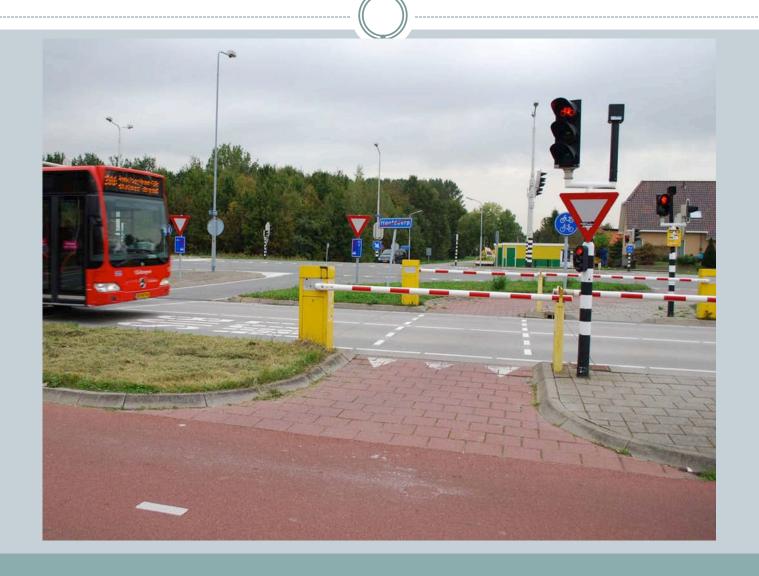
Zurich – traffic management centre



Madrid – VMS at entry to Bus/HOV lane

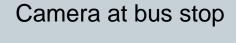


Amsterdam – controlled bicycle crossing



Customer Services

Paris TVM – Video Security



Control display at PCC





Source: RATP

BHLS - Customer comfort - Cambridge

- WiFi on bus
- Socket for PC, phone
- Leather seats
- CCTV for security





Cambridge – in-vehicle WiFi



Cambridge – personal security



Part 3: How is ITS used for BHLS quality improvement?

Context

"Reliability is the most important factor"

- Everyone tells us that RELIABILITY is key for customers
- A lot of attention in the design phase running way, TSP, ITS, ...
- ... but how do systems make sure that is actually happens

A short survey:

- 12 active BHLS systems in Europe
- We already had system data from the field visits
- Questions focus on whether/how ITS is actively used for Ops. Mgt.

• Core questions:

- What quality targets, are they bound in to contracts and payments?
- What ITS, any unique features for BHLS?
- What Operations Management techniques?

Reliability -targets

- Formal reliability targets for all 12 systems:
 - o the same as for non-BHLS routes in 8 of the systems;
 - different for the BHLS in 4 cases
 - set by the relevant transport or local authority in 10 cases
 - o ,negotiated in 1 case; based on EN 13816 in one case
- Targets are set in the service/route contracts and linked to payments and penalties (all but one case)
 - o targets for the planned no. of trips or planned-kms in all cases
 - targets for on-time departures in 10 cases, and for headways in 3 cases; 2 cases do not have targets for either
 - o targets for timekeeping/intervals along the route in 9 cases

Use of AVM systems

- AVM (also known as AVLC, SAE, CAD) are used by all 12 BHLS systems surveyed.
- Primary responsibility for Operations Management of the BHLS is mostly with the Transport Operator:
 - In 6 cases, the Transport Operator(s) are solely responsible to manage the BHLS operations, and do so from their own Control Centre;
 - In 5 cases, the Transport Operator(s) manage the BHLS operations from their own Control Centre, but the Contracting Authority has a monitoring role and can intervene when it deems necessary.
 - In one case, the Contracting Authority manages the BHLS operations from its own Control Centre

Operations Management Techniques

Operations Management Techniques	No.
Additional recovery time built into normal schedule	7
Dynamic schedule adjustment, based on ITS system analysis and prediction	2
Dispatch additional vehicles from the depot, if required	9
'Hot reserve' at terminals	2
'Hot reserve' at key points along the route	4
Turn vehicles early to fill gap in opposite direction, transfer passengers.	6
Instruct driver to halt at designated location mid-route to restore headway	6
Instruct driver to skip stops to reduce headway to vehicle ahead	3
Instruct driver to leave terminus out of service to a point along the route, and commence service from there	6
In-vehicle units to assist drivers maintain even headway, periodic adjustment	7
Roving maintenance staff, to carry out minor repairs and keep buses in service	2
Co-ordination with traffic authorities etc.	12
Standard operating plans for disrupted situations	10
Supervisor at a key point, monitoring and controlling service	1

Findings of the survey

- The ITS concepts and technologies used for the BHLS are the same as for the rest of the bus system.
 - The scale, location and means of deployment varies
 - The devices, applications, software are essentially the same.
- None of the BHLS systems indicated that there was any function or application they could not implement due to a lack of suitable ITS tools
 - note that this is different from wanting to deploy more units, or having the financial capacity for facilities they would like.
- Implementers and managers of the current generation of European BHLS considers that the available range of ITS products and applications is sufficient for their needs.
 - Out this may be "from within the comfort zone"

Observations on practice in ITS for AVM

- Many of the BHLS systems are still in the early phases of ITS deployment – there is an extensive learning-curve
- No observed innovative Ops. Mgt. techniques for the BHLS
 - o BHLS services are being managed the same way as other bus lines.
 - No new techniques for headway management at short intervals.
 - No visible advance in dispatcher techniques v. 20 years ago.
- We have not observed much use of advanced features of AVMS (e.g. use of dynamic scheduling, active headway management, or active transfer/connection management).
- In general, there appears to be more interest in ITS for Traveller Information services (image) than to strengthen Operations Management capabilities (quality, efficiency)

Information resources for BRT, BHLS

- ITDP www.itdp.org
 - BRT Planning Guidelines (2007, v.4 in 2012)
 - Review of US BRT, case studies
- EMBARQ <u>www.embarq.org</u>
 - Case study materials, usage guidance, evaluation
- COST Action on BHLS www.bhls.eu
 - Final report available 11/2011 (at POLIS Annual Conference)
- US National BRT Institute <u>www.nbrti.org</u>
- SUTP <u>www.sutp.org</u>
- Volvo Centre of Excellence, Santiago www.brt.cl
- US TRB/TCRP <u>www.trb.org/TCRP/Public/TCRP.aspx</u>
- World Bank, APTA, UITP, ...
- Thredbo 12 (conference) <u>www.thredbo-conference-series.org</u>