LTG Ulm GmbH

- 1978: Start of LCD production (as a part of AEG concern).
- 1990: First passenger information systems for airports
- 1999: First destination signs for buses
- 2001: First passenger information systems for German rail
- 2012: Completion of new manufacturing plant
- 2015: Takeover by Luminator Technology Group
- 2017: Renaming from BMG MIS GmbH to **LTG Ulm GmbH**
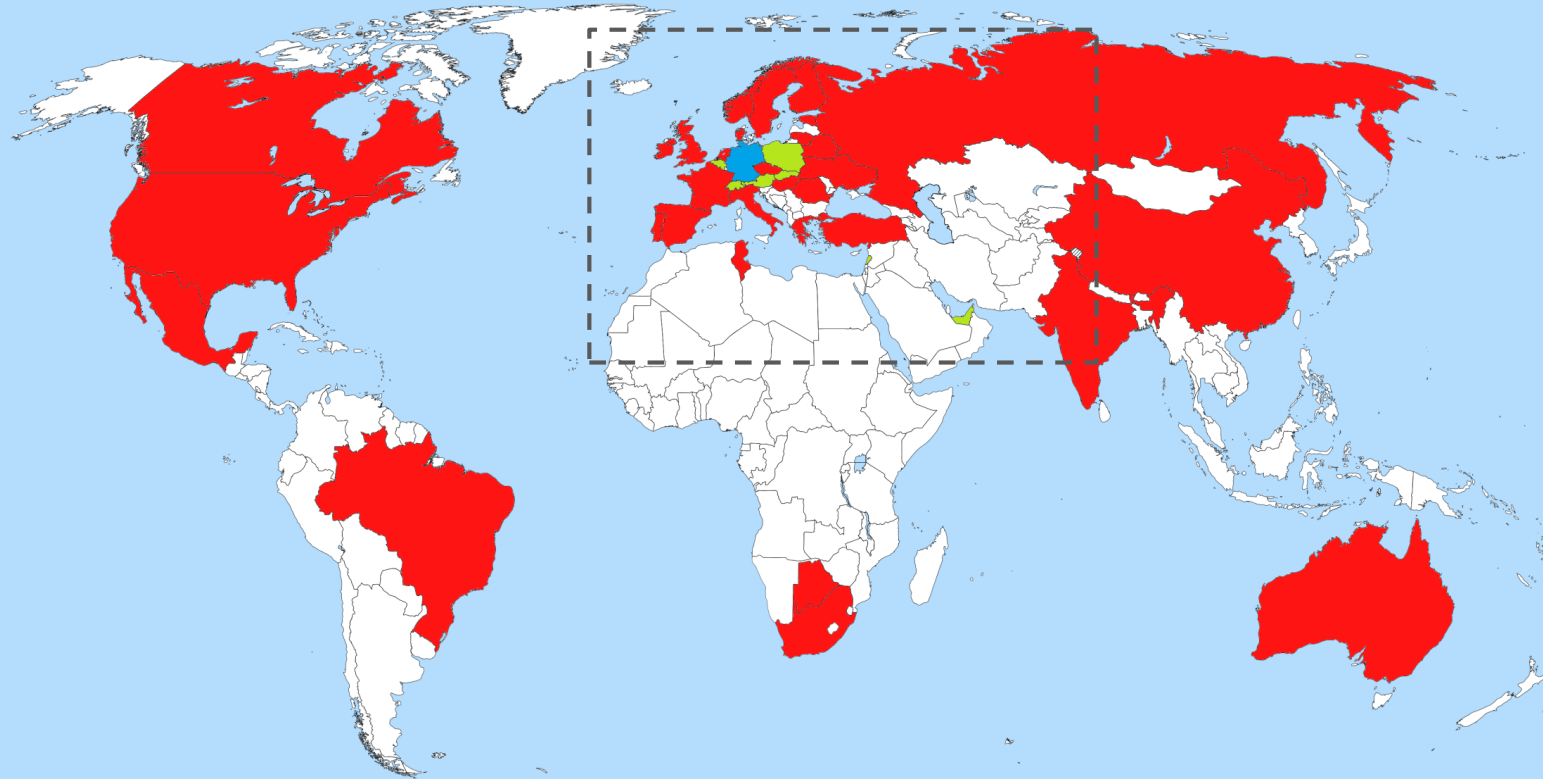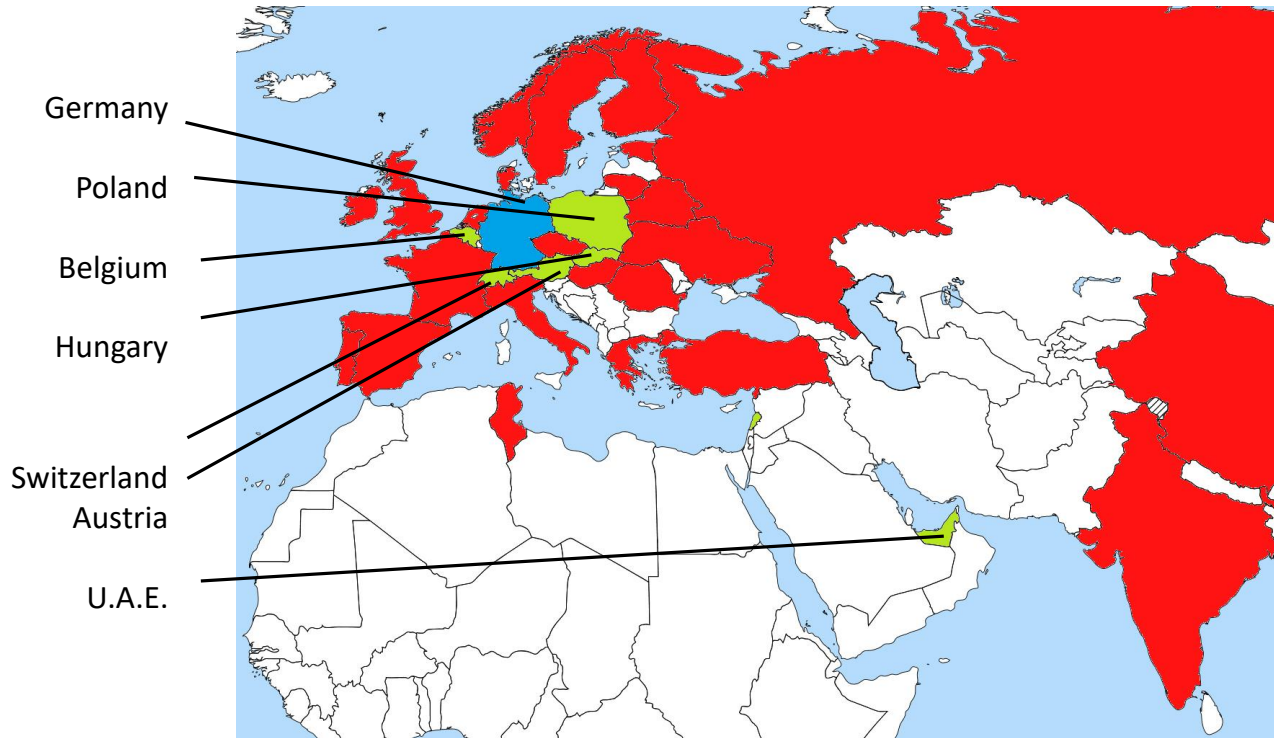
LUMINATOR
TECHNOLOGY GROUP

Facts & Figures

- Headquarter in Ulm, Germany
- Branch offices in Ravensburg, Dresden and Biel (Switzerland)
- Approx. 90 employees
- Thousands of displays all around the world
- State of the art LCD production facility
- Turnover around 21 Mio US$ (2015)
- Major supplier of German Rail displays since 2001 (rating "outstanding" from Deutsche Bahn)
- Dedicated hardware & software development team

LUMINATOR
TECHNOLOGY GROUP

BMG MIS has delivered its products to more than 40 countries

BMG | MIS

LUMINATOR TECHNOLOGY GROUP

Germany

Poland

Belgium

Hungary

Switzerland
Austria

U.A.E.

LUMINATOR
TECHNOLOGY GROUP

Application, Products and Technologies

Application

Rail/Bus/ Tram/Ferry Station

Air Port

Products

Display with power supply → platform boards

overview boards

Display with solar/battery power supply

Display technologies

LCD

TFT

LED

LCD

ChLCD

E-Paper

9

Avionic Application

Special Application

Components

Application

LCD

TFT

LED

ChLCD

E-Paper

Display technologies

BMG | MIS

LCD	Reflective LCD	TFT	ChLCD	E-Paper	LED Monochrome
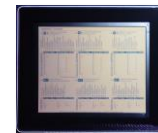
This is just for illustrative purpose. Many different types of models & combinations are possible. For more details and customised solution please contact LTG Ulm team.

LUMINATOR
TECHNOLOGY GROUP

DISPLAY TECHNOLOGIES

- **ETN – LCDs**

- **Bistable ChLCDs / E-Paper**

- **TFTs**

- **LEDs**

SOFTWARE PRODUCTS

- **PACIM software suite**

- **IQ – infotainment system**
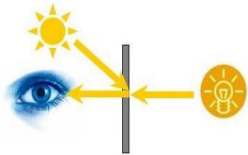
LCD	ChLCD / E-Paper	TFT	LED

Basic of LCD Display
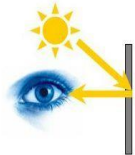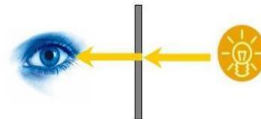
- Display Technology: Transflective

- Viewing Angle:

  vertical 85°/ horizontal 140°

- Luminance: max. 3000 cd/m2

- Contrast Ratio: 40:1

- Operational Temperature Range:
  -30°C to 85°C

- Colour: Monochrome:
  Yellow / Black
  White / Blue

Advantage of LCD Display

- **Very robust technology**

  (mean expected lifetime of LCD > **20 years**)

- Readability:
  Direct sunlight – excellent
  Diffused light – excellent
  Night – excellent

- Maintenance free

- Brightness control: Automatic adjustable

- Modular structure

- Front Panel: Robust laminated safety glass, High quality anti-reflective coating

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1 line, 6 LCD modules

2 lines, 6 LCD modules per line

- Resolution: 104 x 96 pixels/module
  96 x 64 pixels/module

- Colour: white letters on blue background

- Housing variant: Single/Double sided

LUMINATOR
TECHNOLOGY GROUP

LCD Info Boards for bus stops

- Housing variant: Single / Double sided
  Parallel front surfaces
- Data transmission via mobile communications network.
- Text-to-speech functionality available
- Display - Type: 2/3 lines with 162 x 37 Pixel
  3/4 lines with 162 x 76 Pixel
  4/6 lines with 162 x 112 Pixel

  (dependent on layout and font size)

LUMINATOR
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Large LCD Info Boards for railway stations

- Indoor application

- Luminance > 1500 cd/m^2

- Excellent readability

- Very robust technology

  (very long lifetime > 20 years)

- Typical pixel resolution:

  96 x 64 pixels per LCD module

- Overview information boards for bus stations.
- Text to speech function
- E.g. display of 15 departures per board.
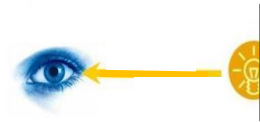
- Display Technology: Transmissive

- Viewing Angle:
  vertical / horizontal 170°

- Luminance: max. 2500 cd/m2

- Contrast Ratio: 3000:1

- Operational Temperature Range:
  -10°C to 70°C

- Colour: 16.7 million colours (8bit)

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- Full HD resolution in 16: 9 format
  with 1920 x 1080 pixels

- Readability:
  Direct sunlight – very good
  Diffused light – excellent
  Night – excellent

- Maintenance free

- Brightness control: Automatic adjustable

- Modular structure

- Front Panel: Robust laminated safety glass

- High quality anti-reflective coating

- High quality panels for 24/7 industrial usage

- Housing variant: Single / Double sided
  V-shaped / Parallel front surfaces

- Text-to-speech functionality available

- Screen size :
  32 & 42 inch for platform display
  46, 55, 65 and 75 inch for overview display

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TECHNOLOGY GROUP

New standard TFT monitors

- Landscape or portrait format.

- Slim design

- Double sided version
  (one housing, two displays)

- Side by side version
  (one housing, two displays)

- Beacon:For automated "device management"

- Interfaces: PoE-Router
  Connection of train stopping sensors

- USV and LORA: 20 min emergency power to remove fault messages via LORA module

LUMINATOR
TECHNOLOGY GROUP

Basic of LED Display

- Display Technology: Emissive

- Viewing Angle: vertical / horizontal 170°

- Luminance: max. 3500 cd/m2

- Operational Temperature Range: -25°C to 50°C

- Colour: monochrome: Amber / White

- Pixel Grid: 4mm

LUMINATOR
TECHNOLOGY GROUP

- Excellent readability under all environmental conditions

- Readability: Direct sunlight – excellent
  - Diffused light – excellent
  - Night – excellent

- Brightness control: Automatic adjustable

- Modular structure

- Front Panel: Robust laminated safety glass,
  - High quality anti-reflective coating

LUMINATOR
TECHNOLOGY GROUP

LED Info Boards for bus station & railway station

- Monochrome LED monitor

- Appealing and slim design (thickness = 10cm)

- Variable pixel resolution

- Pixel pitch: 4mm

- Text-to-speech functionality

- Housing variant: Parallel front surfaces

- Display - Type: 2/4 lines for route display

  8/10 lines for overview display (depend on layout and font size)

RGB LED Displays

- RGB LED monitor

- Variable pixel resolution

- Modular design

LUMINATOR
TECHNOLOGY GROUP
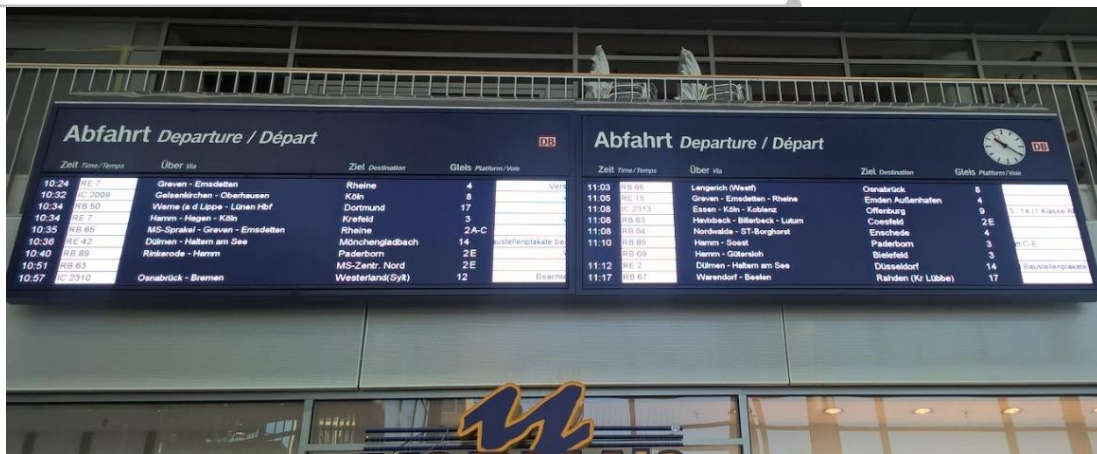
- OPTIMAL medium
  for stand-alone (power/data cable free) information systems

- Solar powered systems with data transmission
  via mobile communications network

- Low cost signs for application at small bus stops

- Lifetime in complete darkness (no charging):
    - About 35 days with small battery pack
    - About 140 days with big battery pack

- Three different technologies
    - ChLCD – Cholesteric bistable LCD
    - Reflective LCD
    - E-Paper

- Display Technology: Reflective

- Contrast Ratio 10:1

- Viewing angle: v/h 170°

- Highest quality anti-reflective laminated safety glass

- Designed for operation in direct sunlight

- Operating temperature range: -20°C to +80°C

- Duration of complete image update : 3.5 seconds

- **Robust technology**
  (mean expected lifetime of ChLCD > 10 years)

- Excellent readability in direct sunshine

- No battery replacement necessary

- Maintenance-free

- No power and data cables are required – simple and inexpensive installation

- Several pages can be displayed

- Due to the high resolution, a wide variety of graphics (QR Code etc.) can be displayed

- Display of the next departures (real time) and a map on the same page

- Screen diagonal: 16 inch (308 x 246 mm)

- Resolution: 800 x 640 Pixel per module

- Installation on existing masts no foundation work required

- Modules can be clustered adjacent to each other seamlessly

- Ultra-low power LEDs, controlled by motion sensor and light sensor

- Text-to-speech functionality

Basic of Reflective LCD Display

- Display Technology: Reflective

- Contrast Ratio: 10:1

- Viewing angle: vertical 80°/ horizontal 140°

- Colour: monochrome

- Operating temperature range: -30°C to +80°C

- Duration of complete image update : 10 milliseconds

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- Excellent readability in direct sunshine

- No battery replacement necessary

- Maintenance-free

- No power and data cables are required – simple and inexpensive installation

- Several pages can be displayed

- Due to the high resolution, a wide variety of graphics (QR Code etc.) can be displayed

LUMINATOR
TECHNOLOGY GROUP

Reflective LCD Info Boards for bus station

- Resolution: 124 x 76 Pixel / module

- Installation on existing masts no foundation work required

- Ultra-low power LEDs, controlled by motion sensor and light sensor

- Modules can be clustered adjacent to each other seamlessly

- Display of ticker possible

- Text-to-speech functionality

Basic of E-Paper Display

- Display Technology: Reflective

- Contrast Ratio: 16:1

- Viewing angle: v/h 170°

- Highest quality anti-reflective laminated safety glass

- Designed for operation in direct sunlight

- Operating temperature range:
  standard version: -10°C to +38°C
  High temperature version: -10°C to +50°C
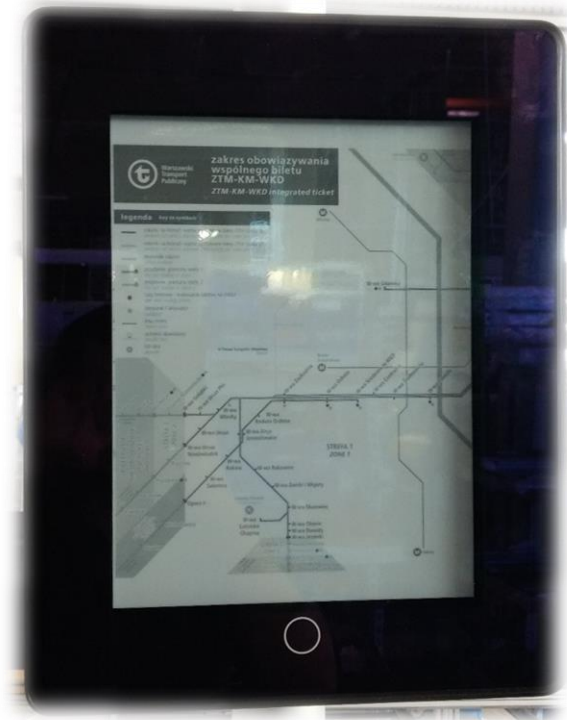
- Duration of complete image update : 1 second

- Excellent readability in direct sunshine

- No battery replacement necessary

- Maintenance-free

- No power and data cables are required – simple and inexpensive installation

- Several pages can be displayed

- Due to the high resolution, a wide variety of graphics (QR Code etc.) can be displayed
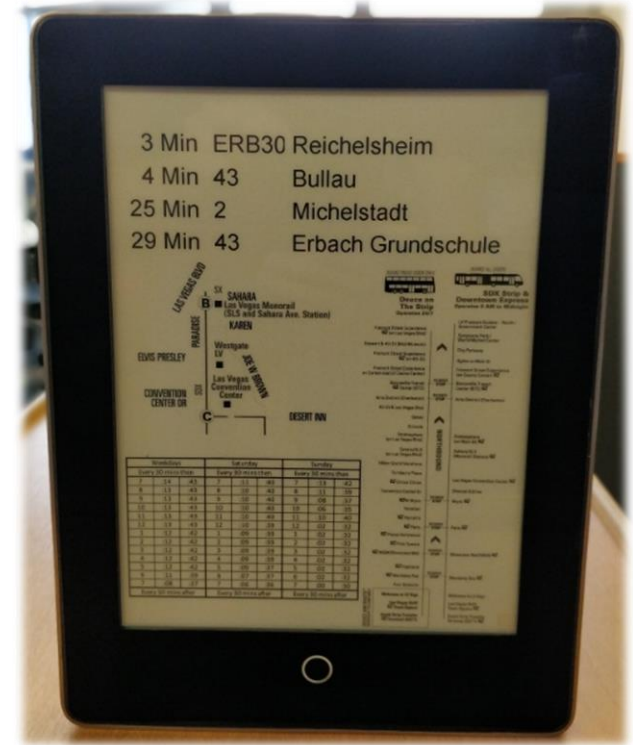
- Display of the next departures (real time) and a map on the same page

- Screen diagonal: 13.3 inch (202.8 x 270.4 mm)

- Resolution: 1200 x 1600 Pixel per module

- Installation on existing masts no foundation work required

- Ultra-low power LEDs, controlled by motion sensor and light sensor

- Text-to-speech functionality

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TECHNOLOGY GROUP

Software Products - PaCIM
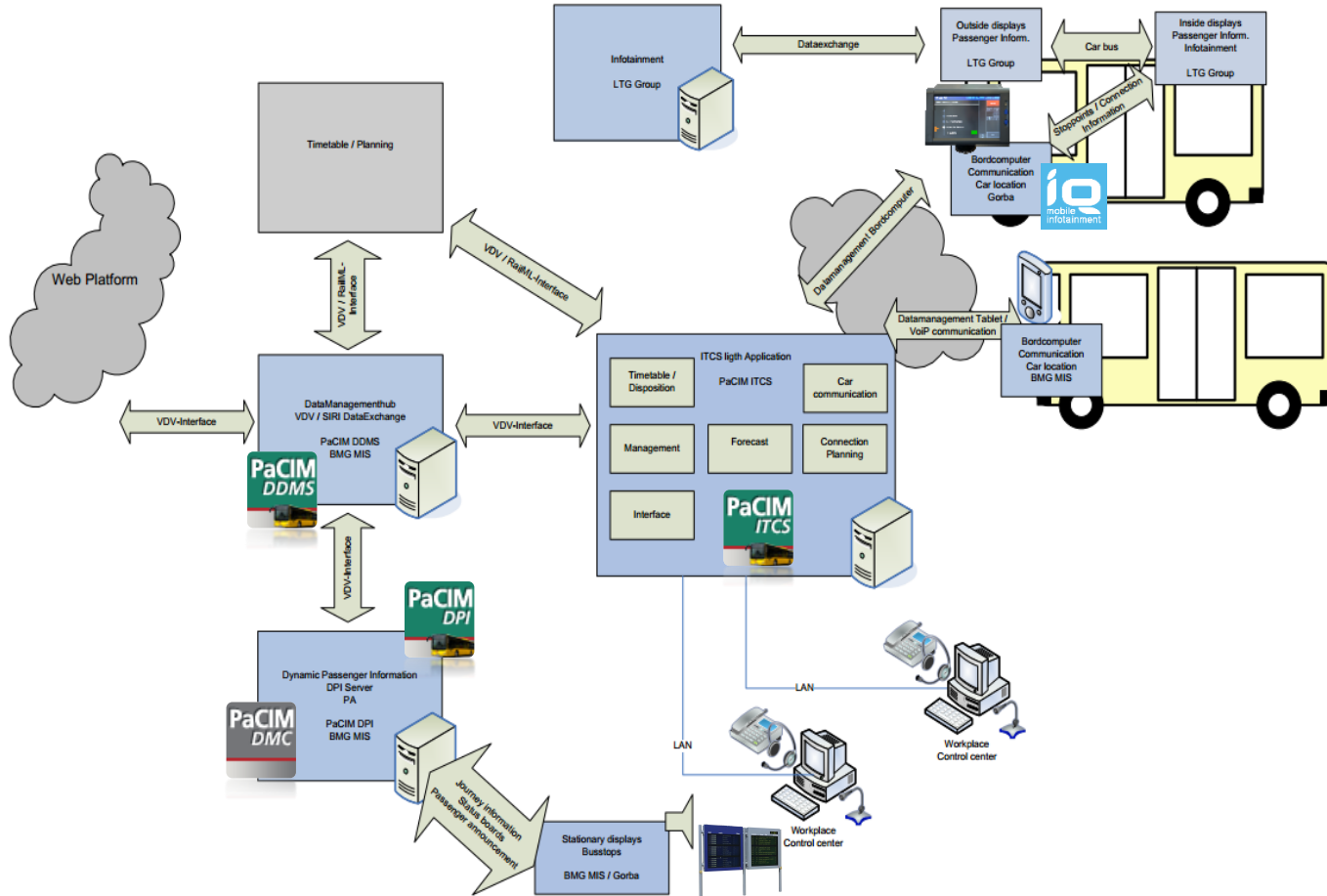
PaCIM DDMS	Data Distributing Management System	Data management hub for collecting and merging passenger information data from ITCS / AVL systems of transport companies and rule-based distribution to the connected systems. Based on standard interfaces
PaCIM INF	Information System Rail	Provides passengers at every station automatically or semi-automated with current information about the planned times, deviations, tracks and next connections
PaCIM ITCS	Intermodal Transport Control System / AVL System	Calculates the schedules and deviation based on the timetable and the tracking information for informing the passengers at stations, in the buses and for web-based information systems
PaCIM DPI	Dynamic passenger information system	Displays passenger information data from a central system on boards and receive status information from the connected displays so that the operator is informed about the current status every time.
PaCIM DMC	Desktop management console Content management system stationary	Infotainment for passengers in conjunction with passenger information. Defines the times and the duration for displaying the objects
iQ mobile infotainment	iQ Entertainment	Entertainment system for buses and trains - WLAN based video, audio, advertisement - Offline and online content and information - BYOD – bring your own device

PaCIM offers all connections to the world of transport networks in the one open platform

LUMINATOR
TECHNOLOGY GROUP

40

- Flow of Passenger information data without PaCIM DDMS

ITCS/AVL System

Manufacturer specific interface

Bords for passenger information at stop points

ITCS/AVL System

Data management hub

Information systems

Transportation company

Exchanging of information about
- ✓ real time departures at stop points
- ✓ delay information for sync of guaranteed connections
- ✓ exchange of planned and real-time timetables

LUMINATOR
TECHNOLOGY GROUP

- Flow of Passenger information data with PaCIM DDMS

ITCS/AVL System

Manufacturer specific interface

ITCS/AVL System

PaCIM DDMS

Services

Data management hub

Bords for passenger information at stop points

Information systems

Transportation company

Exchanging of information about
- ✓ real time departures at stop points
- ✓ delay information for sync of guaranteed connections
- ✓ exchange of planned and

LUMINATOR
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- Modular design

- Version dependent implementation of the services

- Proxy technology for adapting information

- Using TCP/IP – Sockets, HTTP, FTP

- Management of access rigths on the data

- Supporting high availability solutions (e.g. VMWare)

- Interfaces

  - Annual time table, infrastructure data (VDV 452)

  - Information services (VDV 454 REF-AUS / AUS)

  - Passenger information (VDV 453 DFI)

  - Connection infos (VDV 453 REF-ANS / ANS)

Services

VDV SIRI DFI SM ANS CM AUS ET VIS VM AND GM …

PaCIM DDMS
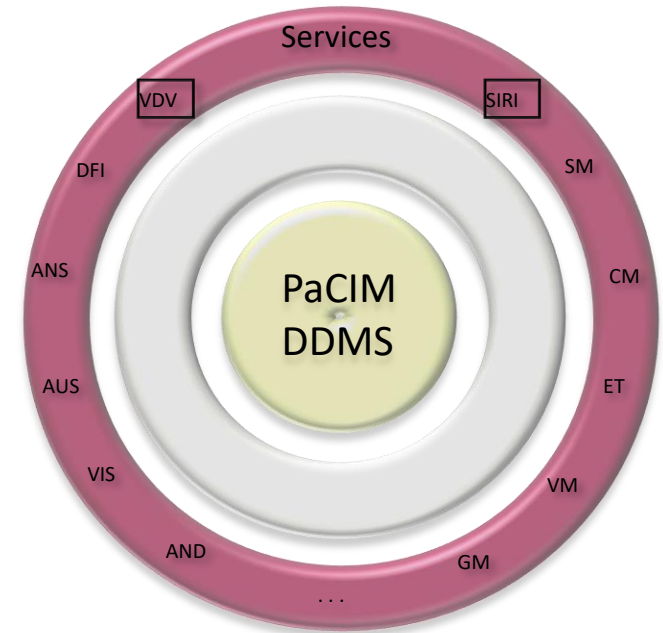
- Passenger information at track and infoboards

- Acoustic announcements

- Handling of signals and information about the trains from

  - UIC (International – www.uic.org)

  - ZLV (German Rail)

  - OR (Object registration)

  - others

- All-round management system for railway (eg. "Deutsche Bahn").

- System contains all available target timetables.

- PaCIM Inf can obtain the real time arrival and departure data from a central railway server or from a DDMS or ITCS system.

- System can address all kinds of output devices (info-boards and platform-boards).

- System can generate automated acoustic announcements.

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- Presentation of real

  time travel data.

- Deviation of real

  arrival and departure times from target time table.

- Administration

  of target time tables

  at different stations.

ZLV-Bus-Data
DB Network

UIC-Broker
Ext.Vert E0, E1
DB Network

Time table data
Time table manager DB S&S

Manual input of operational changes
narrator DB S&S

Train stop sensors

FIA-Server

INPUT

OUTPUT

Index

■ BKU (DB-Network)
■ Modem

Askunft 12:01
Ab 12:12   MET 51612   ...
            ICE 51912   2
Hannover-Frankfurt(M) Stuttgart-Ulm Augsburg Hbf
                       Karlsruhe Freiburg

LUMINATOR
TECHNOLOGY GROUP

PaCIM ITCS

Services
VDV
SIRI
DFI — SM
ANS — CM
AUS — ET
VIS — VM
AND — GM
PaCIM DDMS
...

planned / realtime
VDV 453 DFI / ANS
VDV 454 AUS / REF-AUS

Time table

Planning system

Advantages for the customer:
- further development secured
- standard interfaces zu DDS / DPI
- connection planning / monitoring
- realtime information on boards
- Tablet as OBU – standard component
  with IBIS communication

PaCIM ITCS
AVL system
datamanagement
planned data
disposition / real time

planned / realtime
VDV 453 DFI

DPI system
passenger information

GPS position, deviation
communication
configuration, monitoring

Time table
information

Gare maritime

IBIS

PaCIM On Board Unit
Tablet with PaCIM SW
and Serial to IBIS converter

City Centre
39 Media Center 2
7 C&C Factory 5
82 Royal Garden 6
4 City Airport 7
28 Port Europe 13
N5 Theater Magica 20
74 Goya Museum 26
16 Central Station 28

Bus station

21 City Center
Victoria St.
Vauxhall Bridge
Royal College St.
H Central Station
STOP 12:47

IBIS /
Ethernet

City Centre
39 Media Center 2
7 C&C Factory 5
82 Royal Garden 6
4 City Airport 7
28 Port Europe 13
N5 Theater Magica 20
74 Goya Museum 26
16 Central Station 28

Bus station

Loudspeaker (audio interface)

Passenger
counting
(IBIS)

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PaCIM ITCS

What do the transport company need?

- Real time information for the passengers including deviation
- Connection planning and supervising
- Where are my vehicles
- Communication with the driver
- Directives from system / operator
- Easy integration
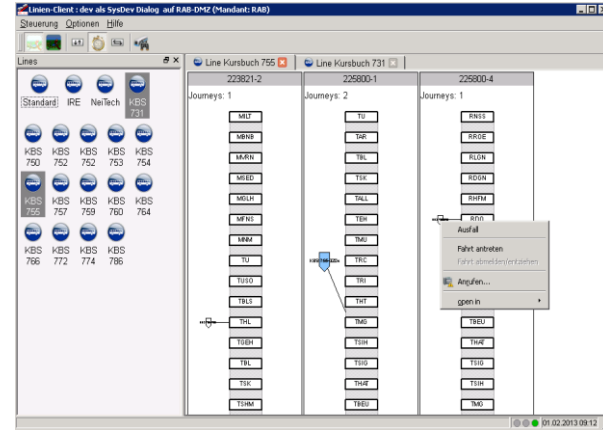
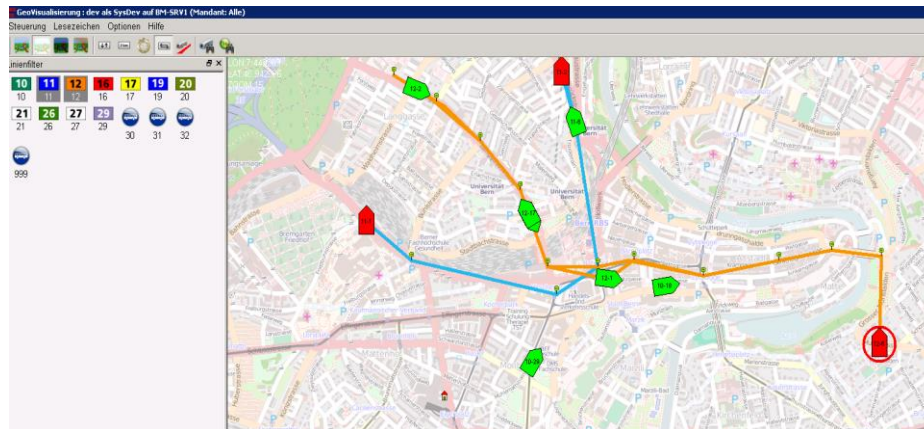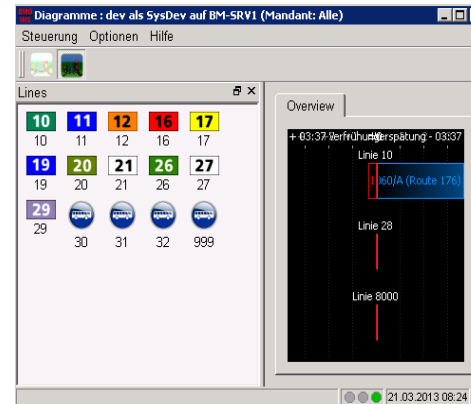PaCIM ITCS is able to satisfy the needs with:

- Annual timetable
- GPS coordinates
- Distances between the stop points
- OBU / Tablet in the vehicles
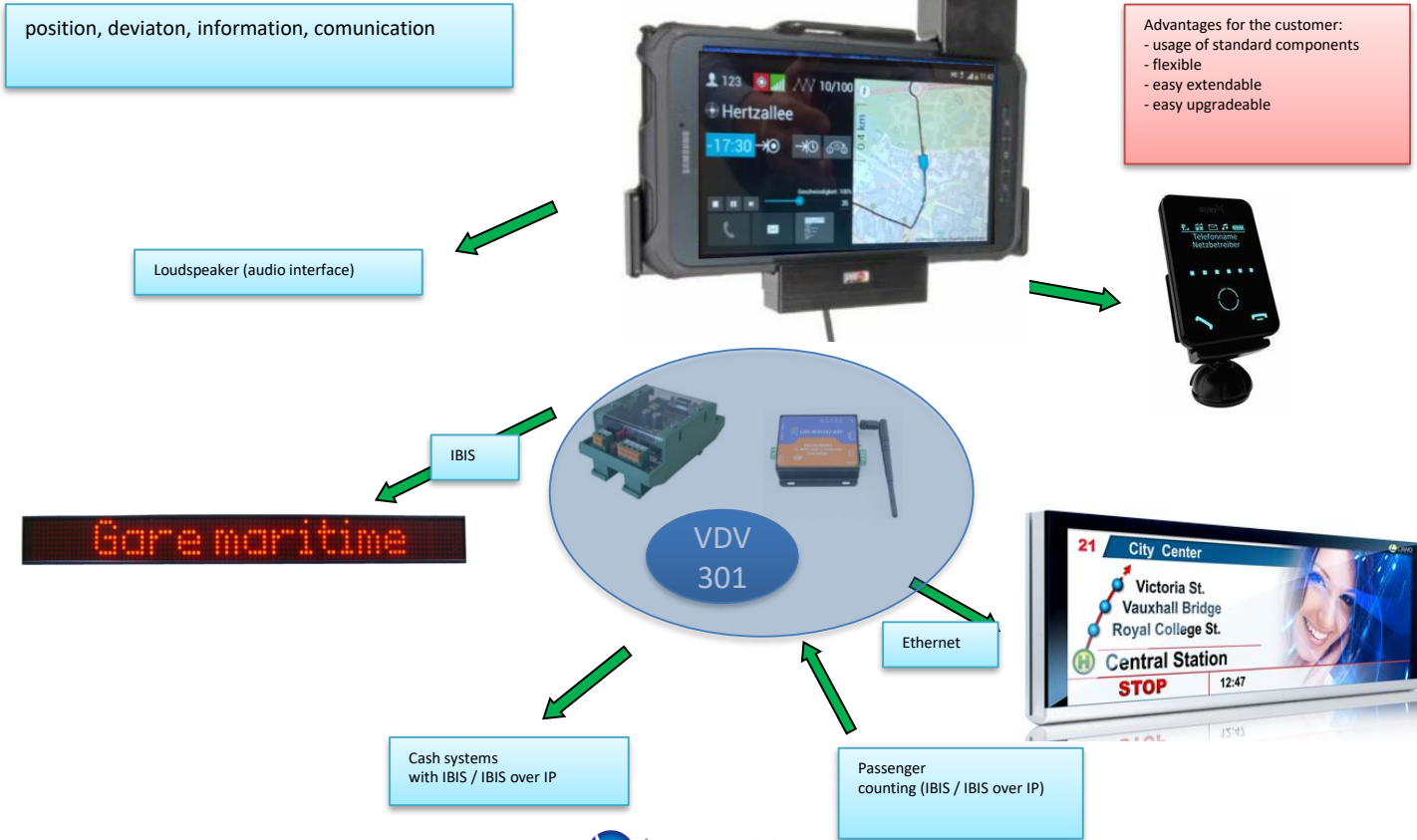- Opt. Route information

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position, deviaton, information, comunication

Advantages for the customer:
- usage of standard components
- flexible
- easy extendable
- easy upgradeable

Loudspeaker (audio interface)

IBIS

VDV 301

Gare maritime

21 City Center
Victoria St.
Vauxhall Bridge
Royal College St.
Central Station
STOP   12:47

Ethernet

Cash systems
with IBIS / IBIS over IP

Passenger
counting (IBIS / IBIS over IP)
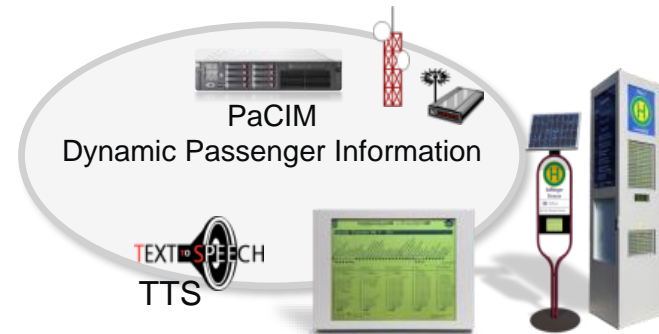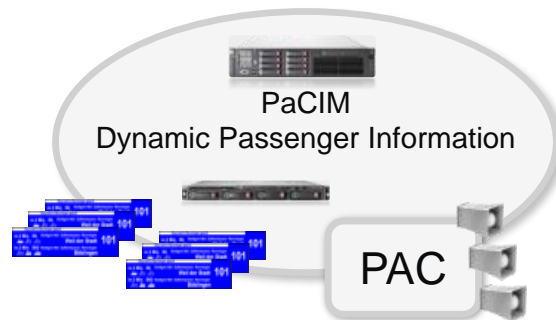
LUMINATOR
TECHNOLOGY GROUP
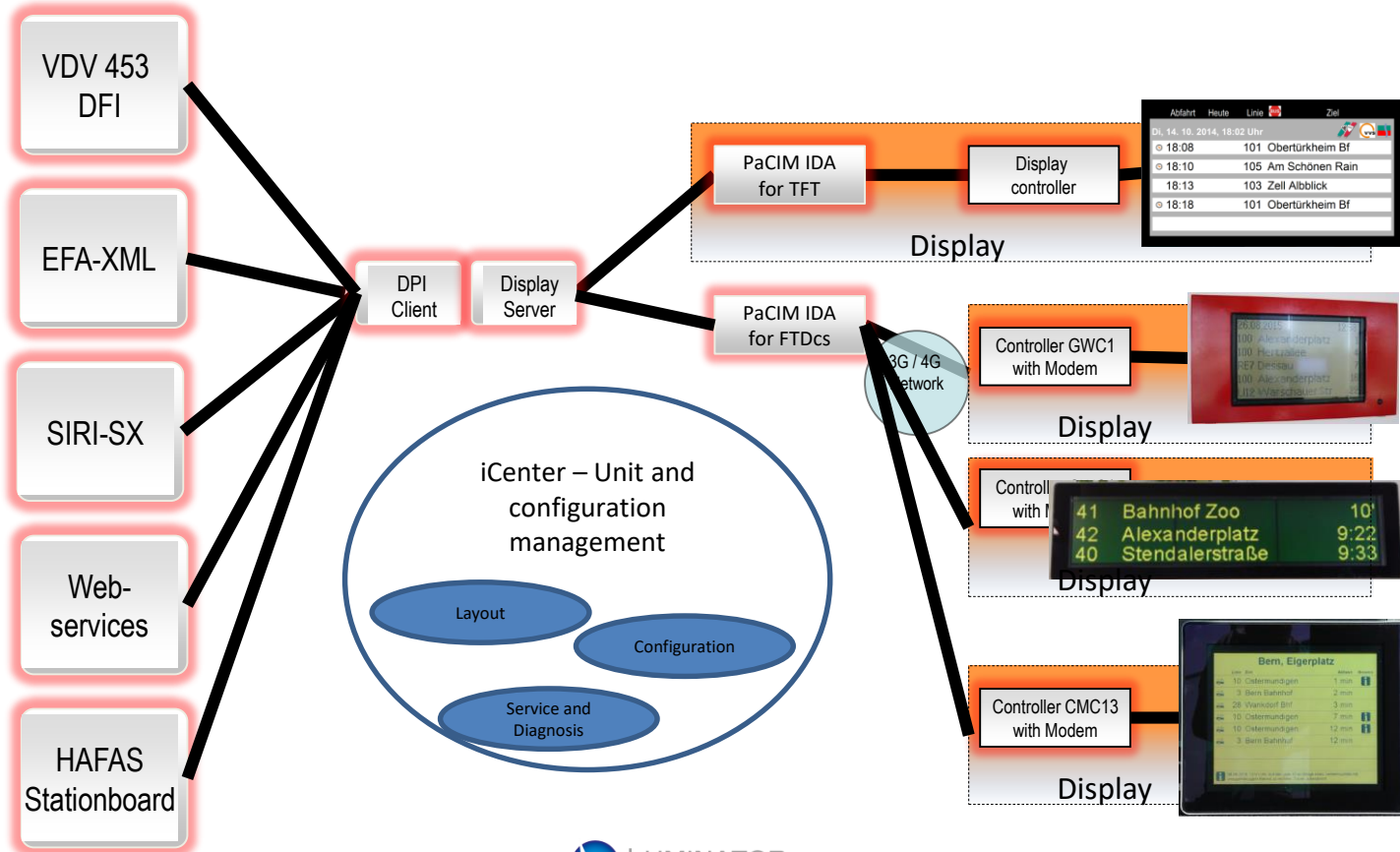
"ITCS for rural areas" or "ITCS Light"

- Gets real time data on position of vehicles from PaCIM TRAC.

- Predicts arrival and departure times at subsequent transit stops.

- Manage the synchronisation of guaranteed connections between fetcher and feeder services (e.g. bus driver is ordered to wait for arrival of belated train).

- ITCS system suited for simultaneous access of different companies.

- Communicates real time data to Passenger information systems, data management hubs

   or to further external ITCS systems.

PaCIM TRAC

PaCIM TRAC

PaCIM TRAC

PaCIM TRAC

"ITCS Light" System

LUMINATOR
TECHNOLOGY GROUP
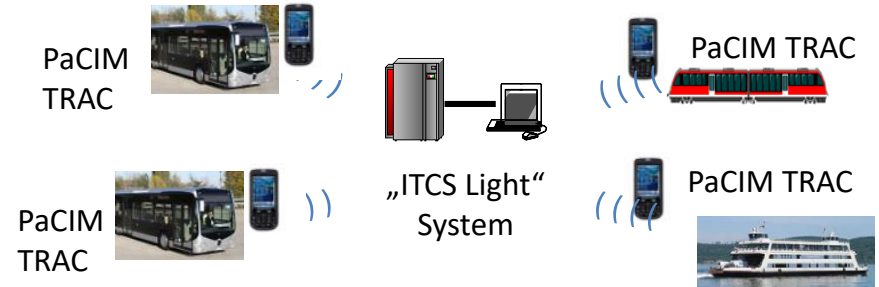
Manufacturer independent addressing of output devices
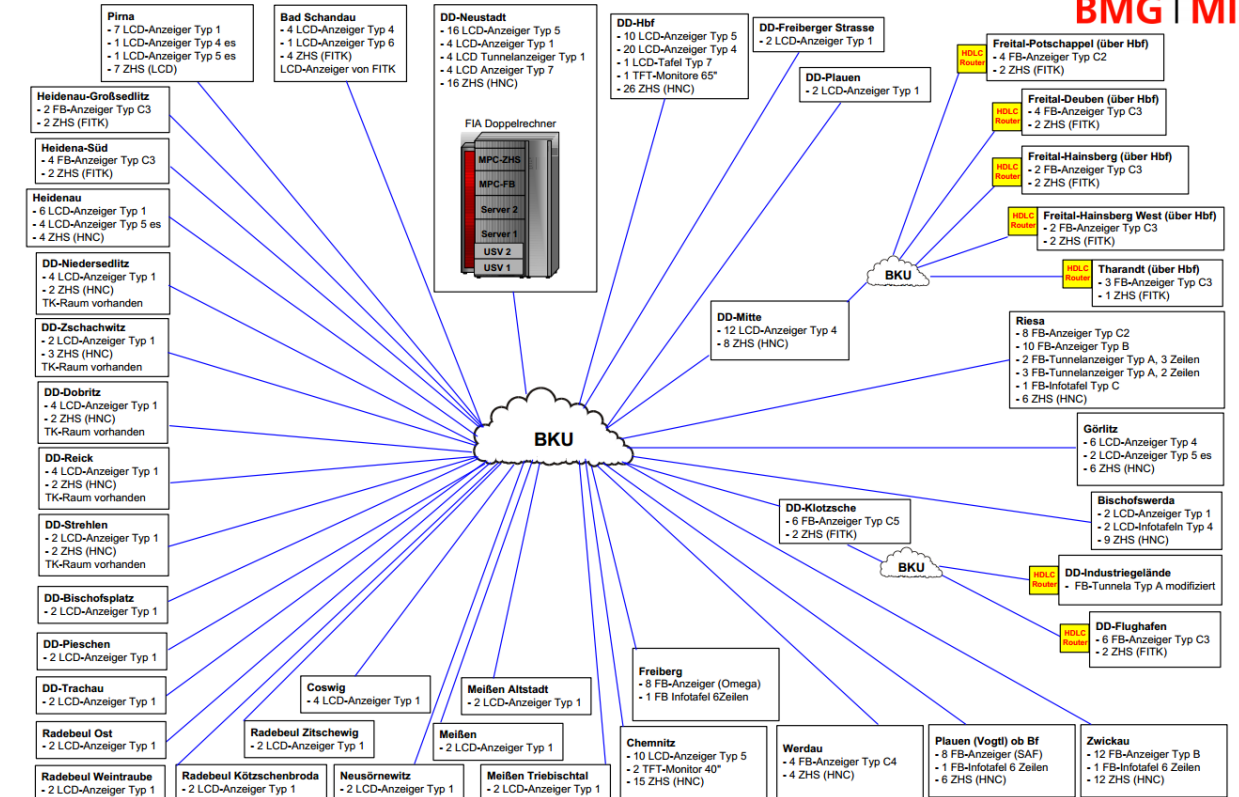
- PaCIM DPI can address all kinds of output devices based on standard interfaces and protocols.

- PaCIM DPI gets real time data from DDMS or ITCS.

- Definition of timetable layouts (fonts, colors, etc.).

- Activation of special announcements / tickers.

- Text to speech (TTS) – generation of automated acoustic announcements.

- Surveillance of output devices.

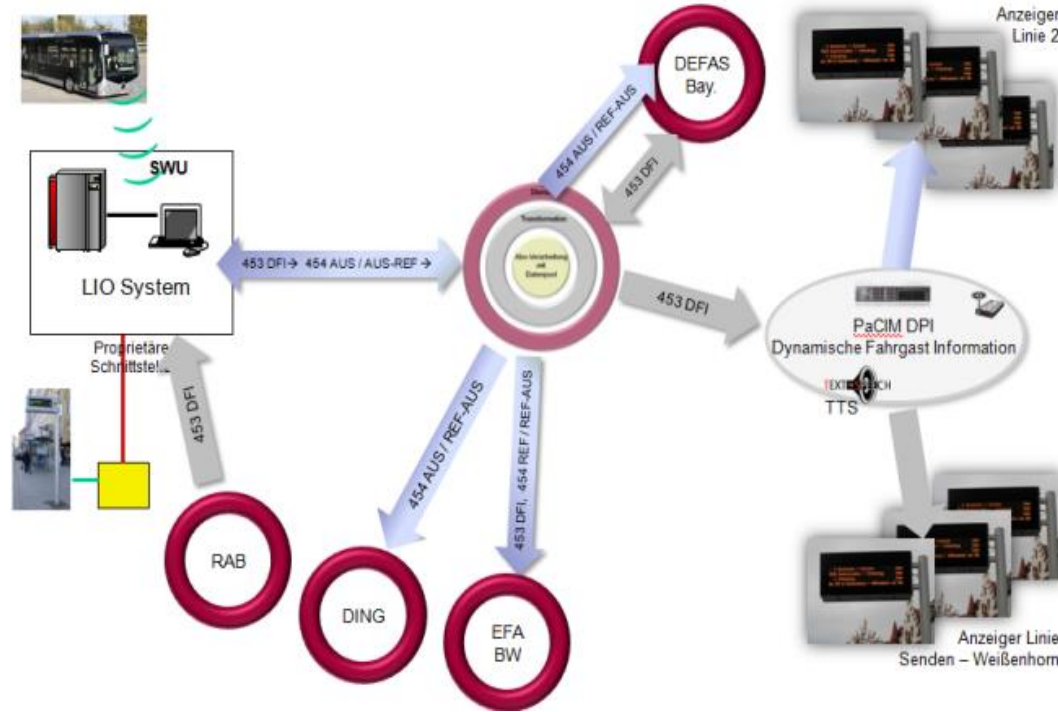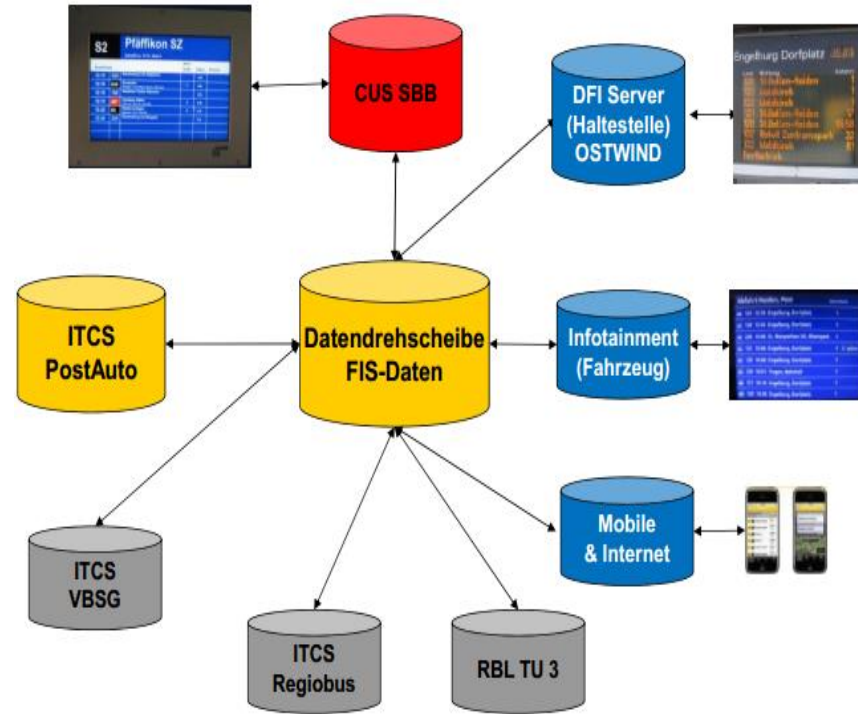**BMG | MIS**

Complete Turnkey Solution
Rail Network

BMG | MIS

Pirna
- 7 LCD-Anzeiger Typ 1
- 1 LCD-Anzeiger Typ 4 es
- 1 LCD-Anzeiger Typ 5 es
- 7 ZHS (LCD)

Heidenau-Großsedlitz
- 2 FB-Anzeiger Typ C3
- 2 ZHS (FITK)

Heidena-Süd
- 4 FB-Anzeiger Typ C3
- 2 ZHS (FITK)

Heidenau
- 6 LCD-Anzeiger Typ 1
- 4 LCD-Anzeiger Typ 5 es
- 4 ZHS (HNC)

DD-Niedersedlitz
- 4 LCD-Anzeiger Typ 1
- 2 ZHS (HNC)
TK-Raum vorhanden

DD-Zschachwitz
- 2 LCD-Anzeiger Typ 1
- 3 ZHS (HNC)
TK-Raum vorhanden

DD-Dobritz
- 4 LCD-Anzeiger Typ 1
- 2 ZHS (HNC)
TK-Raum vorhanden

DD-Reick
- 4 LCD-Anzeiger Typ 1
- 2 ZHS (HNC)
TK-Raum vorhanden

DD-Strehlen
- 2 LCD-Anzeiger Typ 1
- 2 ZHS (HNC)
TK-Raum vorhanden

DD-Bischofsplatz
- 2 LCD-Anzeiger Typ 1

DD-Pieschen
- 2 LCD-Anzeiger Typ 1

DD-Trachau
- 2 LCD-Anzeiger Typ 1

Radebeul Ost
- 2 LCD-Anzeiger Typ 1

Radebeul Weintraube
- 2 LCD-Anzeiger Typ 1

Radebeul Kötzschenbroda
- 2 LCD-Anzeiger Typ 1

Coswig
- 4 LCD-Anzeiger Typ 1

Radebeul Zitschewig
- 2 LCD-Anzeiger Typ 1

Neusörnewitz
- 2 LCD-Anzeiger Typ 1

Meißen Altstadt
- 2 LCD-Anzeiger Typ 1

Meißen
- 2 LCD-Anzeiger Typ 1

Meißen Triebischtal
- 2 LCD-Anzeiger Typ 1

Bad Schandau
- 4 LCD-Anzeiger Typ 4
- 1 LCD-Anzeiger Typ 6
- 4 ZHS (FITK)
LCD-Anzeiger von FITK

DD-Neustadt
- 16 LCD-Anzeiger Typ 5
- 4 LCD-Anzeiger Typ 1
- 1 LCD Tunnelanzeiger 1
- 4 LCD Anzeiger Typ 7
- 16 ZHS (HNC)

FIA Doppelrechner

MPC-ZHS
MPC-FB
Server 2
Server 1
USV 2
USV 1

DD-Hbf
- 10 LCD-Anzeiger Typ 5
- 20 LCD-Anzeiger Typ 4
- 1 LCD-Tafel Typ 7
- 1 TFT-Monitore 65"
- 26 ZHS (HNC)

DD-Freiberger Strasse
- 2 LCD-Anzeiger Typ 1

DD-Plauen
- 2 LCD-Anzeiger Typ 1

DD-Mitte
- 12 LCD-Anzeiger Typ 4
- 8 ZHS (HNC)

DD-Klotzsche
- 6 FB-Anzeiger Typ C5
- 2 ZHS (FITK)

DD-Industriegelände
- FB-Tunnela Typ A modifiziert

DD-Flughafen
- 6 FB-Anzeiger Typ C3
- 2 ZHS (FITK)

Freiberg
- 8 FB-Anzeiger (Omega)
- 1 FB Infotafel 6Zeilen

Chemnitz
- 10 LCD-Anzeiger Typ 5
- 2 TFT-Monitor 40"
- 15 ZHS (HNC)

Werdau
- 4 FB-Anzeiger Typ C4
- 4 ZHS (HNC)

Plauen (Vogtl) ob Bf
- 8 FB-Anzeiger (SAF)
- 1 FB-Infotafel 6 Zeilen
- 6 ZHS (HNC)

Zwickau
- 12 FB-Anzeiger Typ B
- 1 FB-Infotafel 6 Zeilen
- 12 ZHS (HNC)

BKU

HDLC Router

Freital-Potschappel (über Hbf)
- 4 FB-Anzeiger Typ C2
- 2 ZHS (FITK)

Freital-Deuben (über Hbf)
- 4 FB-Anzeiger Typ C3
- 2 ZHS (FITK)

Freital-Hainsberg (über Hbf)
- 2 FB-Anzeiger Typ C3
- 2 ZHS (FITK)

Freital-Hainsberg West (über Hbf)
- 2 FB-Anzeiger Typ C3
- 2 ZHS (FITK)

Tharandt (über Hbf)
- 3 FB-Anzeiger Typ C3
- 1 ZHS (FITK)

Riesa
- 8 FB-Anzeiger Typ C2
- 10 FB-Anzeiger Typ B
- 2 FB-Tunnelanzeiger Typ A, 3 Zeilen
- 3 FB-Tunnelanzeiger Typ A, 2 Zeilen
- 1 FB-Infotafel Typ C
- 6 ZHS (HNC)

Görlitz
- 6 LCD-Anzeiger Typ 4
- 2 LCD-Anzeiger Typ 5 es
- 6 ZHS (HNC)

Bischofswerda
- 2 LCD-Anzeiger Typ 1
- 2 LCD-Infotafeln Typ 4
- 9 ZHS (HNC)

BKU

BKU

BKU

- Planning
- Installation
- Software
- Server
- Maintenance

LUMINATOR TECHNOLOGY GROUP

- DDMS is platform for interchange of passenger information data
- ITCS: real time data & prediction of arrival and departure times
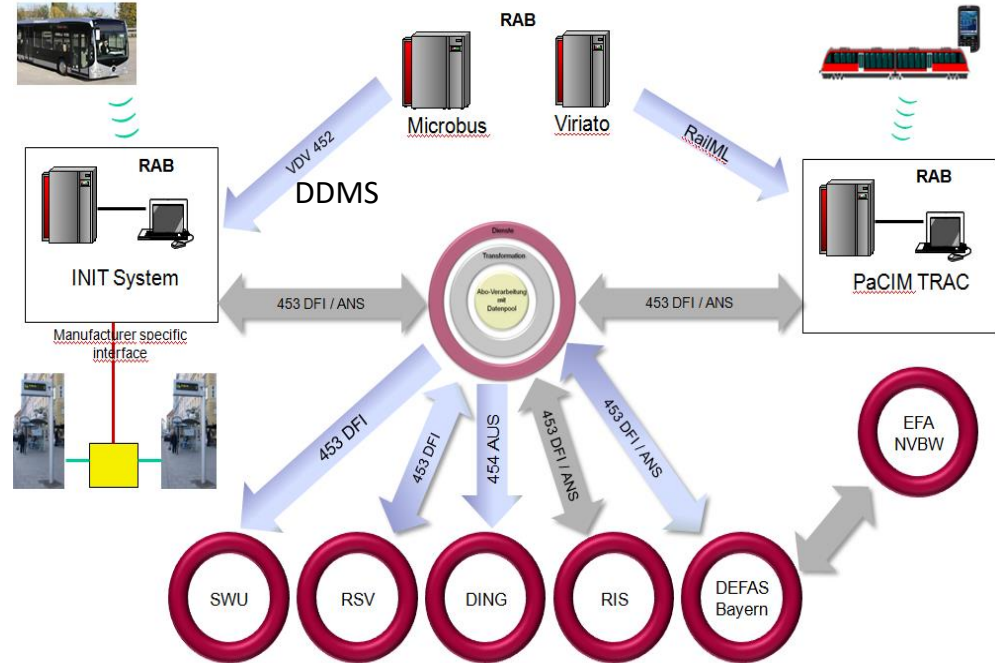- Real time passenger information at stations

BMG | MIS

- Connection of PostAuto, SBB (CUS), VBSG St. Gallen, Regiobus, DFI Ostwind

- Information platform for web based information systems

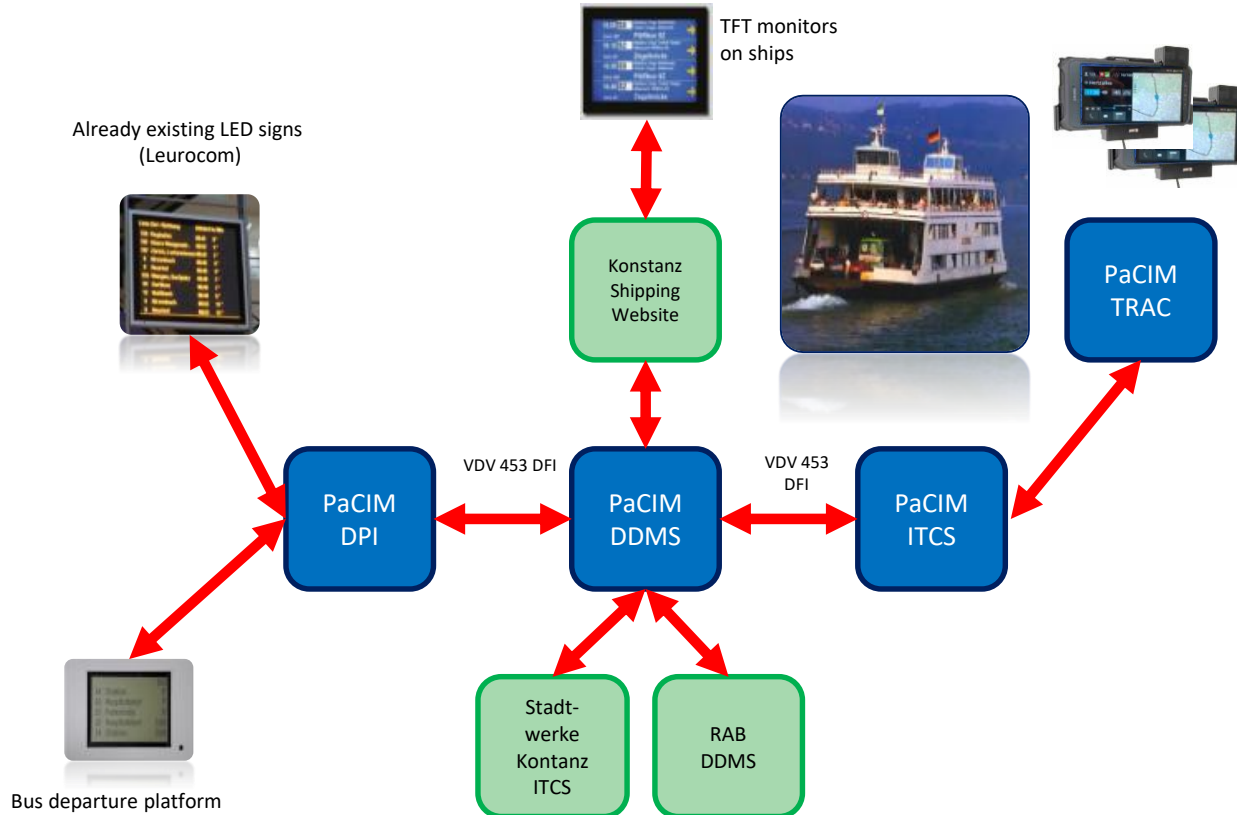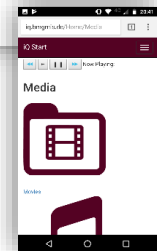## Complete Turnkey Solution
Transportation Network

- DDMS is platform for interchange of passenger information data

- DDMS → reduced number of interfaces between involved systems

- ITCS: real time data & prediction of arrival and departure times

TFT monitors on ships

Already existing LED signs (Leurocom)

Konstanz Shipping Website

PaCIM TRAC

PaCIM DPI

VDV 453 DFI

PaCIM DDMS

VDV 453 DFI

PaCIM ITCS

Bus departure platform

Stadt-werke Kontanz ITCS

RAB DDMS

LUMINATOR TECHNOLOGY GROUP

PaCIM iQ

- Information
- Communication
- Entertainment
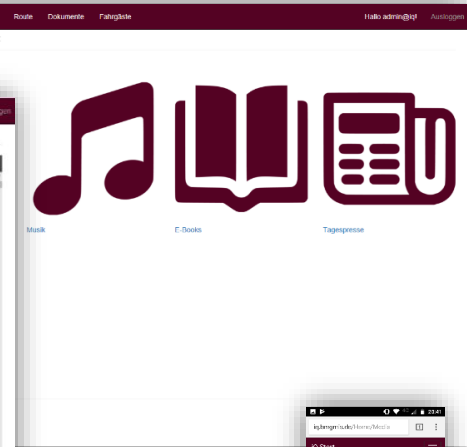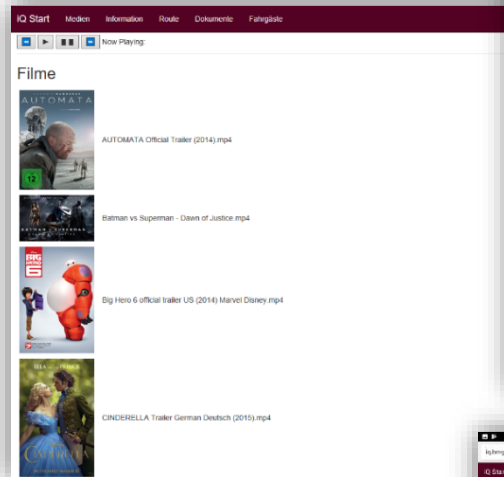
- Extensive thermo – simulation of temperatures profiles inside housings based on state-of-the-art technology.

- Extensive environmental testing of all passenger information boards in various testing chambers.

- Simulation of temperature, humidity and exposure to sunlight (1000 W/m2).

- ISO 9001:2008 for Quality Management Systems

- TSI 1300/2014 for EC Design Certification

- ISO 14001:2004 for Environmental management

- CE Certification

Service Desk for German Rail: ITIL System
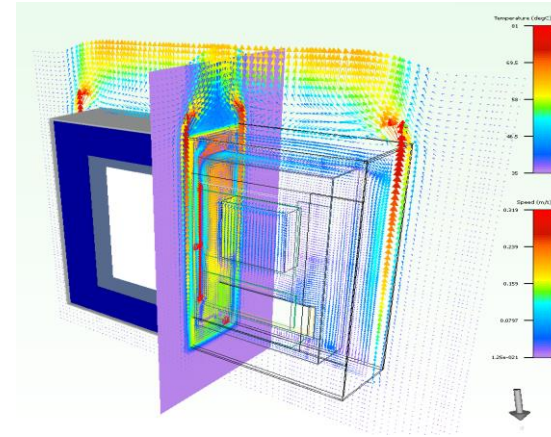
- Service desk is organised according to ITIL (IT Infrastructure Library) standards

- Support and maintenance servicing for 1345 railway stations

- Supervision of 5466 information boards

- Service around the clock, very short response times (1h for large stations)

- Customers report problems (=incidents) by e-mail or telephone

- All incidents and executed actions are entered in detail into database
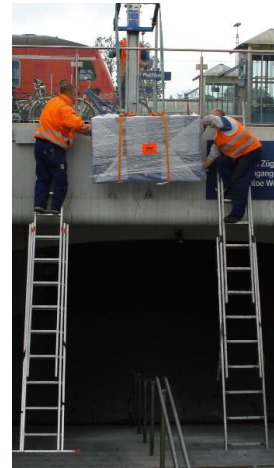
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Special display

Helicopter display
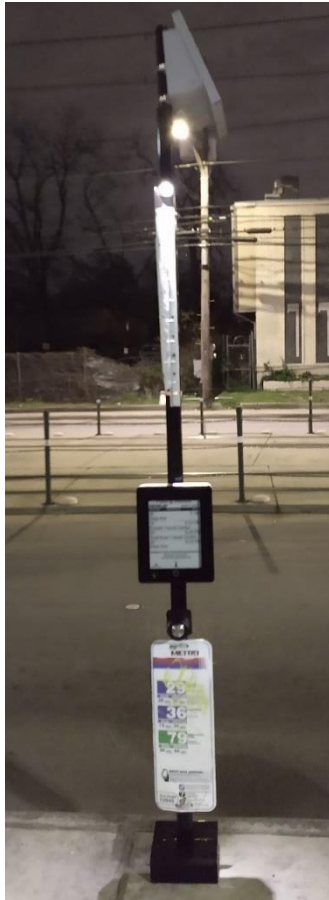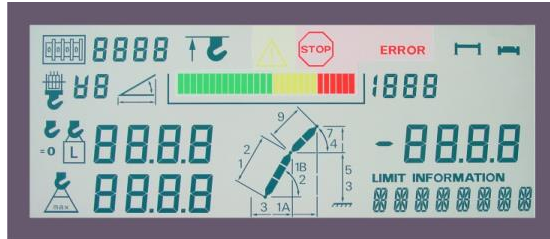
Special displays for crane

Speed Control for luxurious car