

Passagier-Simulation am Flughafen München

- Einsatzgebiete der Simulation
- Planungsvorhaben Terminal 2
- Simulation der Passagierströme im T2
- Simulation der landseitigen Vorfahrt

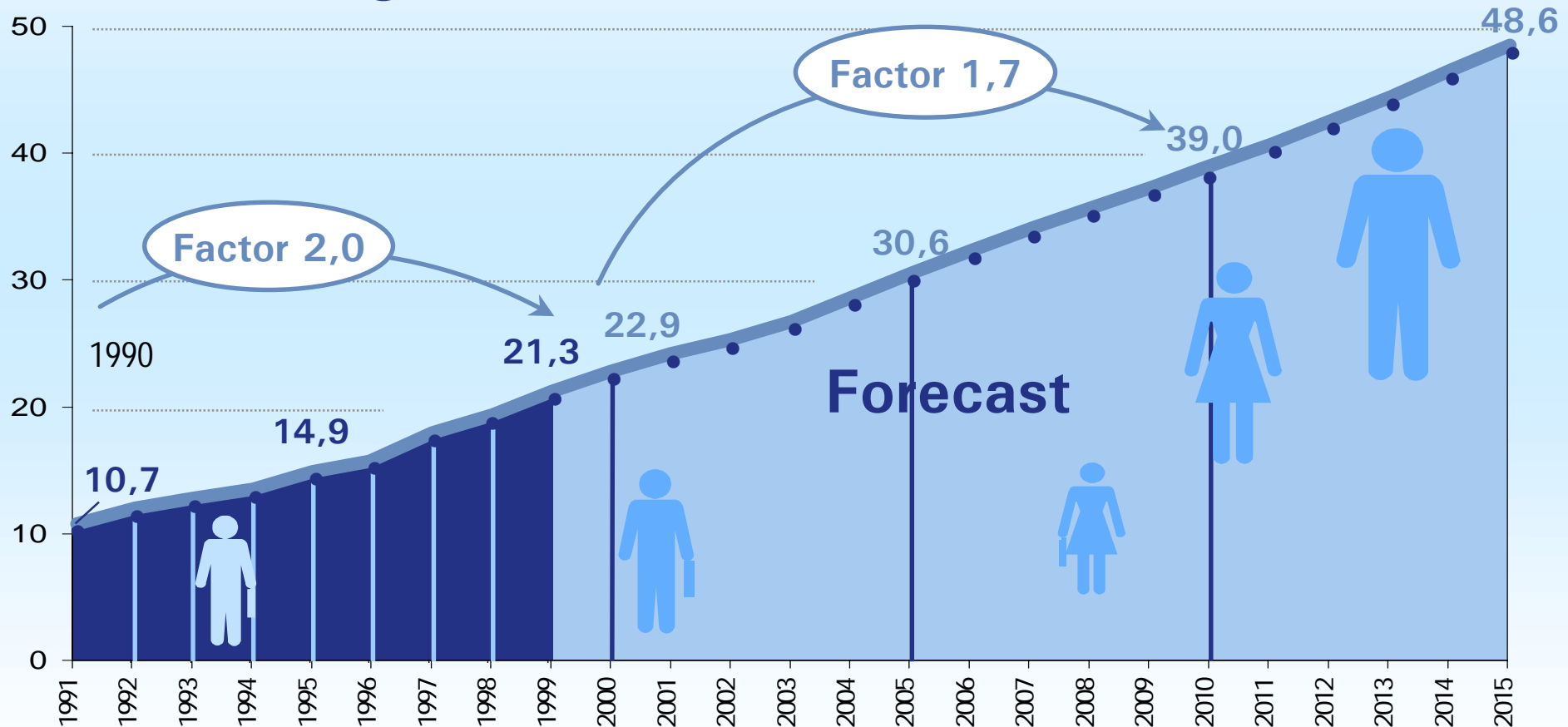
ARENA User Meeting 2000, Freiburg, Germany

SAT Simulations- und Automations-Technologie GmbH

Einsatzbereiche von Simulationen am Flughafen

- Landseitige Verkehrsanbindung
- Passagierfluß im Terminal
- Gepäckanlage
- Vorfeldverkehr der Flugzeugabfertigung
- Prozesse der Flugzeugabfertigung
- Flugzeugrollverkehr
- Flugzeugbewegungen im S/L-Bahnsystem

Passenger Volume (in Mio.)



Project Data

- Investors Joint Venture FMG / DLH
- Investment Costs DEM 2.36 billion
- Begin of Construction March 2000
- Opening Date March 2003
- Capacity 20 million Pax p.a.

Facts for Planning (1)

- **Capacity**
 - 20 Mio. passengers p.a.
 - 8000 typical peak hour passengers
- **Aircraft Stands**
 - 24 contact stands
 - commuter ramp with 4 positions close to building
 - 17 remote stands on ramp East
 - 40 additional remote stands on extended ramp East
- **Terminal Access**
 - individual traffic: curbside South (level 04)
 - bus, taxi: curbside North (level 04)
 - S-Bahn (rapid city train): entrance via Munich Airport Center
 - multi-storey car park with 7000 parking lots linked to terminal

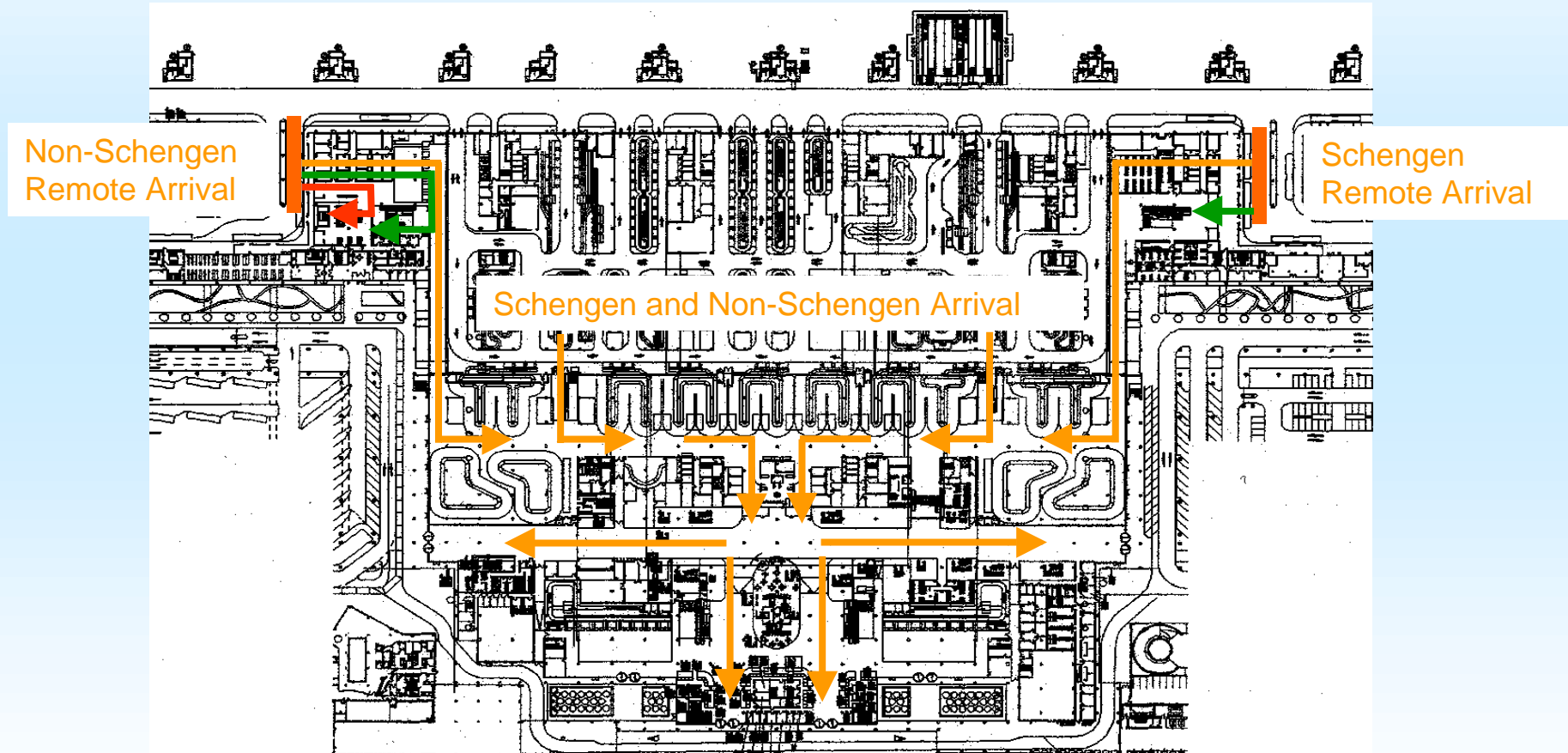
Facts for Planning (2)

- **Check-In**
 - central check-in-hall
 - high level of automation (full service baggage check-in machines, multi-use counters)
 - transfer check-in for not through-checked passengers only
- **Control Points**
 - central security control with boarding pass check
 - central passport control
 - central customs control
- **Transfer**
 - MCT = 30 minutes
 - 6 transfer centers distributed over the length of pier on both levels
 - combined lounges (C/CL and gold card holders) on both levels
 - moving sidewalks, elevators, escalators for vertical transportation

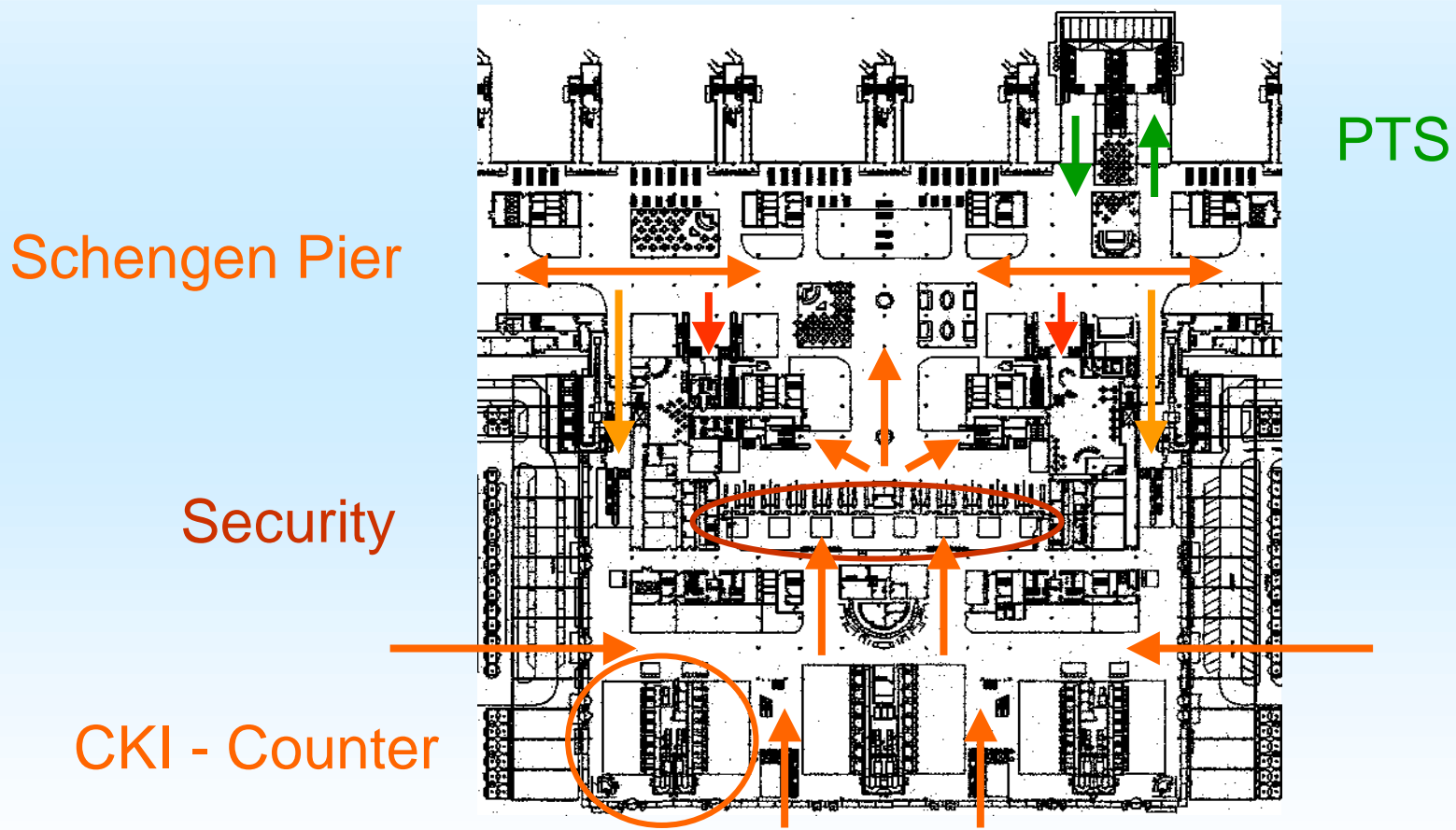
Facts for Planning (3)

- **Boarding**
 - boarding gates only
 - 24 airbridges for Schengen / Non-Schengen, enabling parallel boarding of up to 3 flights
 - 15 additional remote gates for Schengen flights
- **Arrival / Departure**
 - central Schengen- and central Non-Schengen - remote arrival area
 - central baggage claim area
 - welcome area
 - individual traffic: curbside South (level 03)
 - bus, taxi: curbside North (level 03)
 - S-Bahn (rapid city train): entrance via Munich Airport Center
- **Baggage System**
 - container system
 - sorter in T2 and in ramp-station East, linked by tunnel
 - central baggage claim in Terminal 2
 - capacity of tunnel and ramp-station for satellite operation

Passenger Flow Level 3



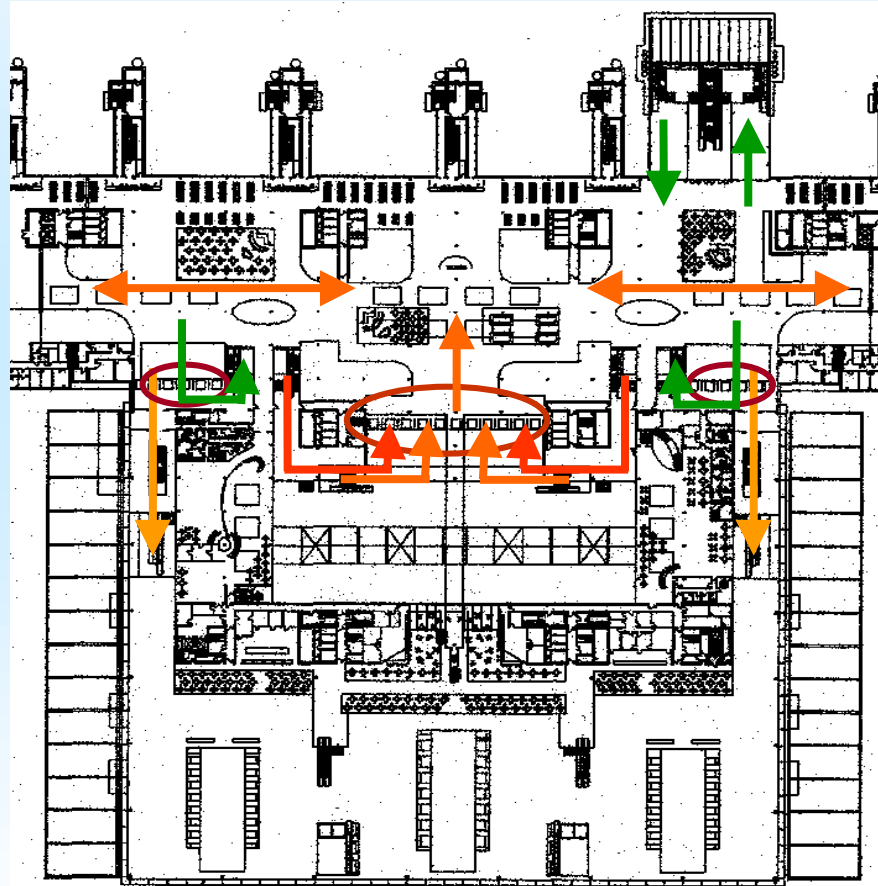
Passenger Flow Level 4



Passenger Flow Level 5

Non-Schengen Pier

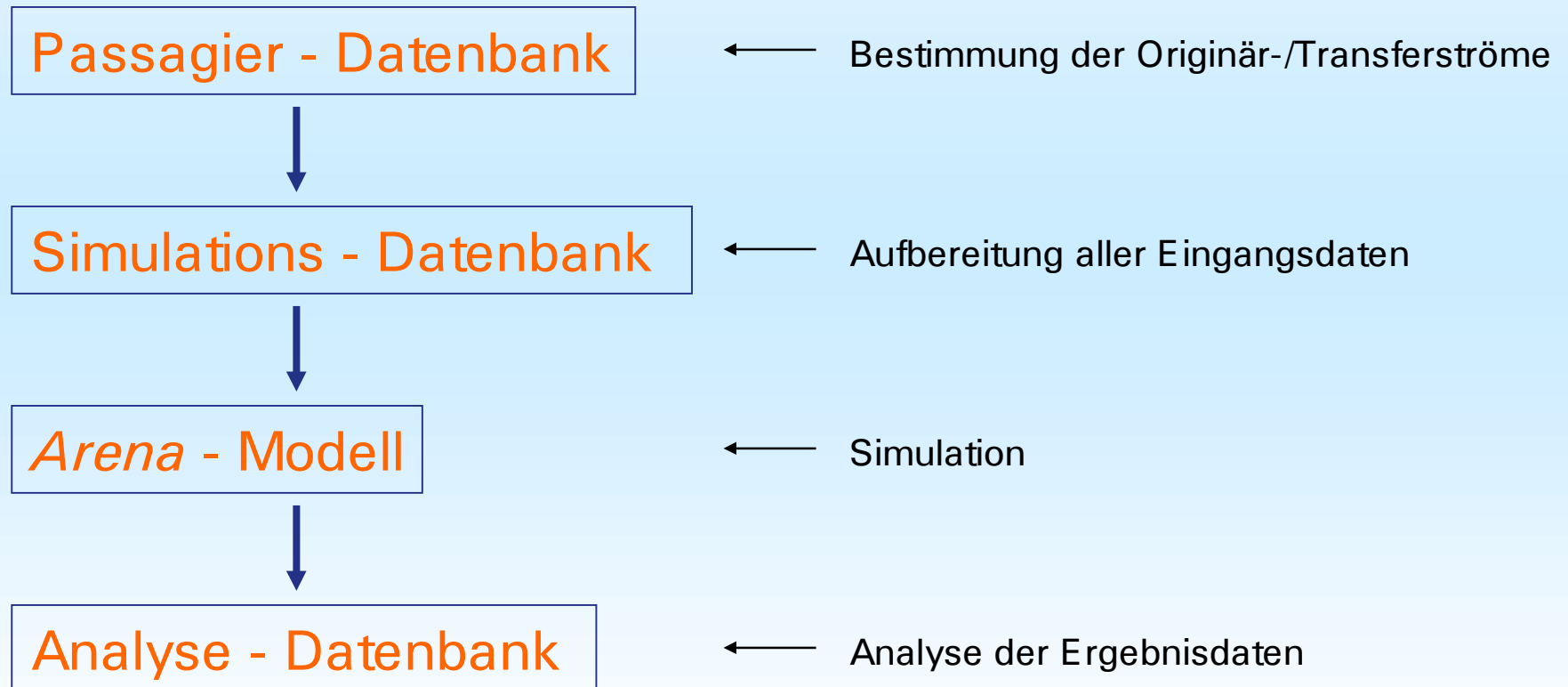
Outbound Passport Control



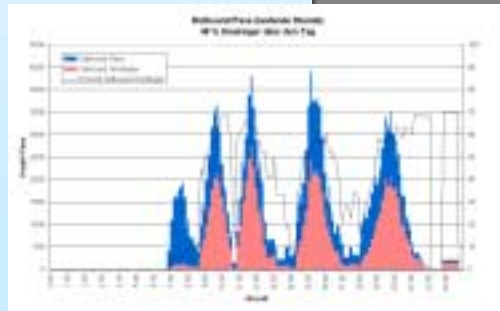
PTS

Inbound Passport Control

Komponenten der Simulation



Passagier-Datenbank



Microsoft Access

Parameter

Flugplanberechnung MUC Terminal 2

Flugplantag:

Umsteiger Umsteiger aus Netz-Tabelle verwenden

Anteil im Tagesschnitt	MCT [min]	Umsteigeslot nach MCT [h]	Max. Anteil Outbound	Max. Anteil Inbound
<input type="text" value="48%"/>	<input type="text" value="30"/>	<input type="text" value="3"/>	<input type="text" value="70%"/>	<input type="text" value="70%"/>

Auslastung

<input checked="" type="radio"/> Generell	<input type="text" value="93%"/>	Dom:	<input type="text" value="93%"/>
<input checked="" type="radio"/> Verteilt		Cont:	<input type="text" value="93%"/>
<input type="radio"/> Individuell pro Flug		InterCont:	<input type="text" value="93%"/>

Linie - Charter Zuordnung:

Enthält das Datum des Flugplans (*TT.MMJJ*)

Simulations-
Datenbank

Microsoft Access

MUC Terminal 2 Simulation

T2_Simulation_V2_200

Tabellen

Name

- Koffquot
- LadNutz
- Latenight
- Latenight_Prozen
- LVG_In_Out
- m_ac
- m_dest
- m_lv
- Map
- Map0000
- map0000_festwe
- Map0001
- map0001_festwe
- Map0002
- map0002_festwe
- Map0003
- map0003_festwe
- Map0004
- map0004_festwe
- MetaAircraft
- MetaAirline

MUC Terminal 2
Simulationsdatenbank V2.0

Prognosezeit: 17.07.06 Modifizierter Koffertfaktor

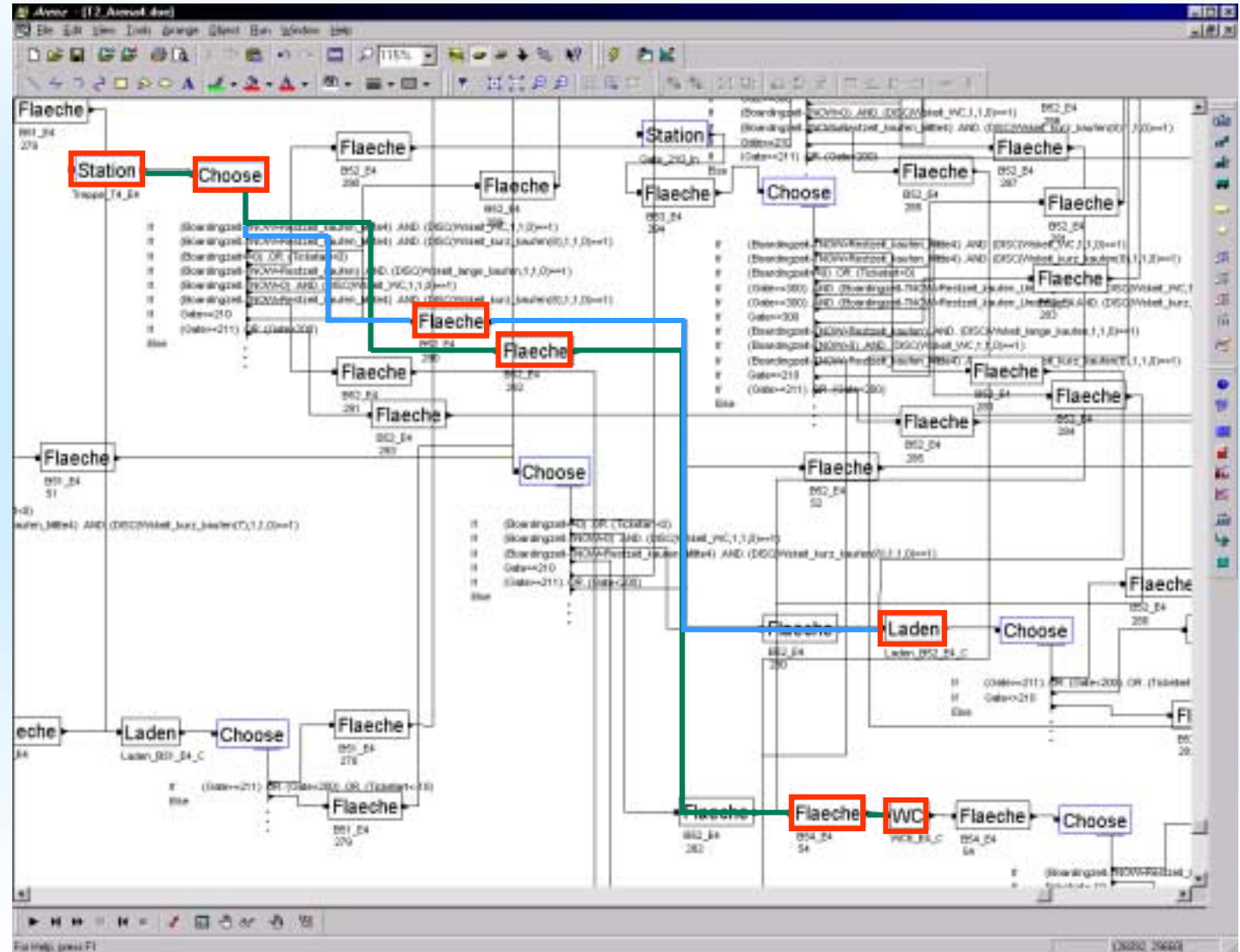
Ergebnis-kontrolle	Arena	
Datencheck	GFA Datenexport	Historie
Verrechnungstabellen		Neues Experiment
Simulations-Daten	Daten-Eingabe	Geladenes Experiment
Schedule Pass/Zoll	Schedule CKI - Counter	Experiment laden

Formularansicht

Arena Modell

Passagier geht zum WC

Passagier geht einkaufen



Template Entwicklung

unter *Arena 4*

Gate [X]

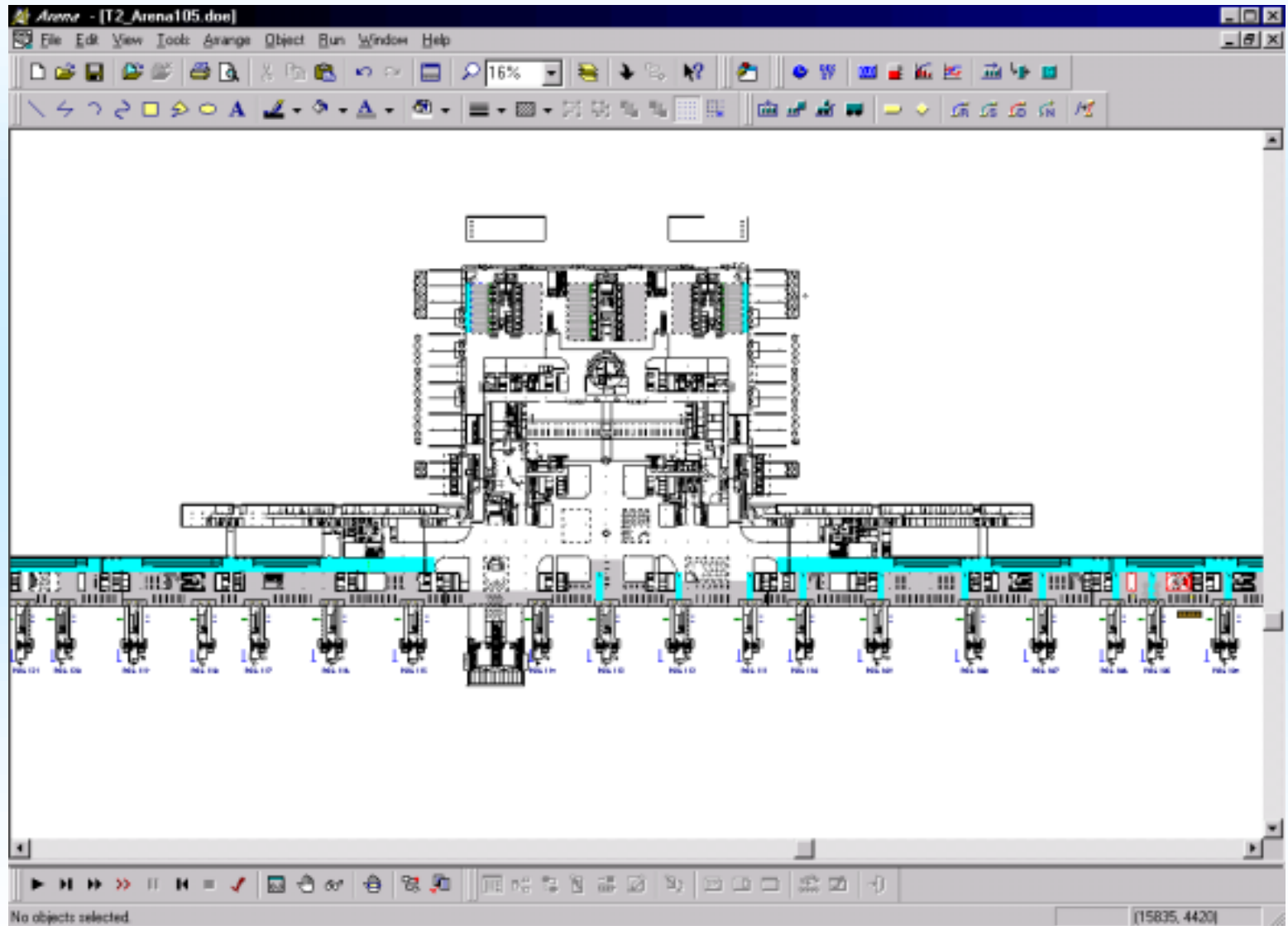
Art: Bruecke Busgate

Gate Statistik: Statistik File ID: Gate_Statistik

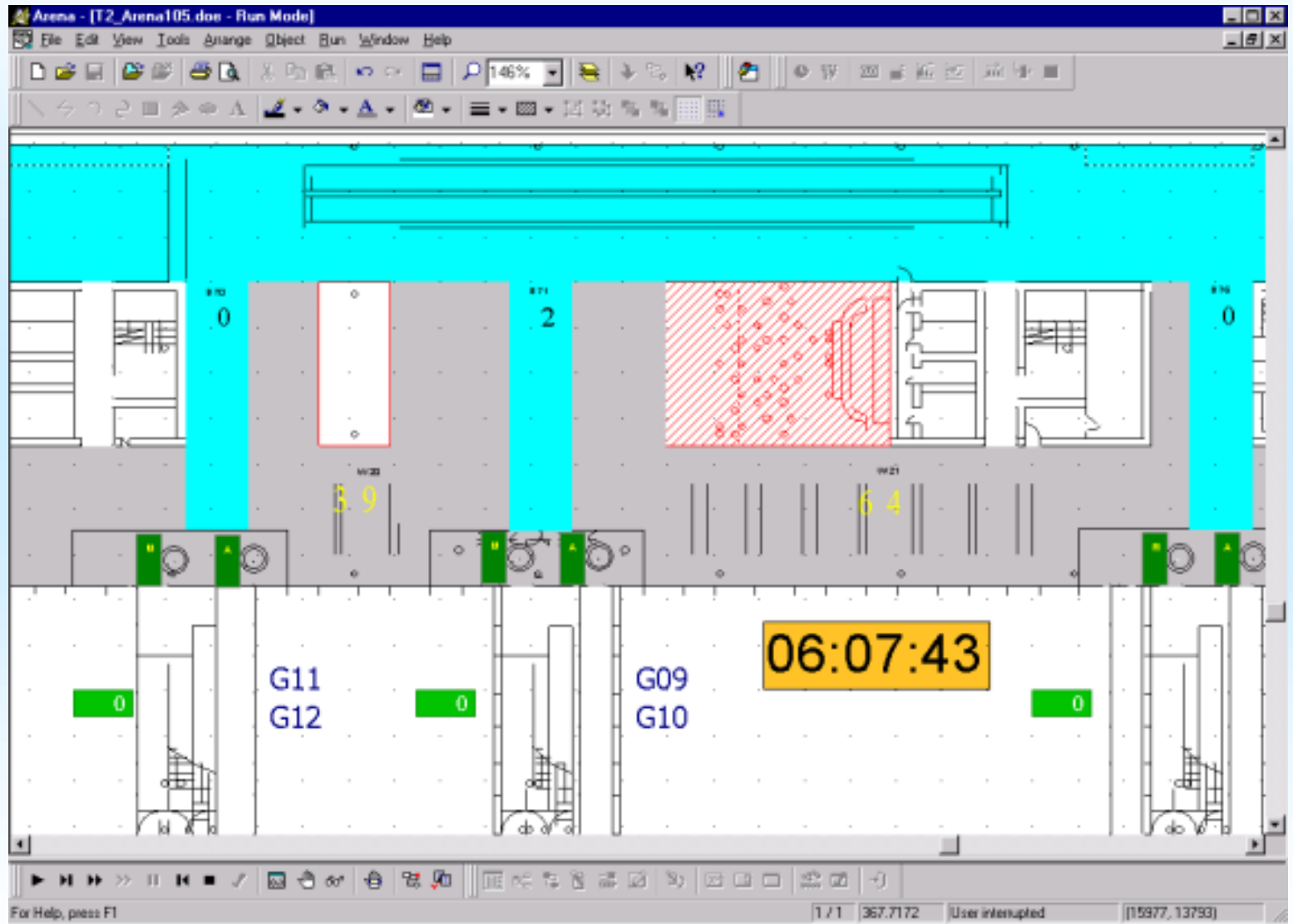
<u>G</u> ate_R:	Gate_G17_R	Ticketart:	Ticketart
<u>G</u> ate_R_Q:	Gate_G17_R_Q	Ticketart_manuell:	2
<u>M</u> an_Boarding_R:	man_Boarding_G17_R	<u>W</u> skeit_manuell:	Wskeit_manuell_Boardin
<u>m</u> an_Boarding_R_Q:	man_Boarding_G17_R	<u>Z</u> eit_man_Boarding:	Zeit_manuell_Boarding
<u>a</u> ut_Boarding_R:	aut_Boarding_G17_R	<u>Z</u> eit_aut_Boarding:	Zeit_Automaten_Boardin
<u>a</u> ut_Boarding_R_Q:	aut_Boarding_G17_R	<u>Z</u> eit_einsteigen:	Zeit_einsteigen_Flugzeug
<u>B</u> eobachtungsflaeche:	B28_E4	<u>P</u> axlaenge:	Laenge_pro_Passagier
<u>V</u> ar_Flaeche:	Var_BFlaeche_E4(28)	<u>P</u> latzbedarf:	Platzbedarf
<u>W</u> eglaenge:	Weglaenge_Gate(17)	<u>G</u> eschwindigkeit:	Geschwindigkeit
<u>S</u> tation_End:	Ende_Outbound	<u>W</u> artesignal:	Signal_Gate(17)
		<u>A</u> bflugzeit:	Abflugzeit

OK Cancel Help

Animation:
T2 Ebene 4



Animation:
Teilausschnitt



Analyse-Datenbank

The screenshot shows a Microsoft Access window titled "MUC T2 Simulation" with a form titled "Importieren und Auswerten der Ergebnisdateien". The form is divided into three columns for "Ebene E03", "Ebene E04", and "Ebene E05", and a right-hand "Optionen" section.

Ebene E03	Ebene E04	Ebene E05	Optionen
<input type="checkbox"/> B - Anzahl Paxe	<input type="checkbox"/> B - Anzahl Paxe	<input type="checkbox"/> B - Anzahl Paxe	<input type="checkbox"/> Automatische Auswertung nach Import der Daten
<input type="checkbox"/> W - Anzahl Paxe	<input checked="" type="checkbox"/> W - Anzahl Paxe	<input type="checkbox"/> W - Anzahl Paxe	<input type="checkbox"/> Ressourcen-aktualisierung nach Import der Daten
<input type="checkbox"/> B - Flächenbelastung	<input checked="" type="checkbox"/> B - Flächenbelastung	<input type="checkbox"/> B - Flächenbelastung	<input type="button" value="Import starten"/>
<input type="checkbox"/> W - Flächenbelastung	<input checked="" type="checkbox"/> W - Flächenbelastung	<input type="checkbox"/> W - Flächenbelastung	<input type="button" value="Ressourcen aktualisieren"/>
<input type="checkbox"/> B - Summe Paxe	<input type="checkbox"/> B - Summe Paxe	<input type="checkbox"/> B - Summe Paxe	<input type="button" value="Paxsumme aggregieren"/>

Optionen:

- Automatische Auswertung
- Manuelle Auswertung

File name: Anzahl_Paxe_auf_B01_E4.csv

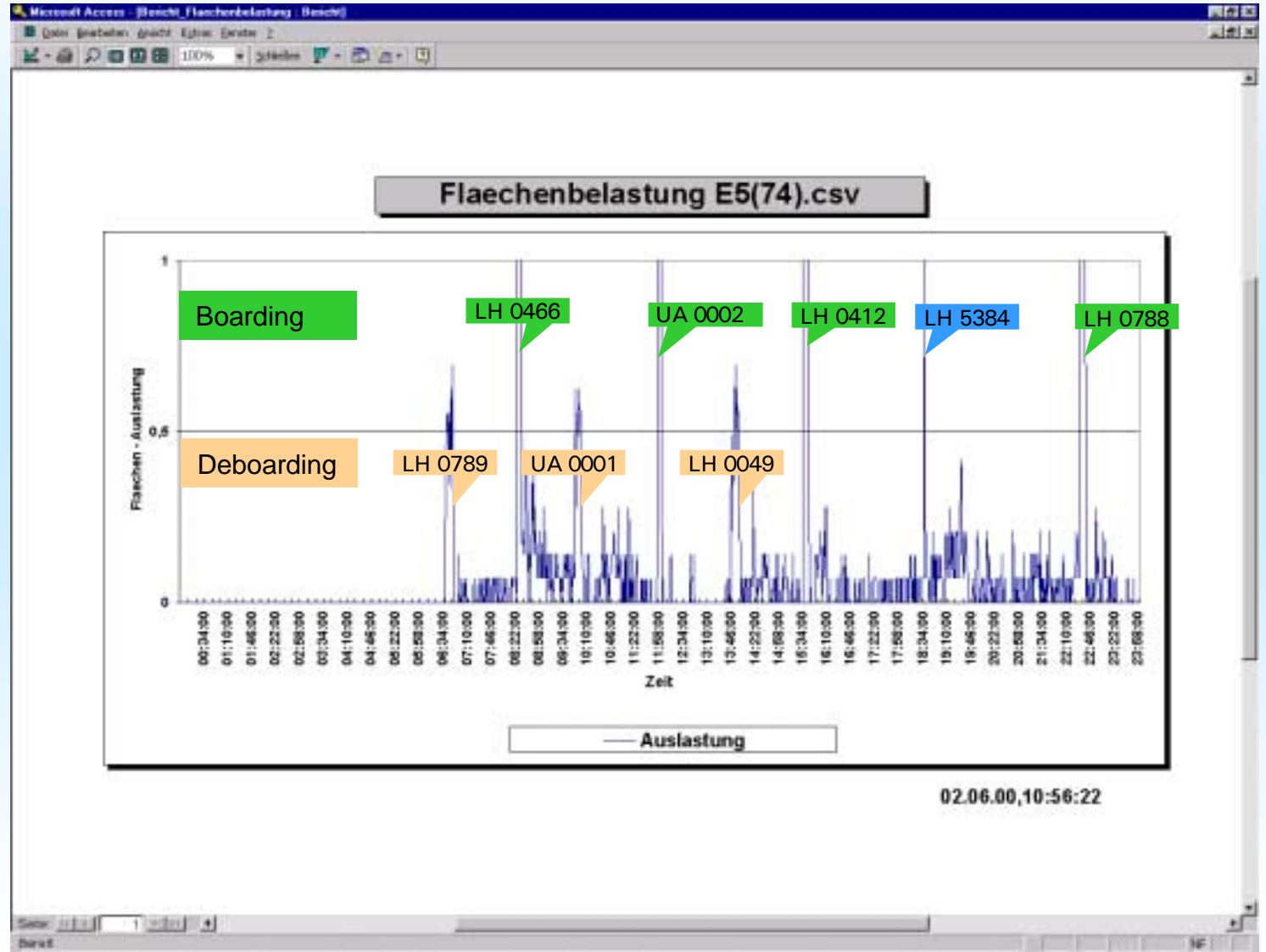
Datensatz: 1 von 1

Formularansicht

Beobachtungs-
fläche vor

Gate H13/H14
E05 (POS207)

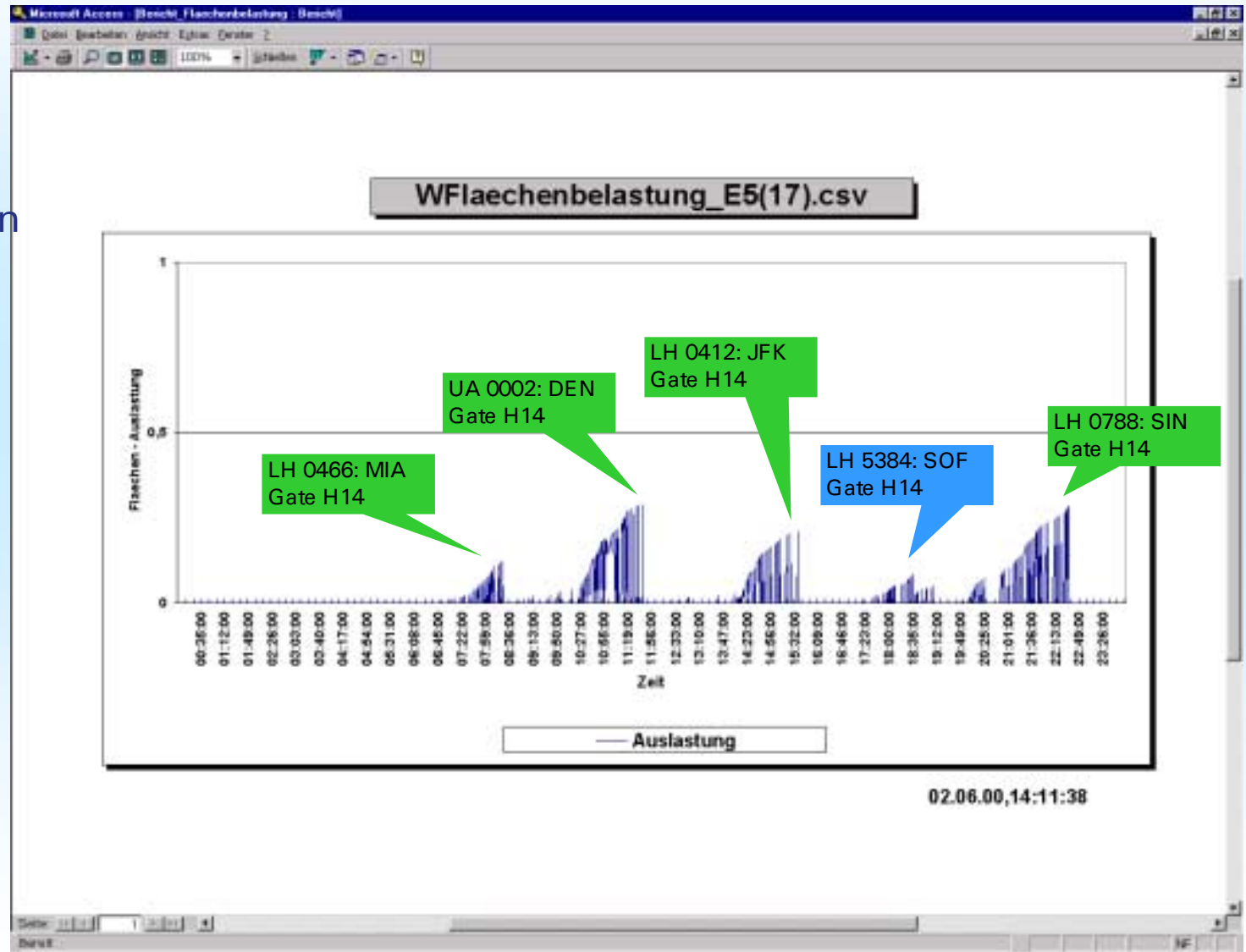
Fläche 74 in E05
33 m²



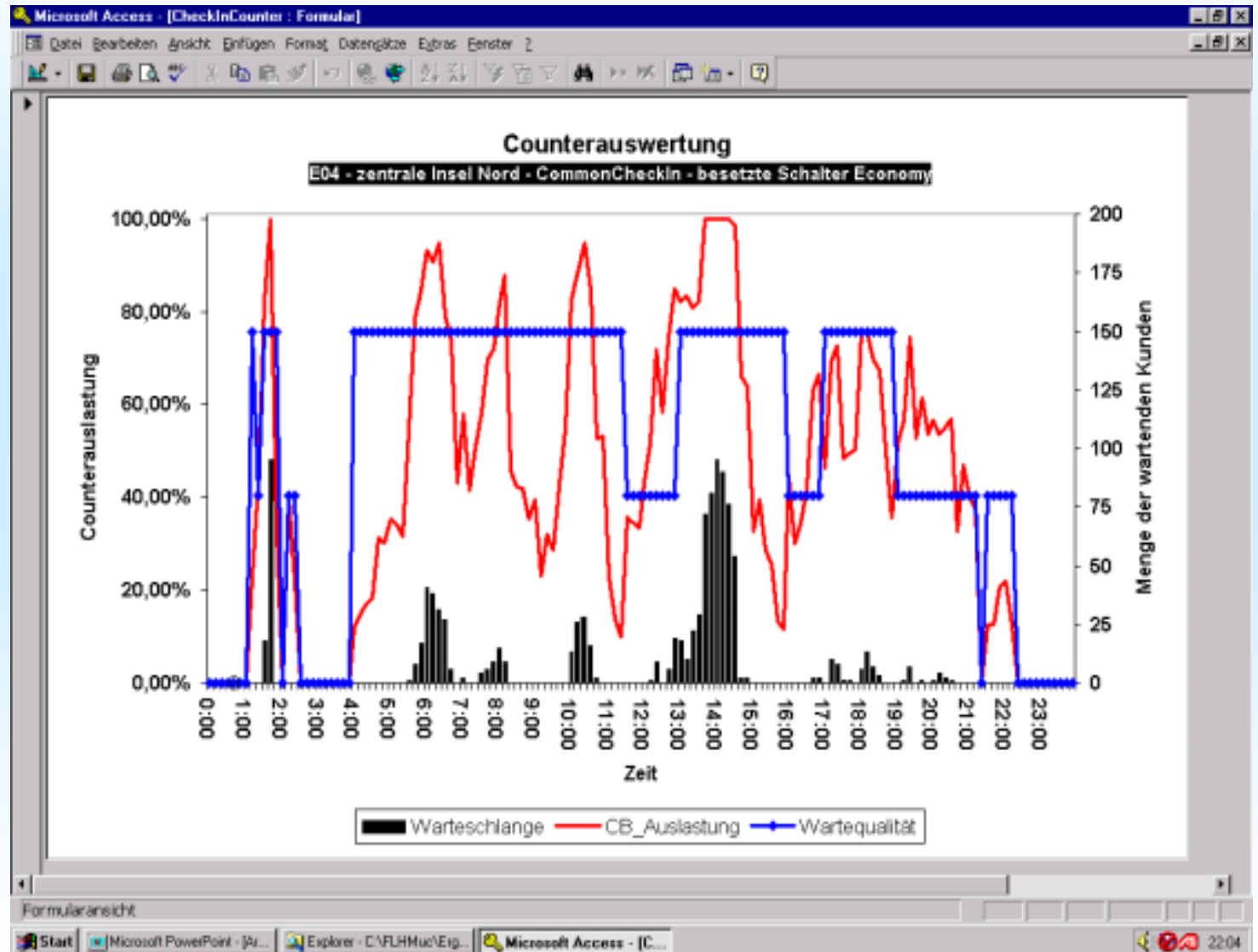
Warteraum-
nutzung

Warteraum W17 in
E05
zwischen
Pos 207 - 208

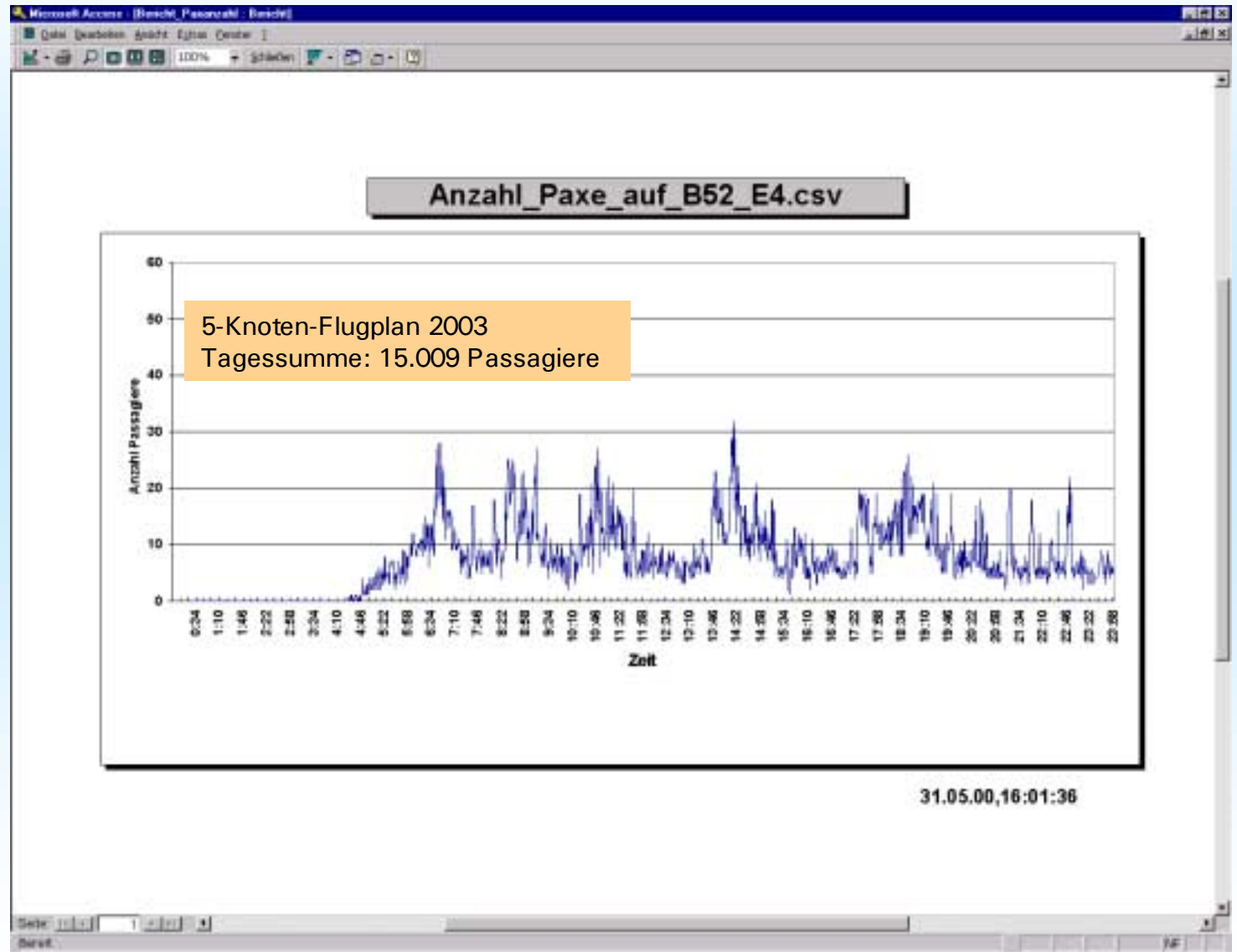
Fläche: 407 m²
2,3 m² / Passagier



Analyse der Warteschlangen



Passagierzahl
auf Fläche 52 in
E04

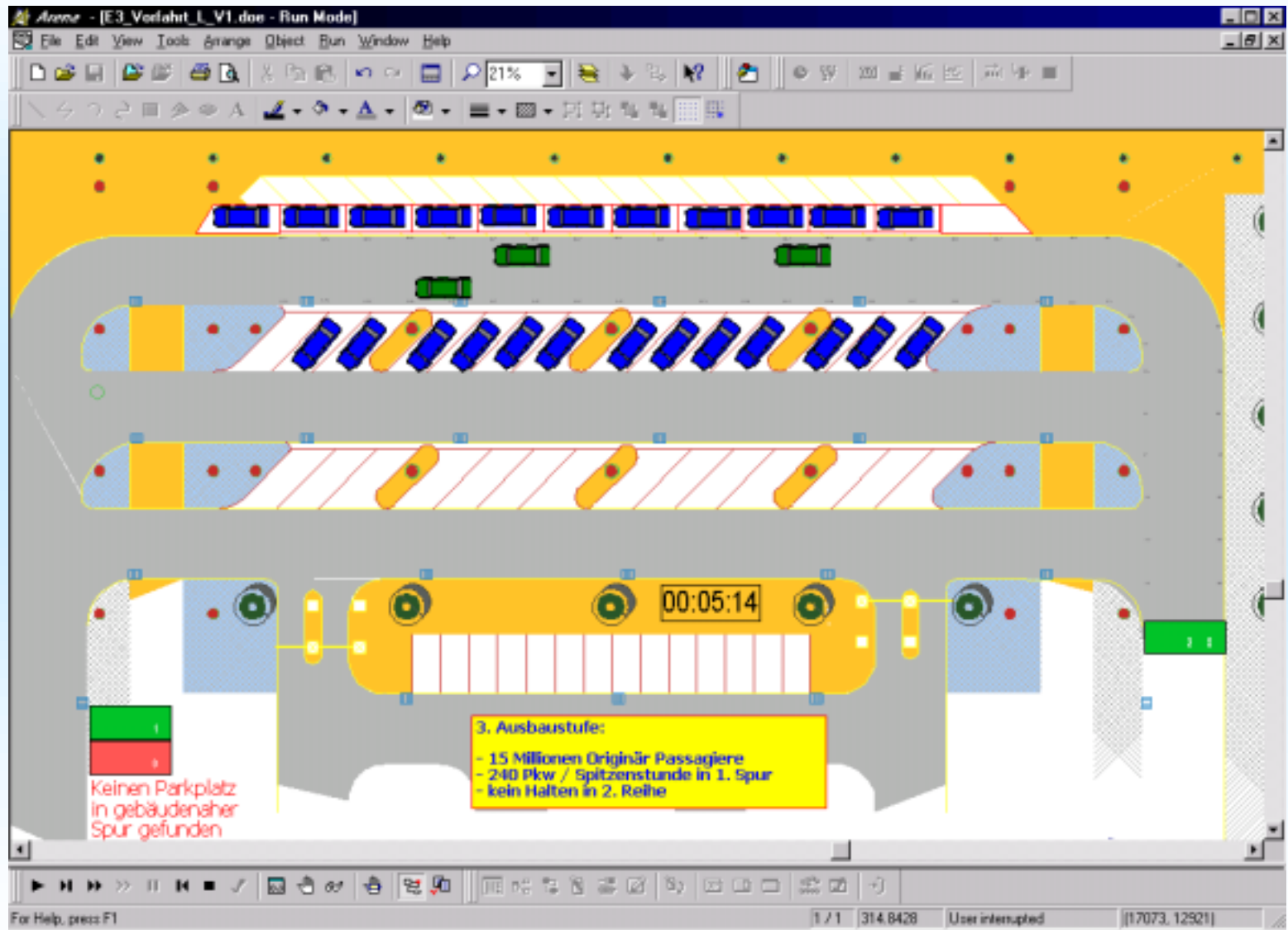


Einsatz der Terminal-Simulation

- Einbindung des LH-Check-In Konzeptes
- Disposition und Analyse der Service-Einrichtungen
- Bestimmung der MCT
- Analyse der Retailnutzung
- Belastungsänderungen (anderer Prognoseflugplan)
- (...)

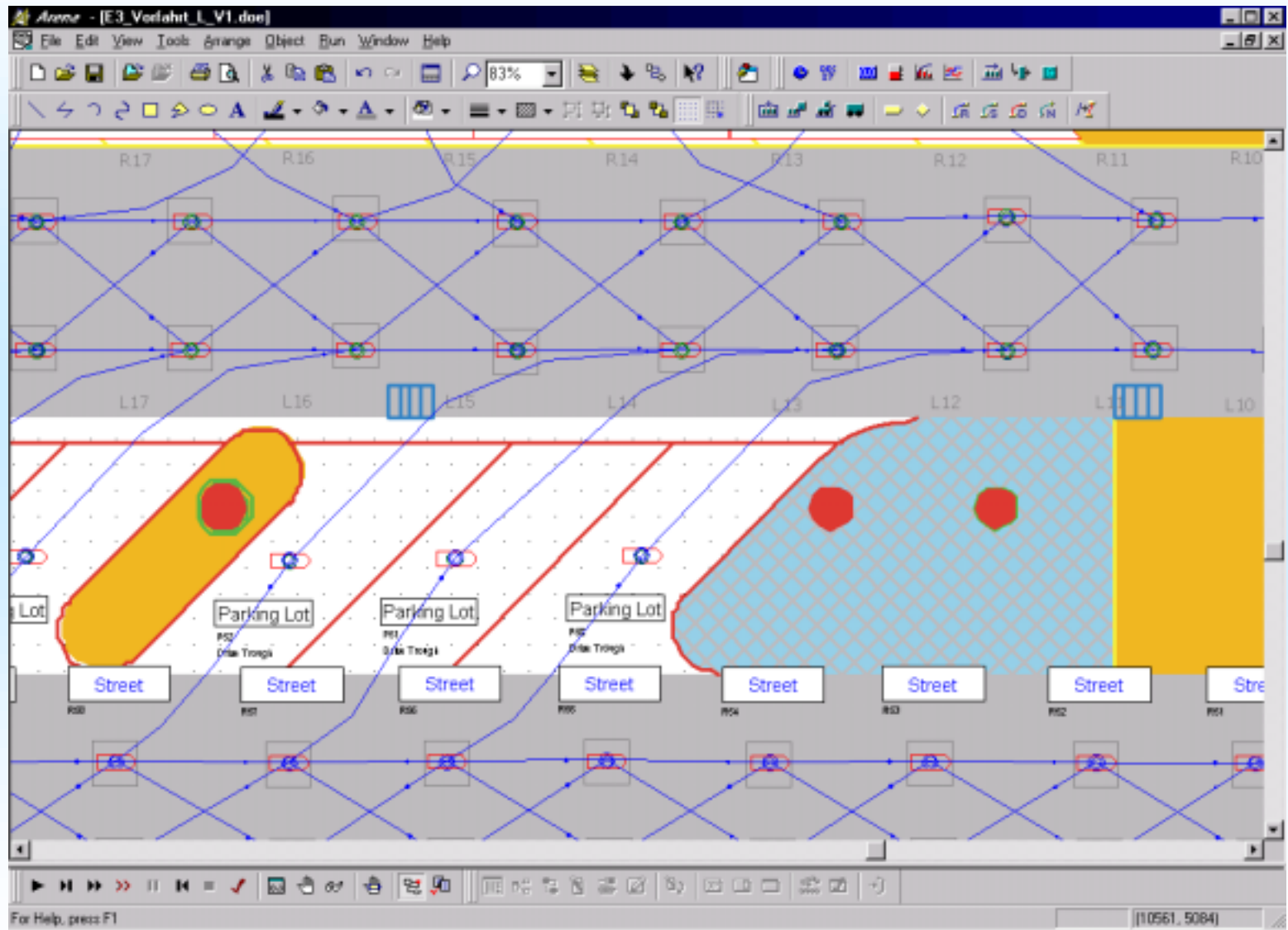
Vorfahrt-Simulation:

Terminal 2
IV Ankunft



Vorfahrt-Simulation:

Überlappende Ressourcen



Vorfahrt-
Simulation:

Template
Entwicklung

Street Section [X]

Settings

- Seize 3 Street Sections
- Downstream Line Change
- Upstream Line Change
- Parking Lot
- Hold in Second Line
- Change Line for Parking
- Intersection
- Merging

Name: R27

Picture: Car1

SL_Upstream_1: R26

SL_Downstream_1: R28

SL_Downstream_2: R29

QL Upstream 1: L26

QL_Downstream_0: L27

QL_Downstream_1: L28

QL_Downstream_2: L29

Length_Downstream: 3.5

Speed_Downstream: 25

Percent Line Change: Percent_Line_Cha

Length_LineChange: 5