

sTraffic Toll Collection System

May. 2015



sTraffic Toll Collection System

Contents

1. **sTraffic Overview**
2. **Toll Collection System**
3. ETC(RFID,IR/RF)



Contact Information:

dalma@straffic.co.kr

3rd FI KNET Bid,338 pankyoro,Bundang-gu,Seungnam, Gyeonggi-do,463-400

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We provide the
fast and safe transportation solutions
 for humans and nature

▶ General

Name • sTraffic Co., Ltd.

CEO • Moon, Chanjong

Address • 338 pangyo-ro
 bundang-gu
 Seongnam City

Factory • 31 Galmachi-ro244-gil
 Jungwon-gu
 Seongnam City

Tax ID • 144-81-09125

Founded at • 28 Jan. 2013

Business Area • Solution provider for
 Transportation and
 S/W development

▶ History

2013 • **Spin-off from SAMSUNG SDS**

2011 • UTIS for 5 major cities

2011 • Busan metro Line 4 Signaling

2010 • Busan ITS

2009 • Incheon Bridge Traffic Sys.

2007 • Hi-pass open nation wide for KEC

2006 • Daejun metro Line 1 Signaling

2004 • Seoul Bus Management System

2004 • KTX signaling phase 1

1998 • **Move to SAMSUNG SDS**

1997 • Daegu metro Line 1 Signaling

1994 • TCS open for Korea Expressway Corp.

1993 • Start Railroad business

1991 • **Start Road Transportation Business at
 SAMSUNG Electronics.**

2014 • ETCS for Misiryung Tunnel
 • TCS/ETCS for Yongma Tunnel

2013 • TCS/ETCS for Bukhang Bridge
 • TCS 2013 for KEC
 • Unmanned Toll Systems for KEC
 • E-payments for Gwangan Bridge
 • KTX Signaling for Phohang Line

▶ Resources

Patents • 54 registered

Solutions • Road: Multilane Toll
 System and 7 others
 • Railroad: Signaling
 System and 4 others



Managing Support Team

Road Transportation Division

- Toll Collection System(TCS)
- Electronic Toll Collection System (ETCS)
- Traffic Management System
- Bus Management System

Railroad Transportation Division

- High speed railroad signaling system
- Railroad signaling system
- Railroad Communication System
- Transportation SI

Research Institute

- Next generation Toll Collection System
- Next generation Railroad System

Ensure business continuity by road transport business, railroad signaling / communications business related tangible and intangible assets transferred from SAMSUNG SDS

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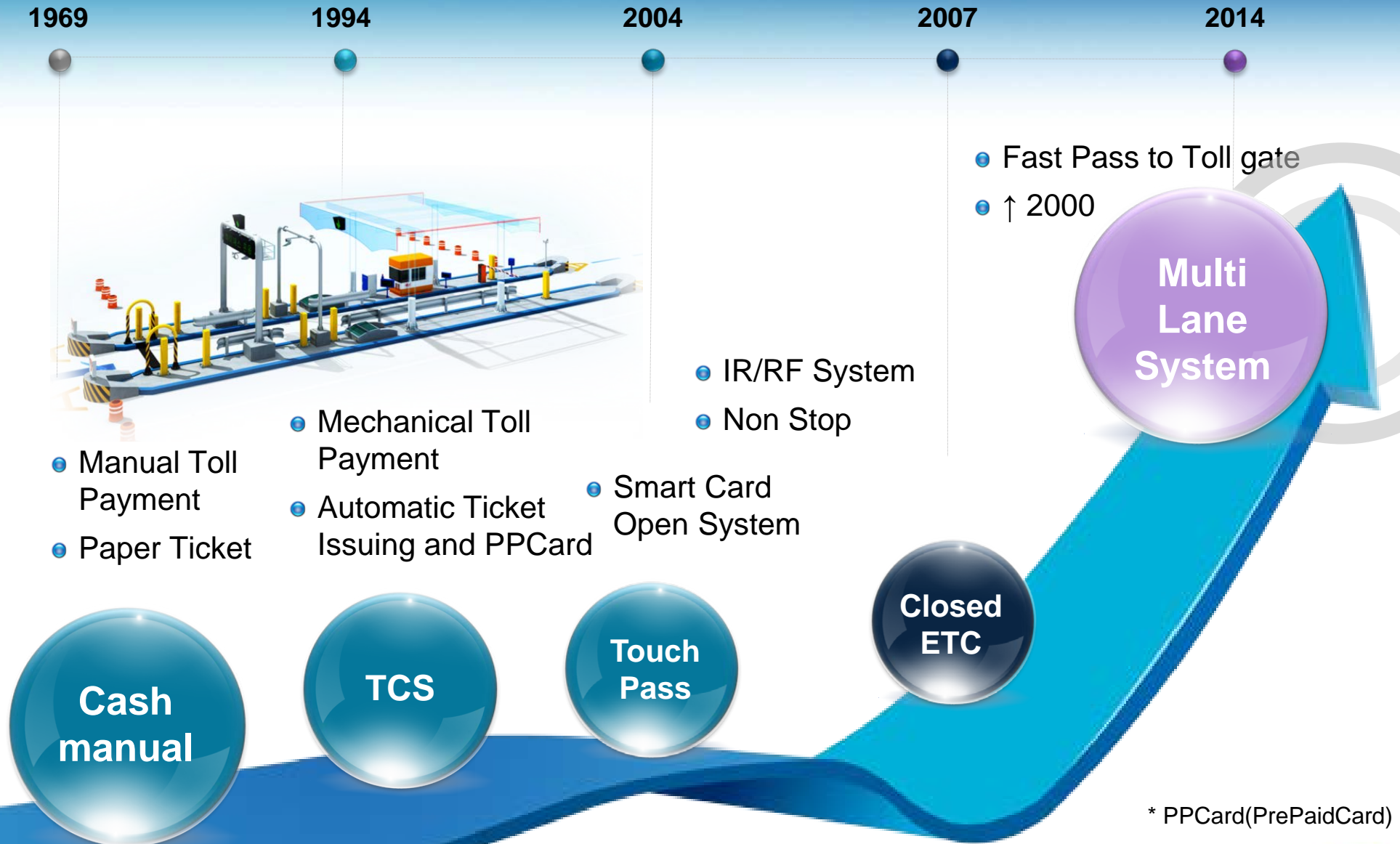
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Toll Collection History in Korea

1. Toll Collection System



Benefit of Toll Collection System

1. Toll Collection System



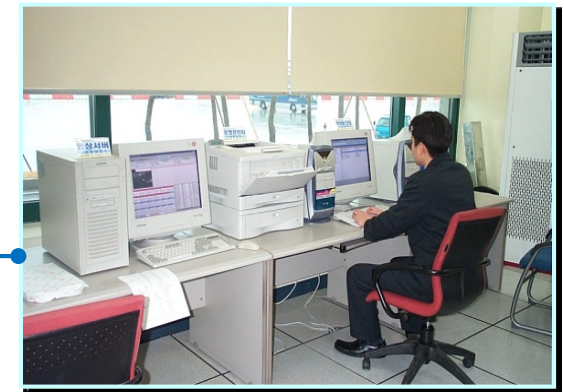
**Reduce
Tollgate
Congestion**

**Intelligent
Automatic
System**



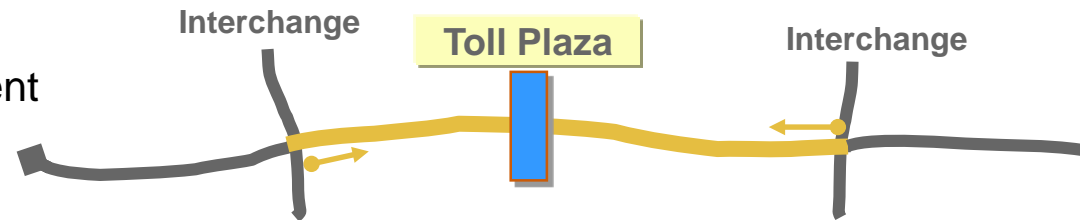
**Various
Payment
Method**

**Inspection
Transparency &
Accuracy**



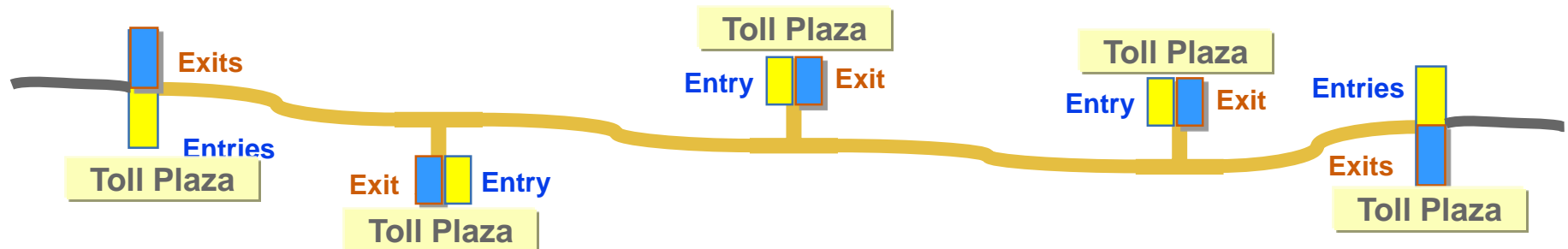
Open TCS

- Toll fee according to Vehicle classification
- Adapted to short distance road in urban area
- Cash, magnetic prepaid card, Smart card and ETC(Electronic Toll Collection) payment

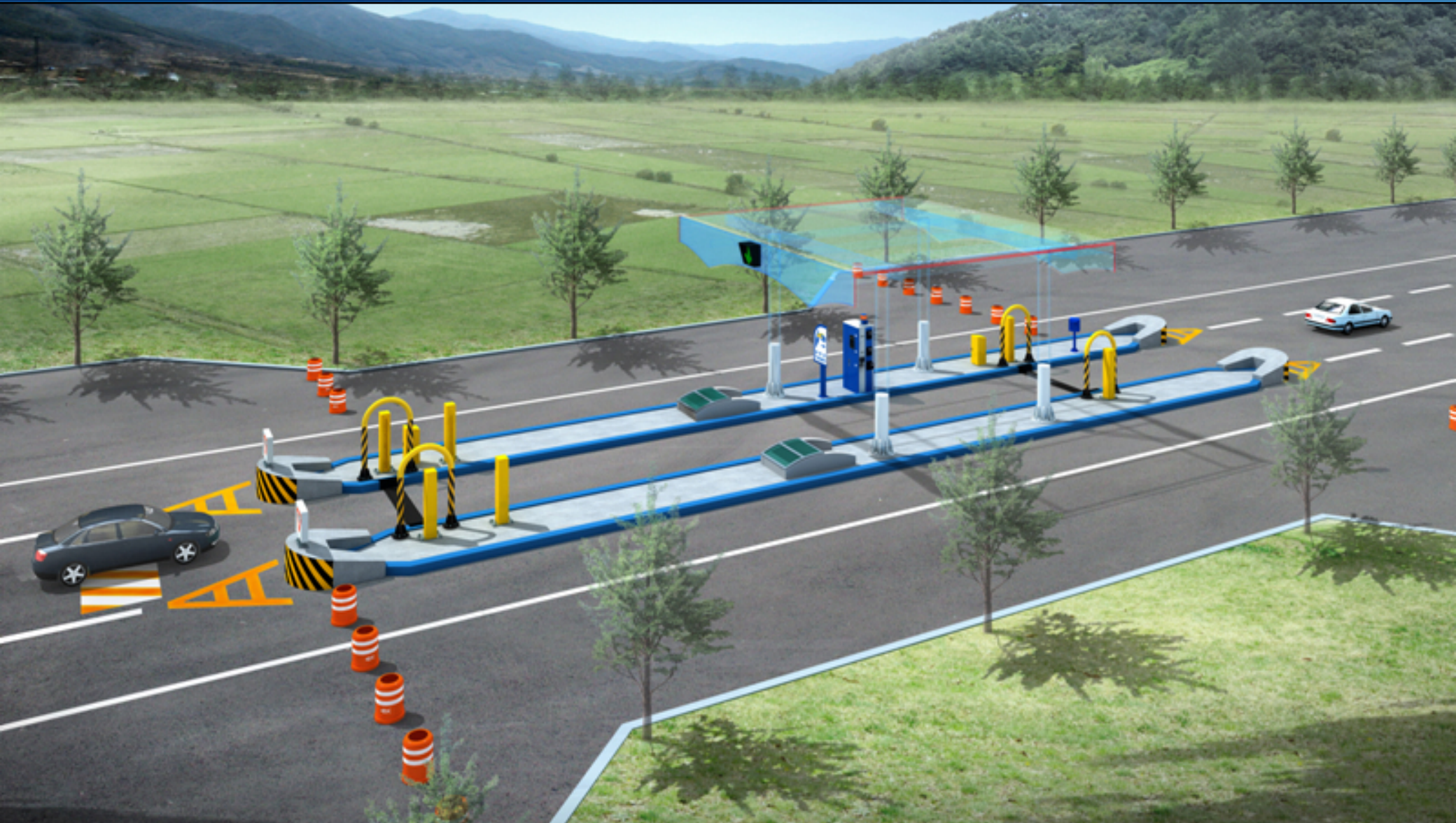


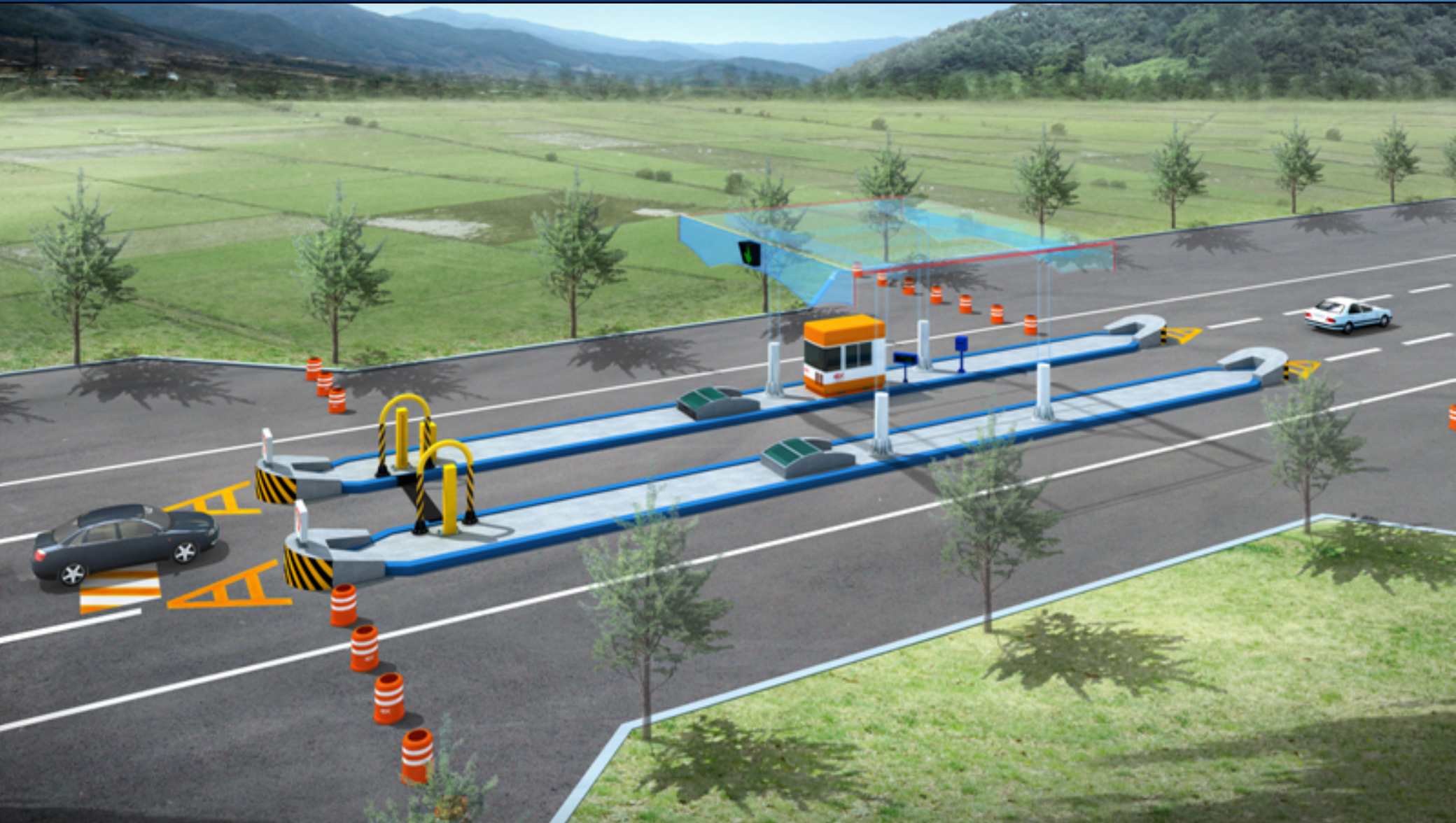
Closed TCS

- Entry and exit lanes
- Adapted to long sections with few interchanges
- Toll fee according to mileage and vehicle classification
- Transaction based on entrance ticket or OBU (ETC)



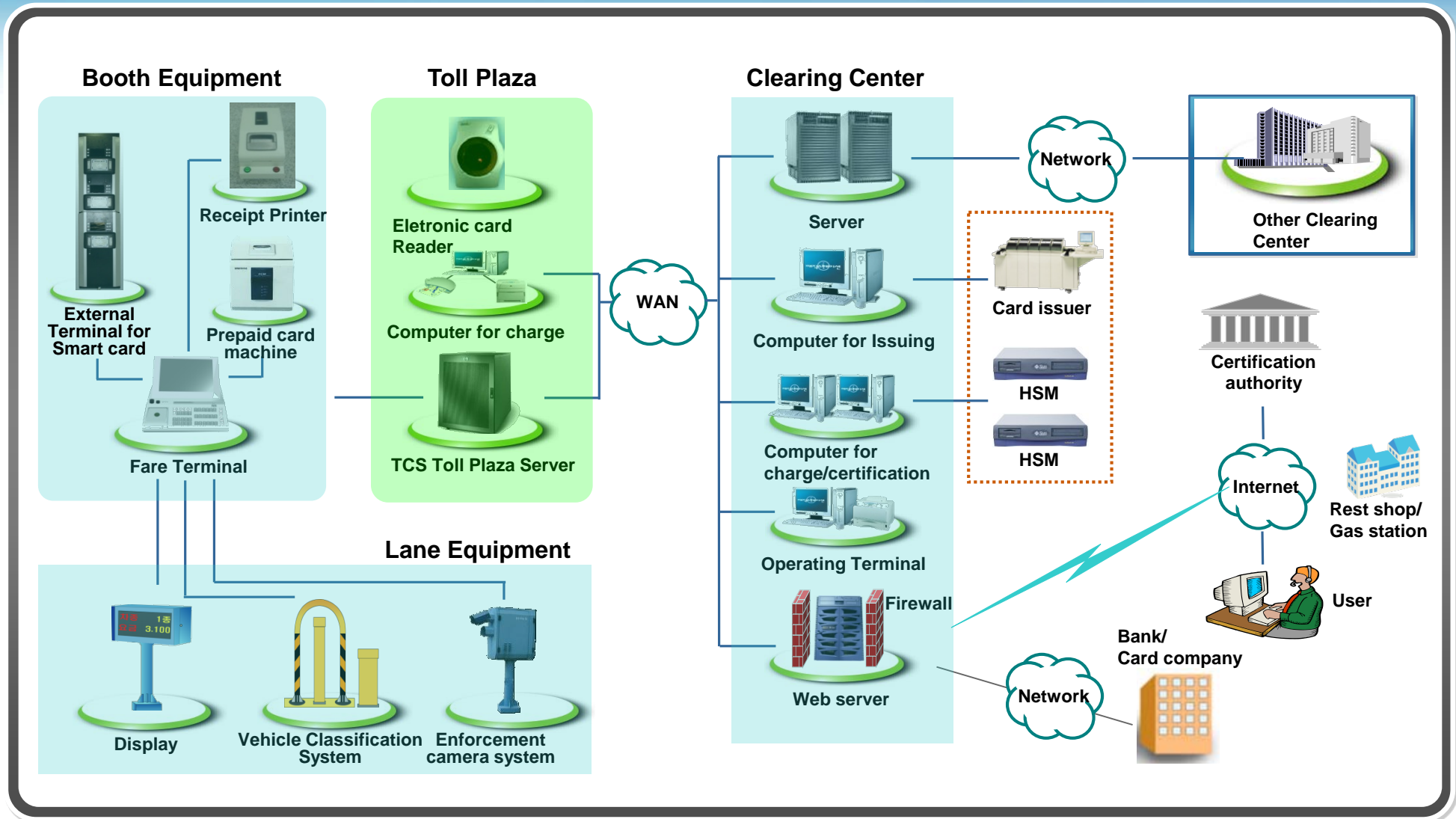






Toll Collection Payment System Diagram

1. Toll Collection System



*HSM(Hardware Security Module)

Vehicle Classification System

- ③ Classify Small vehicle
- ③ Classify the class of vehicles with under 120km/h
- ③ Sense tow-bar with over 30mm
- ③ Classify cars by sampling tread, wheel width per 10mm units (99.7% Accuracy)



Vehicle Class & Fare Display

- ③ Display the transmitted information within a second
- ③ Display various characters, symbols, figures and information
- ③ Light control function



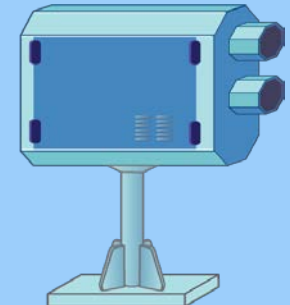
External Terminal For Smart Card

- ③ Antenna can separate on a collision
- ③ Voice information
- ③ Electronic card reading ability over 50mm
- ③ Pre and post-payment processing possible



Enforcement Camera System

- ③ Collet photographing with under 70Km/h
- ③ Control the light by judging whether the day or night
- ③ Backup data for 2 days while disconnected
- ③ Constant temperature, dust prevention Structure



Toll Terminal

- ④ Main Controller for toll collection
- ④ Toll Terminal & Lane Controller separate model
- ④ 15" color graphic TFT LCD
- ④ 22,000 vehicles backup while disconnected



Receipt Printer

- ④ High-speed printing
- ④ Indicate for shortage of paper
- ④ Auto Cutting function



Prepaid Card Machine

- ④ Protect a fault and wrong by using prepaid card in collection process
- ④ Magnetic Type Use
- ④ Card Reading ability 99.9%
- ④ Prevent Falsification by using hologram



Automatic Ticket Issuer

- 3 different issuing mouth with magnetic strip reader
- Fast issuing time by separation of issuing and holding parts (1.5 Sec)
- Ticket cassette changeable



* BLDC Motor(Brushless DC Motor)

Touch Screen Toll Terminal



1. Intuitive view, through concisely shaped Lane
2. Improve readability by using iconic images and color, which representing vehicle according to vehicle class
3. Focus through animation effect, when currently processing vehicle is moving
4. Rated representation with video information and processing information
5. Display information about previously processed vehicle
6. Optimized button configuration fitted to work flow



Shift report

근무 확인서

광안대로
 근무일자: 2002.1.17(木) 근무번호: 0101 근무자: 삼성SDS(1999) 차로별: 하행이 근무시간: 2002.01.17 12:13:14 ~ 2002.01.17 17:13:14 처리상태: 수결
 출력시간: 2002.02.19(수) 11:58:12

1. 차량 대수

구분	대수	소계	금지 처리 오차
건전	20	0=0-0	0=0-0
불량	2	18	0=0-0
정산	18	0=0+0	0=0-0
건전 총	1	19	1

2. 수입 내역

구분	건수	금액	금액합계	과부족 금액
하나라드	3	2,000		0 - 0
하이패스	4	3,500	15,000	
정수할 현금	8	9,500	9,500	
정수할 현금	***	9,700	9,700	
하이패스	0	0	0	

3. 차종별 처리 내역

구분	경차	소형차	대형차	소대형	합계
현금	1	4	2	1	8
하나라드	2	1	0	0	3
하이패스	1	3	0	0	4
대수	0	1	0	0	1
도주	0	1	0	0	1
사무실(기타)	0	2	0	0	2
처리대수	4	12	2	1	19
금지대수	4	11	2	1	18
오차	0	1	0	0	1
현금	500	4,000	3,000	2,000	14,000
하나라드	1,000	1,000	0	0	2,000
하이패스	500	3,000	0	0	3,500
소계	2,000	8,000	3,000	2,000	15,000
대수	0	0	0	0	0
불량요금	0	0	0	0	0

4. 특별처리 건수

구분	건수	사무실(기타)	건인	차종변경
내역	1	2	1	0

5. 보고서 번호: W1010

Daily report

정수집계 보고서

광안대로
 근무일자: 2002.1.17(木) 날짜: 월요일
 출력시간: 2002.02.19(月) 19:10:31

1. 현금 정수집계

구분	①근무자 정수	②사무실 정수	③미수금 정수	④과당금	⑤기타	⑥환불	⑦합계	⑧회수권	⑨순현금
금액	1,234,500	4,600	1,000	6,500	3,200	2,000	1,247,800	10,000	1,237,800

2. 카드 정수집계

구분	정산 건수	미정산 건수	건수 합계	①정산 금액	②미정산 금액	③=0-0 금액 합계
하나라드	51	1	52	48,000	700	47,300
하이패스	20	0	20	19,800	0	19,800
합계	71	1	72	67,800	700	67,100

3. 차종별 처리 내역

구분	경차	소형차	대형차	소대형	합계
현금	10	20	15	3	48
하나라드	11	12	13	14	50
하이패스	12	13	14	15	54

4. 비교

폐쇄차로 통행대수	1
오늘 발생 미수금 총액 (오늘 발생 부가통행료)	3,400
부족금 합계	5,400



Customer Web

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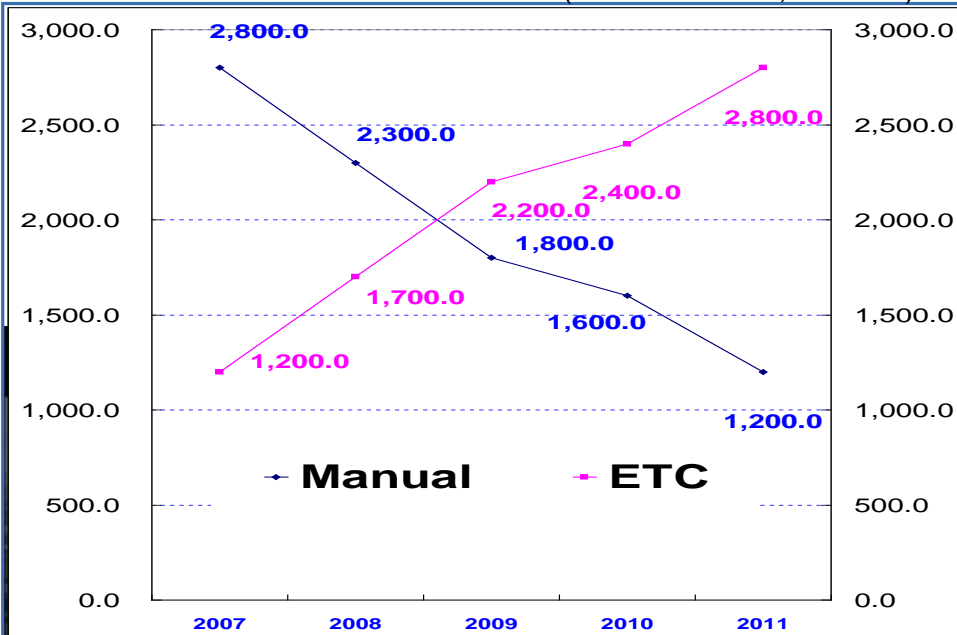
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Manual vs. ETC (Traffic Vol. per day)

(Unit : Thousand, Vehicles)



- ETC : 233% Increase
(1,200 thousand → 2,800 thousand)
- Manual : 43% Decrease
(2,800 thousand → 1,200 thousand)

Improvement of Traffic Flow at Tollgate

TCS Entrance



600 vehicles/hour

TCS Exit



260 vehicles/hour

ETC(IR/RF,IR)



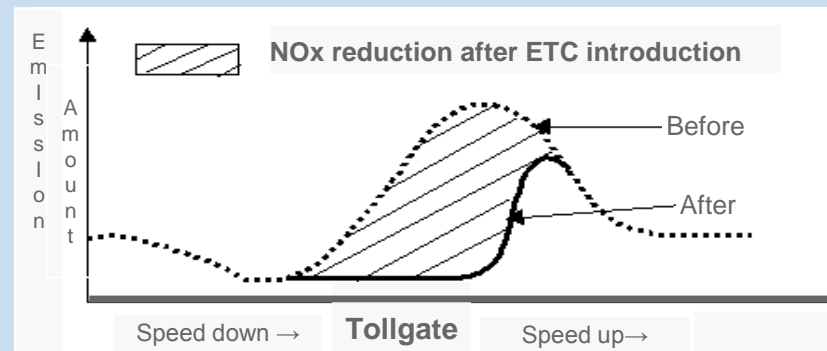
1,200 vehicles/hour

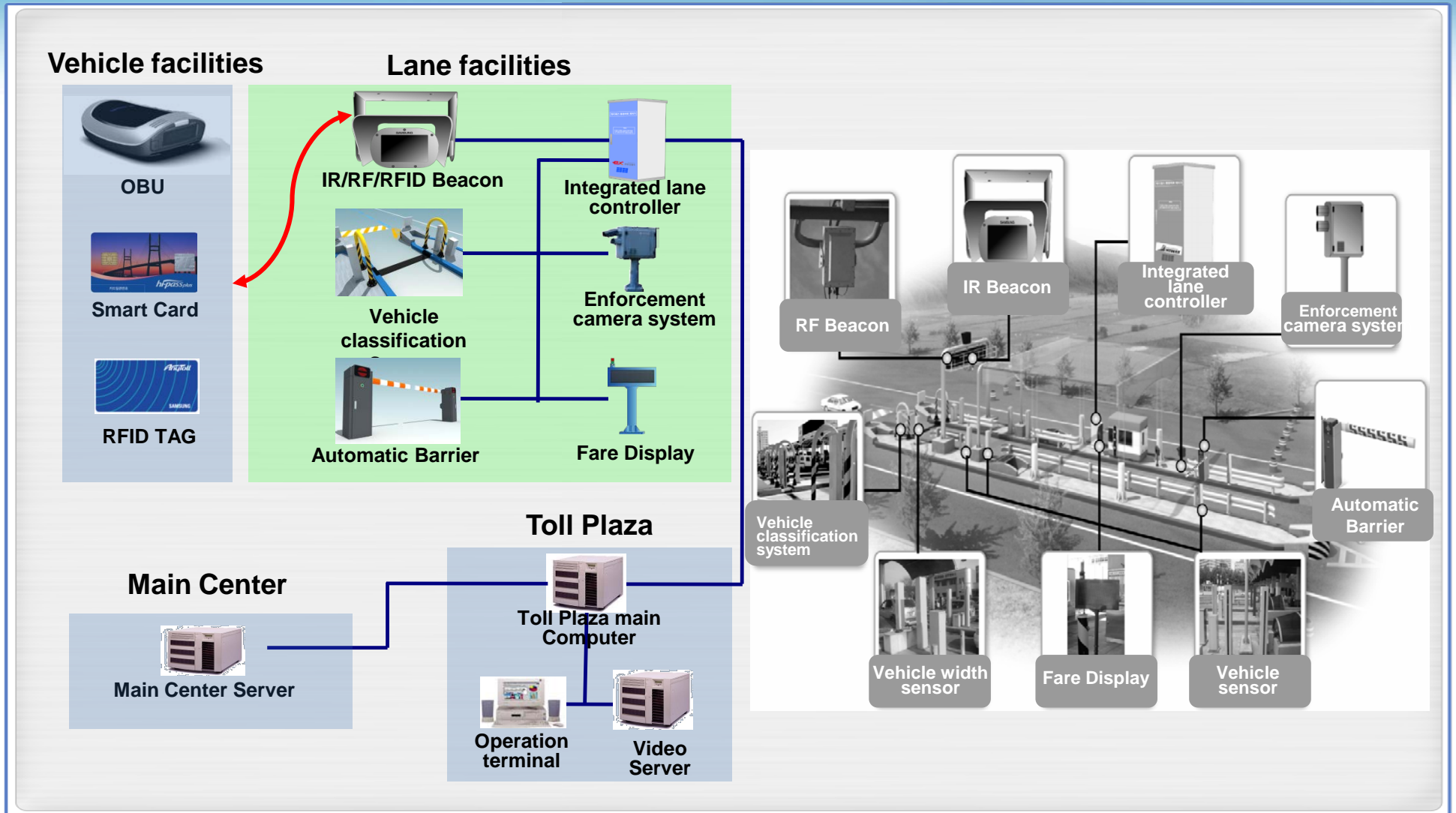
ETC(Multi)



Over 2,000 vehicles/hour

Improvement Thanks to the NOx Reduction







OBU / Tag

- IR DSRC OBU
 - 5.8GHz DSRC OBU
- * OBU(On Board Unit)



IR Beacon

- 100% localization
- IR(800nm ~ 900nm) DSRC
- 1Mhz Communication Speed



RF Beacon

- 100% localization
- 5.8GHz RF DSRC
- 1Mhz Communication Speed



Lane Controller System

- Process 40,000 vehicles while disconnected
- Accommodate IR and RF simultaneously



Vehicle Classification System

- 97% vehicle type classification at a speed of below 160Km/h
- 99.9% vehicle detection at a speed of below 120Km/h.



Enforcement Camera System

- Image of violation vehicle photographing
- Automatic letter extraction from photographed license plate



Fare Display

- Display various letters, signs and number
- Self-diagnose function and the test points are had built-in



Automatic Barrier

- Swing off function
- Within 0.6 second operation



Tag

- RFID Tag (ISO 18000-6C)



RFID Antenna

- Passive RFID
- 860 ~ 960 MHz UHF band



RFID Reader

- Passive RFID
- 860 ~ 960 MHz UHF band
- RF Power : less than 1 W (30dBm)

* DSRC(Dedicated Short Range Communication)



OBU / Tag

- IR OBU
- RFID Tag (ISO 18000-6C)

* OBU(On Board Unit)



IR Beacon

- 100% localization
- IR(800nm ~ 900nm) DSRC
- 1Mhz Communication Speed



RF Beacon

- 100% localization
- 5.8Ghz RF DSRC
- 1Mhz Communication Speed



RFID Antenna

- Passive RFID
- 860 ~ 960 MHz UHF band



RFID Reader

- Passive RFID
- 860 ~ 960 MHz UHF band
- RF Power : less than 1 W (30dBm)



Lane Controller System

- Process 40,000 vehicles while disconnected
- Accommodate IR and RF simultaneously

* DSRC(Dedicated Short Range Communication)

Toll Collection System by using RFID Tag

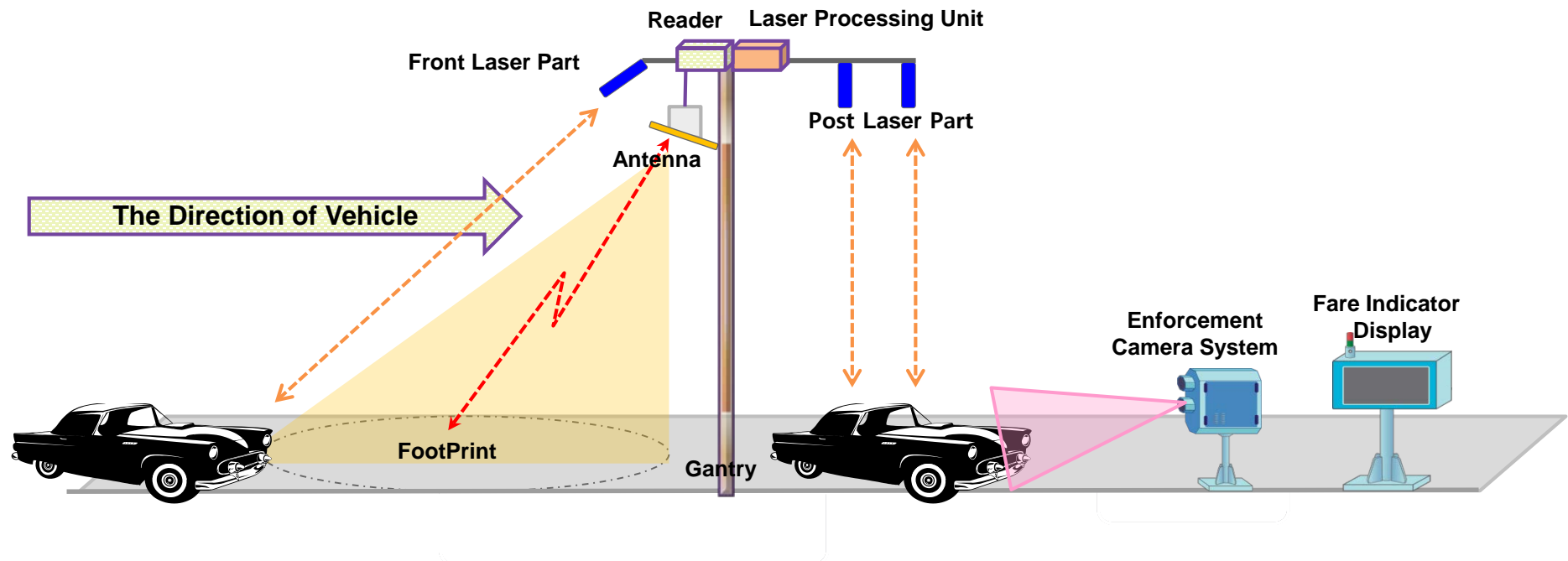
Support ISO 18000-6C Protocol (EPC Class 1 Gen2)

UHF (865 ~ 928 MHz) Frequency

Passive RFID Technology

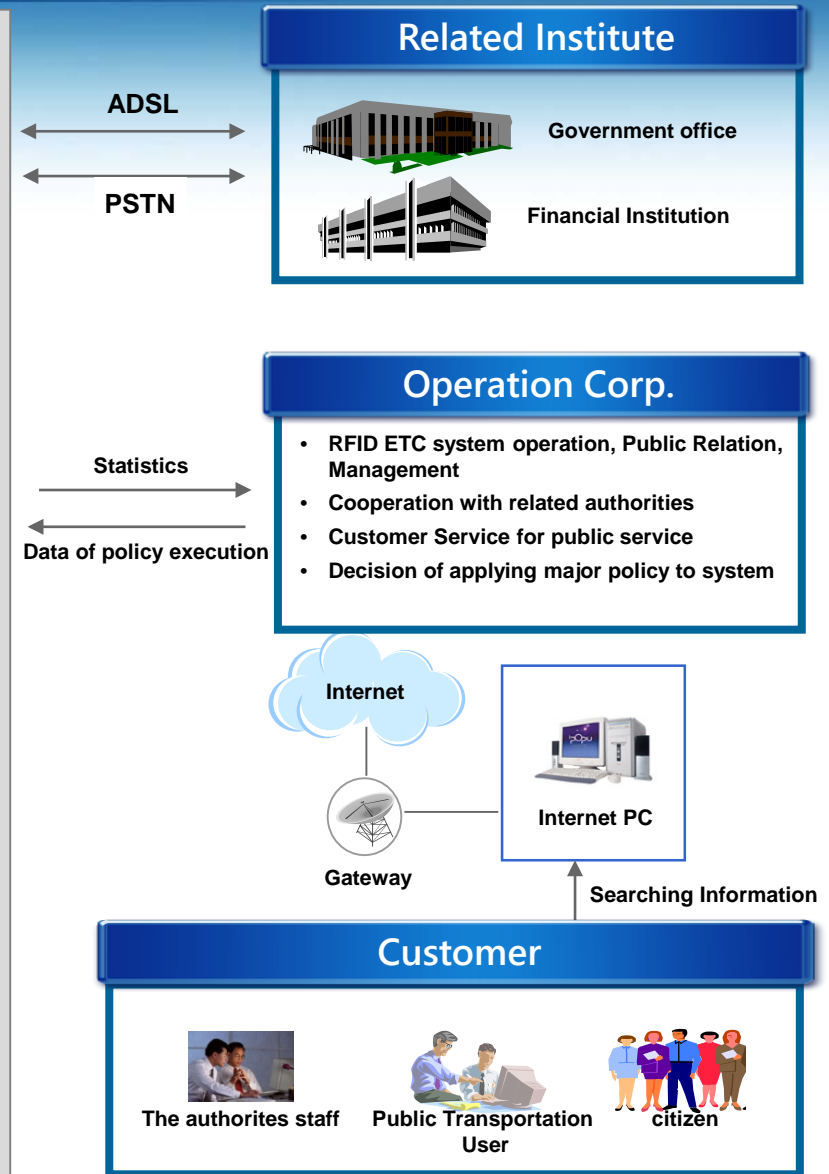
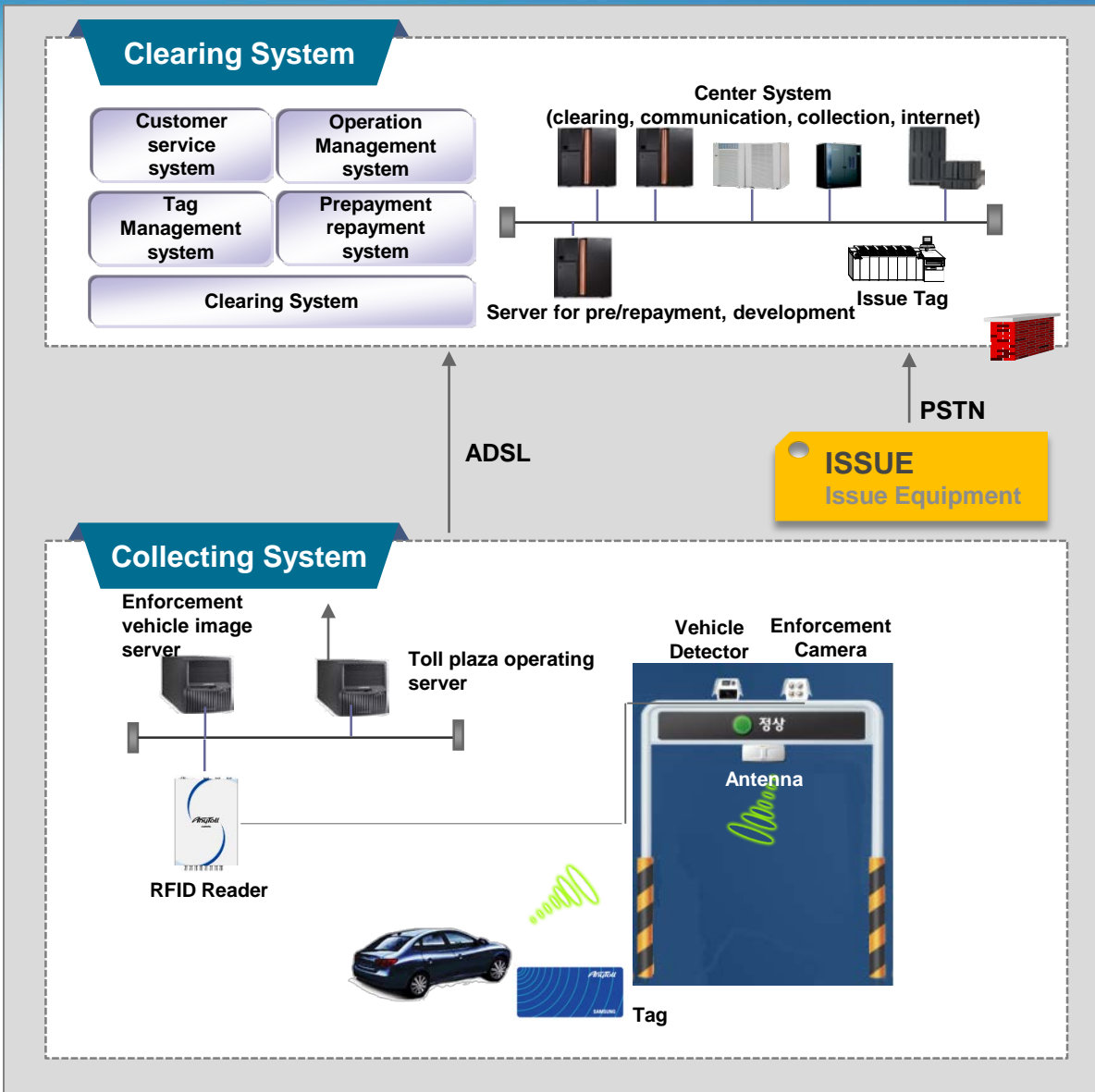


- AnyToll Tag is an Electronic Toll Collection System using RFID with UHF(860~960MHz) band.
- The Tag and Reader support ISO 18000-6C protocol.
- The system has the capacity to collect toll from the vehicle, which is passing at 160Km/h in a single lane.
- A reader can process the received data of 4 antennas.
- There are two types of tags. One is for inside vehicle, the other is outside vehicle.



ETCS(RFID) Network Diagram

2. ETCS(RFID)



1rd

~1994

Entrance Traffic Jam



2rd

1994~2010

Exit Traffic Jam



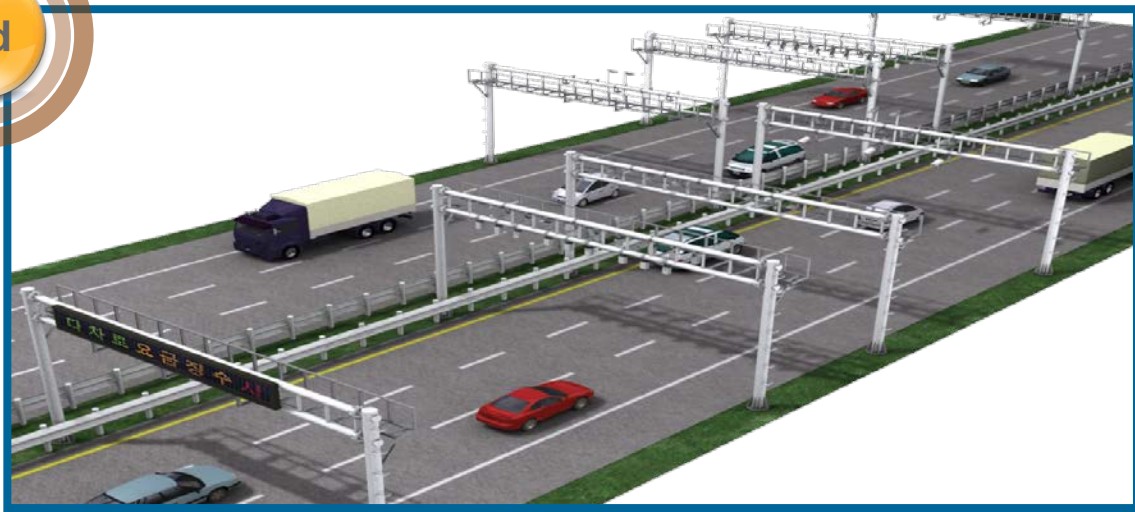
3rd

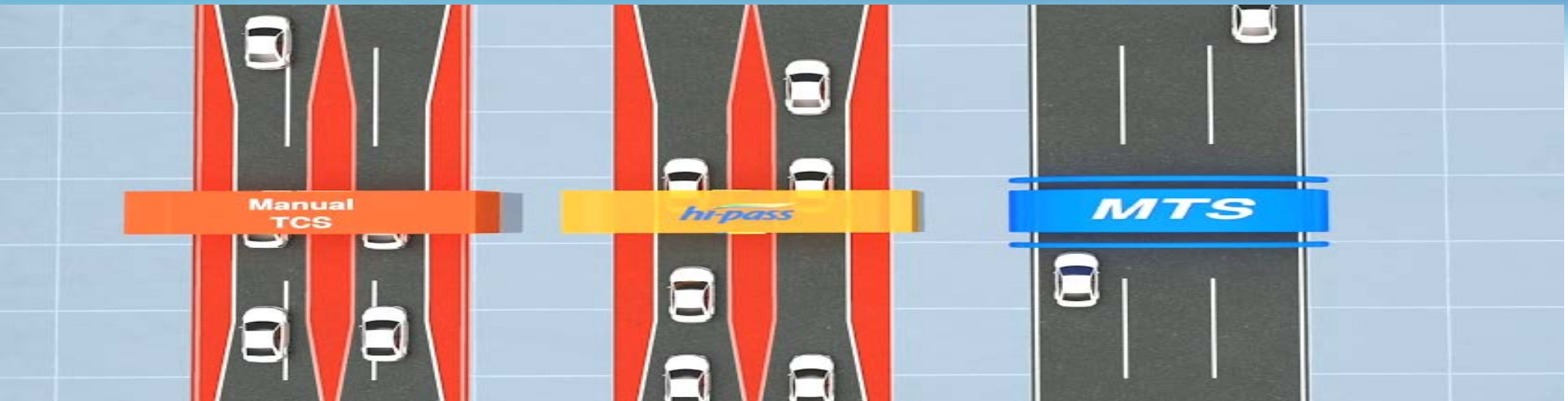
2002~

Increase Accident



4rd





ETC

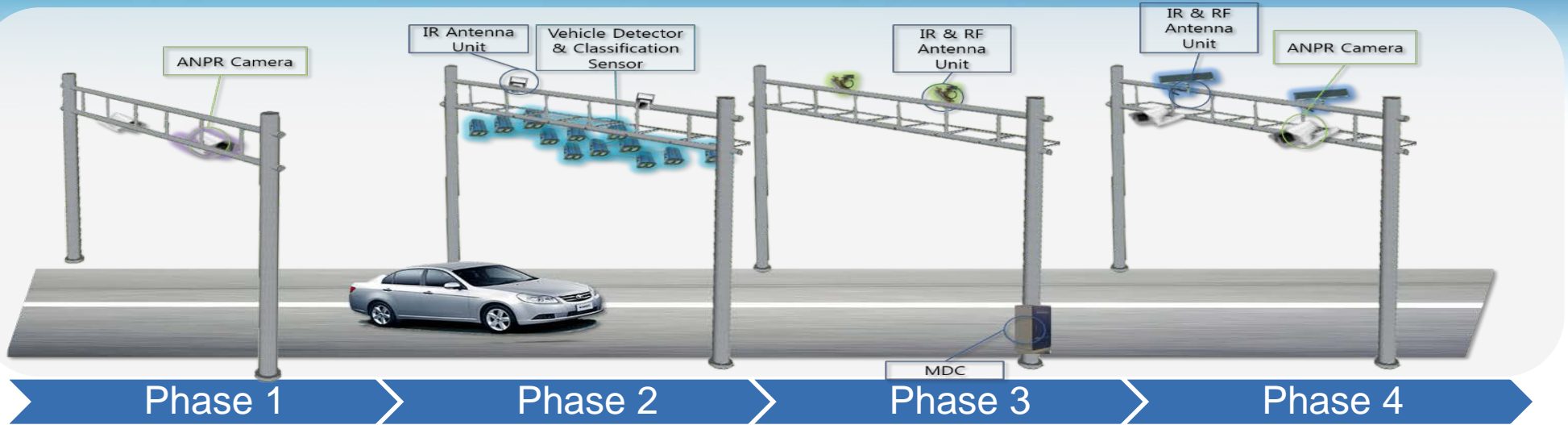
- Single Lane
- Lane capacity : over 1,200 vehicles / lane /hour(ETCS)

MTS

- Multi-Lane
- Free Flow
- No Island
- -No need of cash
- Lane capacity : over 1,800 vehicles / lane /hour

MTS is free-flow multi-lane toll collection system using DSRC+ technologies. There is no need for complicated tollgate structures any more. MTS ensures safety and smooth traffic flow by eliminating the need for lane change or speed decrease to pay a toll. In addition, MTS helps reduction of fuel consumption and carbon dioxide emission from vehicles due to slowdown or congestion around the tollgate ensures the comfortable city environment.

Multi-lane Tolling & Structure



IR Antenna Unit

- Wakeup IR OBU(On Board Unit)
- Start of Transaction
- Check of IR OBU Location
- Toll Result to Toll Server

RF Antenna Unit

- Start of Transaction
- Check of RF OBU Location
- Toll Result to Toll Server

ANPR Camera

- #2 ANPR Cameras on Gantry #4 take 2 pictures of car front plate
- #1 ANPR Cameras on Gantry #1 take 2 pictures of car rear plate
- Plate Image to Toll Server



IR Antenna Unit

- Wave length : 870 nm
- Sensitivity : 0.8mW/m² or less
- Standard : KS X 6915
- Transmission Speed : 1.00 Mbps



RF Antenna Unit

- Center Frequency : 8.5GHz
- Max. EIRP :+32 dBm
- Standard : TTAS_KO-06.0025/R1
- Transmission Speed : 1.024Mbps



Vehicle Classification Sensor

- Laser Protection Class : Class 1 (IEC 60825-1 :2007)
- Scanning Frequency: 25Hz or higher



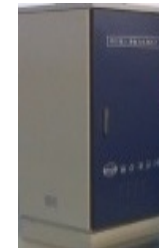
Vehicle Detection Sensor

- Laser Protection Class : Class 1 (IEC 60825-1 :2007)
- Pulse Repetition frequency:2kHz
- Beam Radiation Angle :2 mrad



ANPR Camera

- Active Pixel :1920(H) x 1080 (V)
- Scan type : Progressive
- Flash : IRED type, Dual
- Flash 8 million



MDC

- MTS DSRC Controller
- IR & RF DSRC Processing Unit
- Total 36 Antennas Control (20 IR & 16 RF Antennas)

- sTraffic has a Test Road which is located in Hwang-Gan, Chungcheongbuk-do, South Korea.
- Length : 2km, temporary develop office and Gantries for several ETCS, RFID Toll, Multi-lane Equipment.
- Test driving speed up to 120Km/H~160Km/H



Thank you



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