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

<table>
<thead>
<tr>
<th>Year</th>
<th>Event</th>
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<tr>
<td>2013</td>
<td>Spin-off from SAMSUNG SDS</td>
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<td>2011</td>
<td>UTIS for 5 major cities</td>
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<td>2011</td>
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<td>2010</td>
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<td>2009</td>
<td>Incheon Bridge Traffic Sys.</td>
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<td>2007</td>
<td>Hi-pass open nation wide for KEC</td>
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<td>2006</td>
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<td>2004</td>
<td>Seoul Bus Management System</td>
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<td>1994</td>
<td>TCS open for Korea Expressway Corp.</td>
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<td>1993</td>
<td>Start Railroad business</td>
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<td>1991</td>
<td>Start Road Transportation Business at SAMSUNG Electronics.</td>
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### Resources
- **Patents**: 54 registered
- **Solutions**:
  - Road: Multilane Toll System and 7 others
  - Railroad: Signaling System and 4 others

### Solutions
- TCS/ETCS for Bukhang Bridge
- TCS 2013 for KEC
- Unmanned Toll Systems for KEC
- E-payments for Gwangan Bridge
- KTX Signaling for Phohang Line
- ETCS for Misiryung Tunnel
- TCS/ETCS for Yongma Tunnel

### Timeline
- 1994: Start Railroad business
- 1997: TCS open for Korea Expressway Corp.
- 1998: Move to SAMSUNG SDS
- 2004: KTX signaling phase 1
- 2006: Seoul Bus Management System
- 2007: Daejun metro Line 1 Signaling
- 2010: Busan ITS
- 2011: Busan metro Line 4 Signaling
- 2011: UTIS for 5 major cities
- 2013: Spin-off from SAMSUNG SDS
Ensure business continuity by road transport business, railroad signaling / communications business related tangible and intangible assets transferred from SAMSUNG SDS.
sTraffic
Toll Collection System

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Toll Collection History in Korea

1. Toll Collection System

- Manual Toll Payment
- Paper Ticket
- Mechanical Toll Payment
- Automatic Ticket Issuing and PPCard
- Smart Card
- IR/RF System
- Non Stop
- Fast Pass to Toll gate
- ↑ 2000

Cash manual
TCS
Touch Pass
Closed ETC
Multi Lane System

* PPCard(PrePaidCard)
Benefit of Toll Collection System

1. Toll Collection System

- Reduce Tollgate Congestion
- Various Payment Method
- Intelligent Automatic System
- Inspection Transparency & Accuracy
**Type of Toll road**

### 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)
Open type Toll Collection System
Closed type TCS (Entrance)
Closed type TCS (Exit)

1. Toll Collection System
1. Toll Collection System

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

**Vehicle Class & Fare Display**
- Display the transmitted information within a second
- Display various characters, symbols, figures and information
- Light control function

**External Terminal For Smart Card**
- Antenna can separate on a collision
- Voice information
- Electronic card reading ability over 50mm
- Pre and post-payment processing possible

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

1. Toll Collection System

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

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

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

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)
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
sTraffic
Toll Collection System

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Benefits of ETCS (Electronic Toll Collection Systems)

2. ETCS

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

Manual vs. ETC (Traffic Vol. per day)

- **Manual**: 233% Increase
  - (1,200 thousand → 2,800 thousand)

- **ETC**: 43% Decrease
  - (2,800 thousand → 1,200 thousand)

Improvement Thanks to the NOx Reduction

- NOx reduction after ETC introduction

- Speed down → Tollgate → Speed up
**2. ETCS**

**Vehicle facilities**
- OBU
- Smart Card
- RFID TAG

**Lane facilities**
- IR/RF/RFID Beacon
- Vehicle classification
- Enforcement camera system
- Automatic Barrier
- Fare Display

**Main Center**
- Main Center Server

**Toll Plaza**
- Toll Plaza main Computer
- Operation terminal
- Video Server

**Toll Plaza main**
- Vehicle classification system
- Fare Display
- Vehicle sensor

**Automatic Barrier**

**RF Beacon**

**IR Beacon**

**Integrated lane controller**

**Enforcement camera system**
ETCS Equipments Specification

2. ETCS

**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
ETCS Equipments Specification

2. ETCS

**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)
ETCS Equipments Specification

**2. ETCS**

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* DSRC (Dedicated Short Range Communication)

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

- 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(multi Lane)

1. Entrance Traffic Jam ~1994
2. Exit Traffic Jam 1994~2010
3. Increase Accident 2002~

4rd
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.

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

2. ETCS(Multi)
ETCS(Multi) Process

Multi-lane Tolling & Structure

**Phase 1**
- Wakeup IR OBU(On Board Unit)
- Check of IR OBU Location
- Start of Transaction
- Check of IR OBU Location

**Phase 2**
- RF Antenna Unit
- Toll Result to Toll Server

**Phase 3**
- IR Antenna Unit
- Toll Result to Toll Server

**Phase 4**
- 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

**ANPR Camera**

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

**IR Antenna Unit**
- Start of Transaction
- Check of IR OBU Location
- Toll Result to Toll Server
### ETCS(Multi) Equipments Specification

#### 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 : 1.024 Mbps

#### 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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