



# **ETC Challenges and Potentials in Taiwan**

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**Far Eastern Electronic Toll Collection Co.,Ltd.**

# Background

FETC has 20 year contract with highway bureau since 2004

## ▶ Manual toll



## ▶ Phase I : 2006 SLFF ETC



## ▶ Phase II : 2013 MLFF ETC



### Manual → Phase I

- ▶ Manual toll & ETC toll
- ▶ Extend ETC Lane by usage
- ▶ IR OBU & RFID eTag

### Phase I → Phase II

- ▶ Construct over 370 new gantries
- ▶ Full ETC service
- ▶ Only RFID eTag

# Background



## ETC Operational Statistics

**Customer**

Total over 2.6 Million

**ETC Transactions**

Total over 1.1 Billion

**ETC Utilization**

Daily : 65% (2012/10/19)

Passenger Car : 60% (2012/10/19)

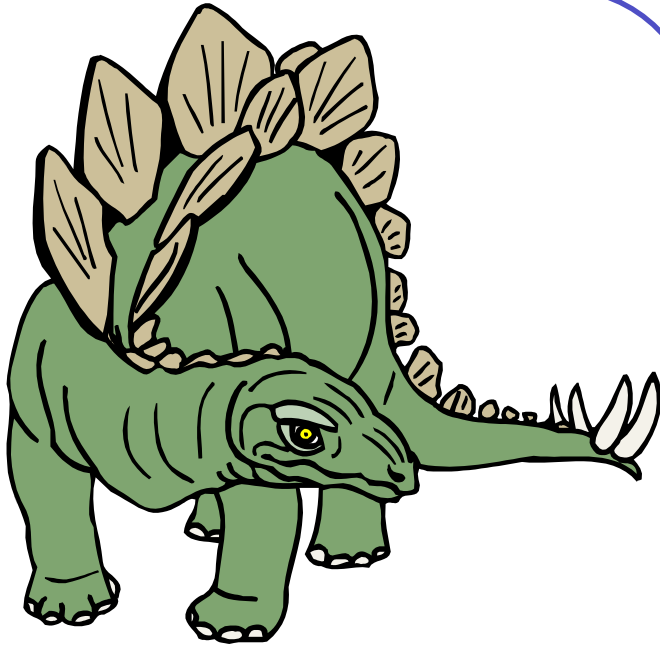
Truck : 93.80% (2012/5/19)

**ETC Transactions**

Daily : 1.13M (2012/09/29)

# Challenges(1) - Legacy system

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*Legacy IR System*

*Vendor's black box*



*ETC Operator*

# Challenges(1) - Legacy system

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- *Analyze the data pattern*
- *Define the interface between Modules*
- *Set up the new architecture*
- *Develop Core System*



# Challenges(1) - Legacy system

## ◆ Our purposes

- **Operation independence:** Maintain our system to comply with contract requirements with government
- **Technology independence:** Keep pace with technology advancement and allow new technology to be adopted into our existing system

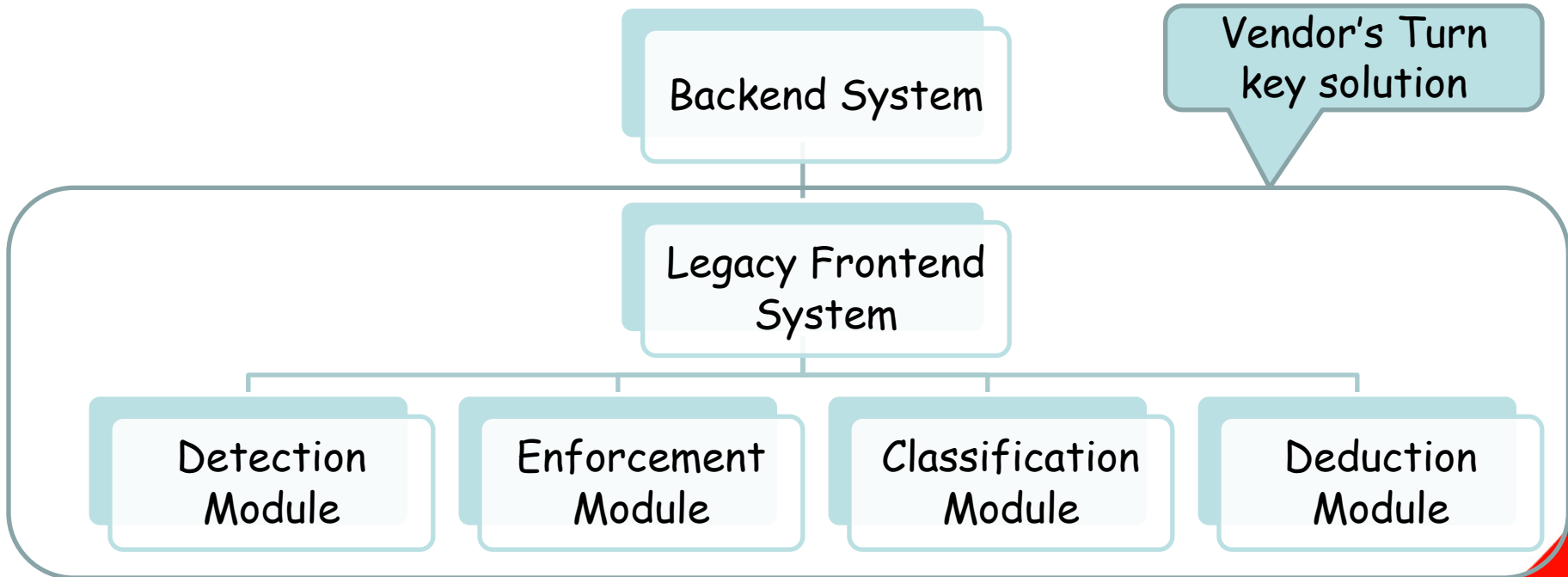
### *Develop Second Generation SLFF ETC System*

- **Development independence:** Provide an open platform to support future ITS development in Taiwan
- **Cost management:** Be able to adopt new system in a more gradual way instead of major overhaul. Thus we can reduce the cost and efforts for technology change management.



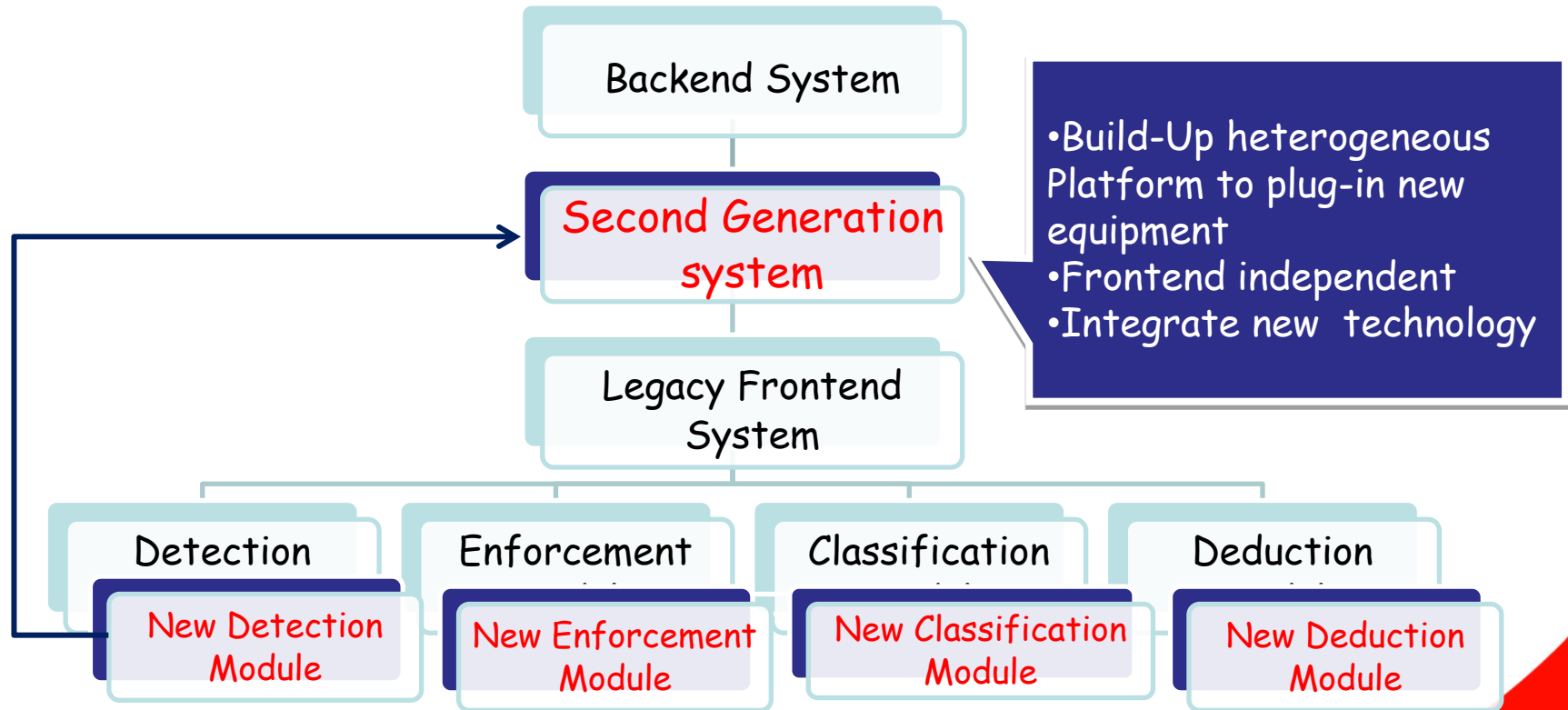
# Challenges(1) - Legacy system

## Original System Architecture



# Challenges(1) - Legacy system

## Heterogeneous System Architecture

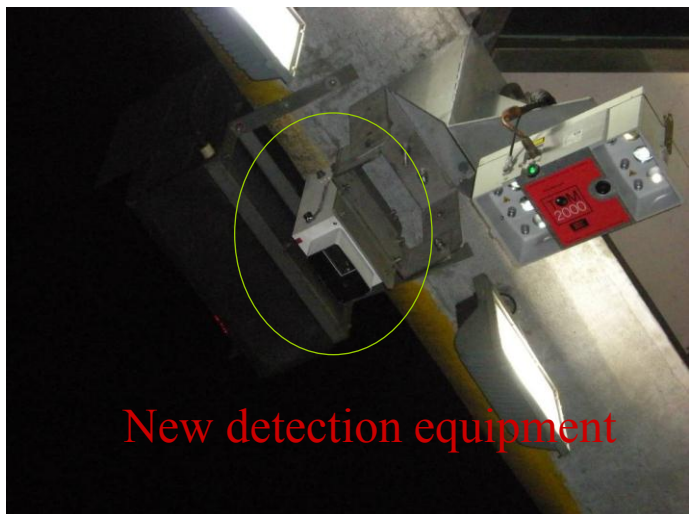




# Challenges(1) - Legacy system

- ◆ Integrate second generation enforcement system with current IR legacy system at Toll Plaza

Test item	Test result
Detection rate	100%
Classification rate	100%
Toll Collectable rate	100%
Matching rate	100%



New detection equipment



New enforcement equipment



# Challenges(1) - Legacy system

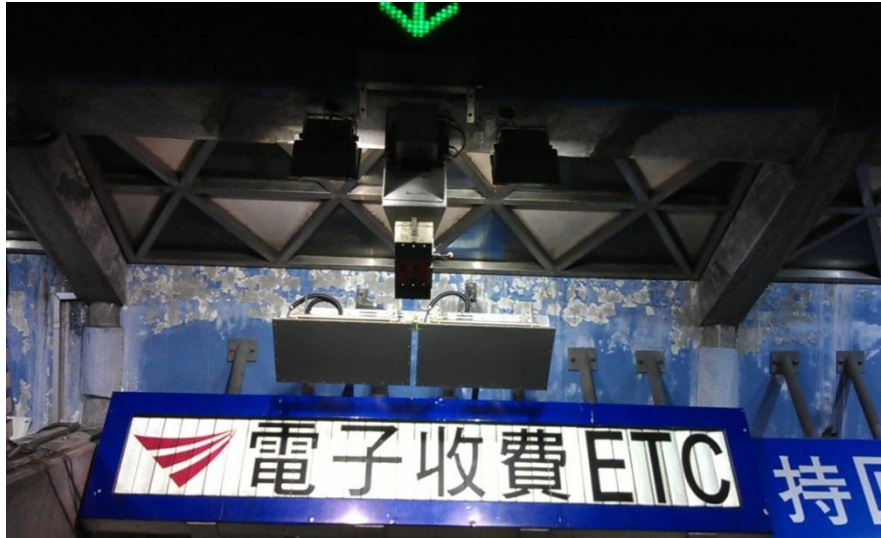
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- ◆ Integrate second generation deduction system (MW) with current IR legacy system at Toll Plaza



# Challenges(1) - Legacy system

- ◆ Keelung e-Tag trial service ( start service at two toll plaza )



# Challenges(1) - Legacy system

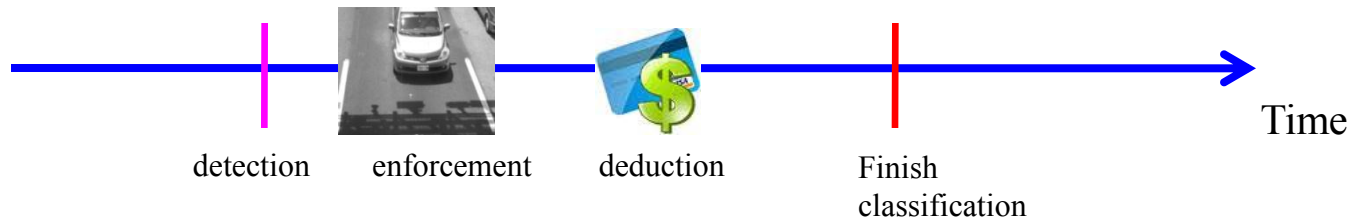
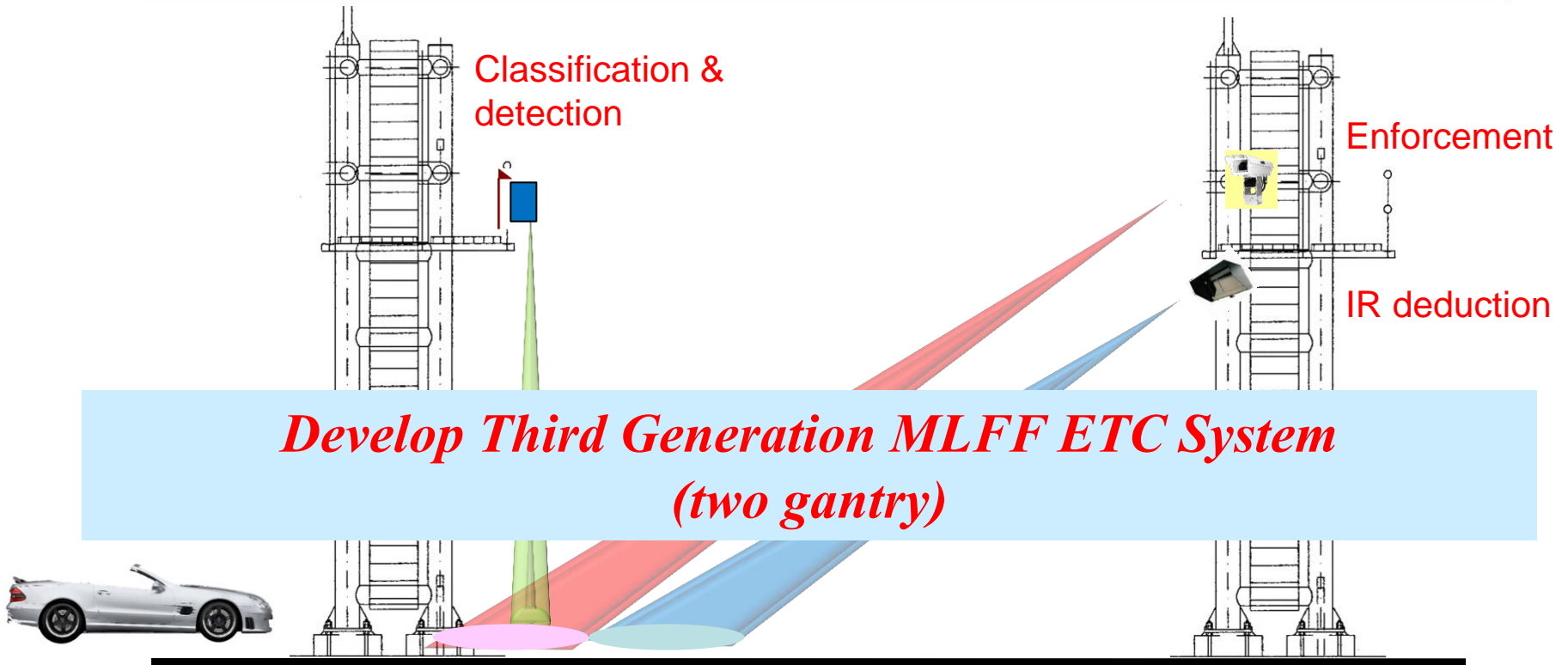
IV&V test item: Heavy rain test

*The IR & RFID dual ETC system passed the IV&V test conducted by TÜV*

**PASSED**



# Challenges(2) - MLFF system

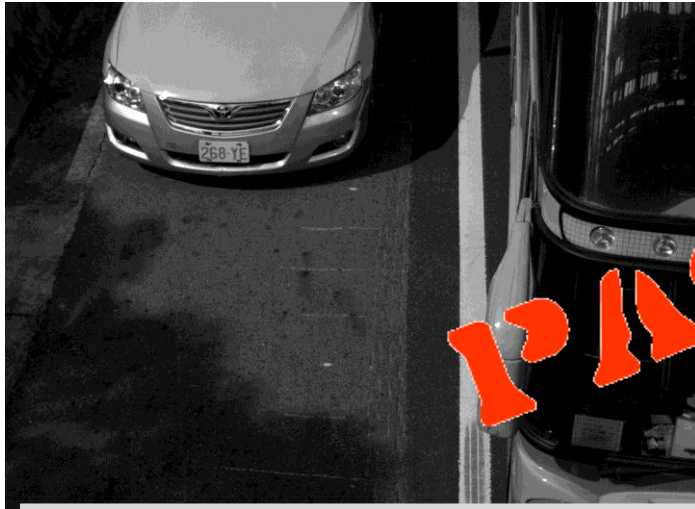


## Challenges(2) - MLFF system

- ◆ Applying second generation platform in a multilane free flow (MLFF) two gentry environment



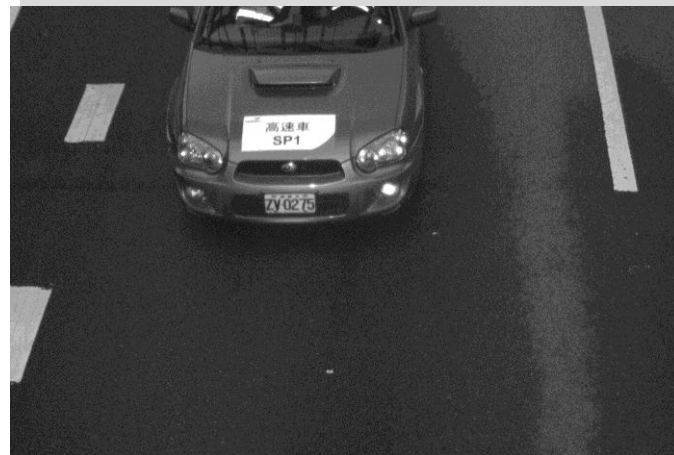
# Challenges(2) - MLFF system



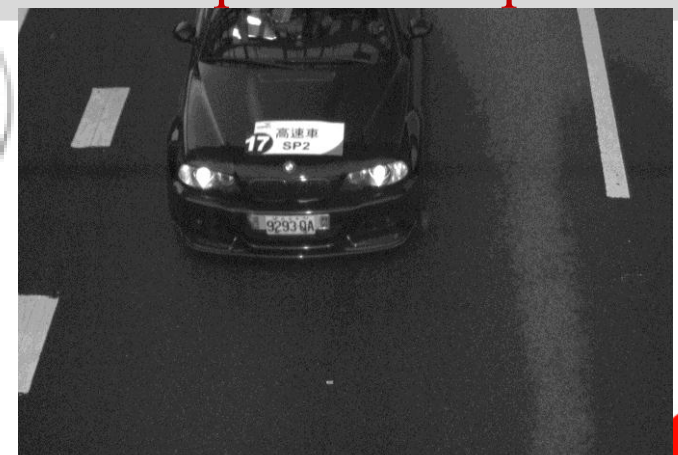
Parallel Driving



Bumper to Bumper



Deduction (172Km/hr )

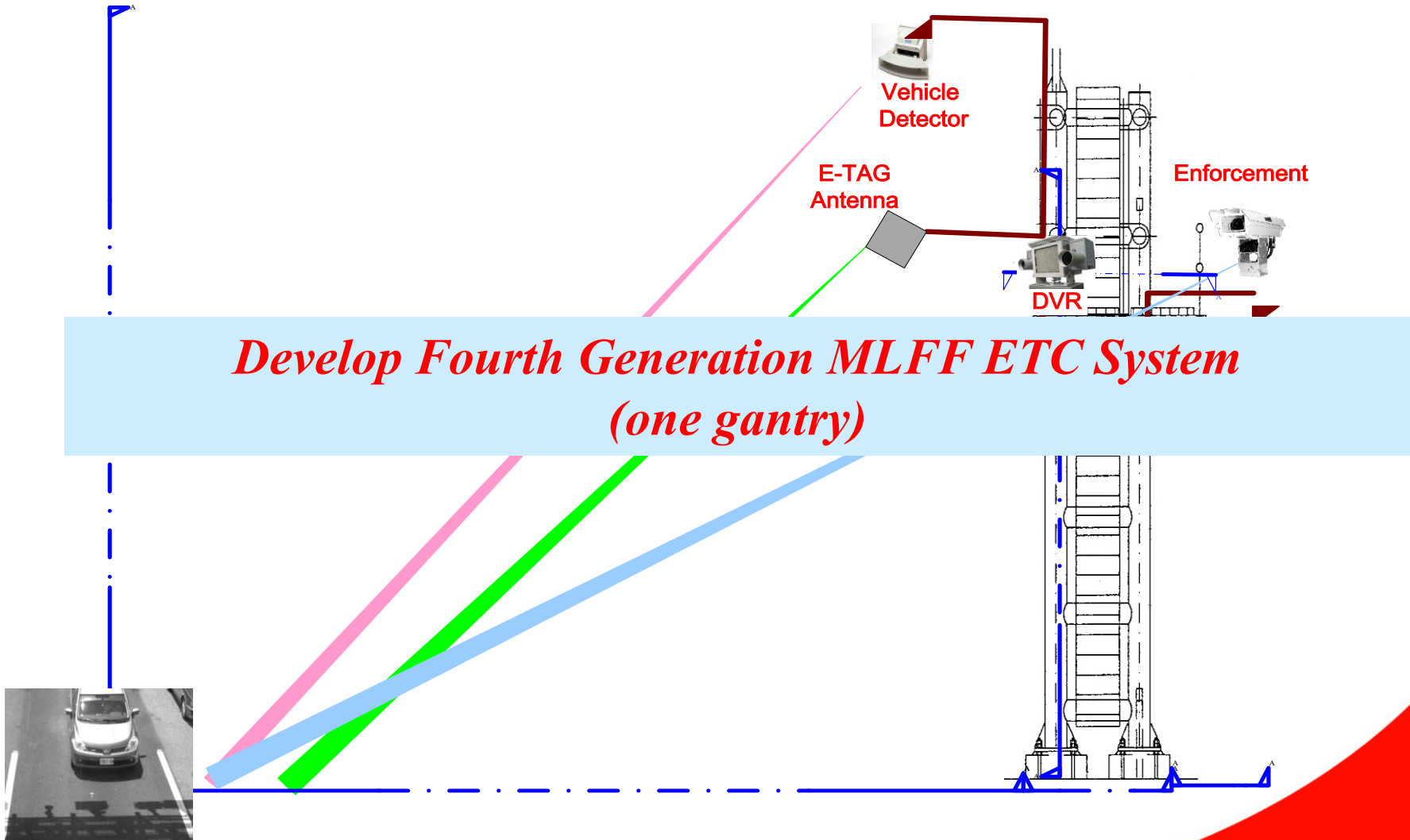


Enforcement (182Km/hr )

PASSED



# Challenges(3) - MLFF system cost





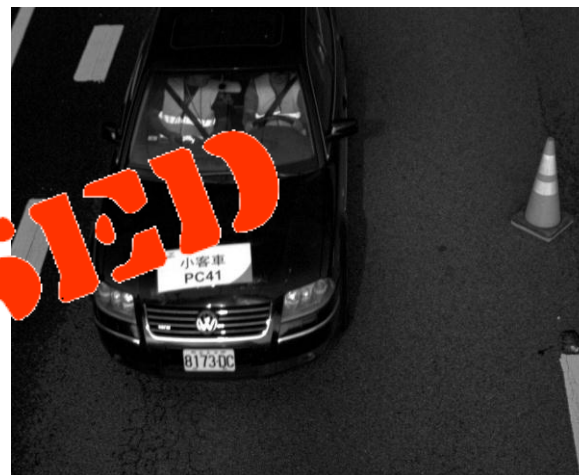
# Challenges(3) - MLFF system cost



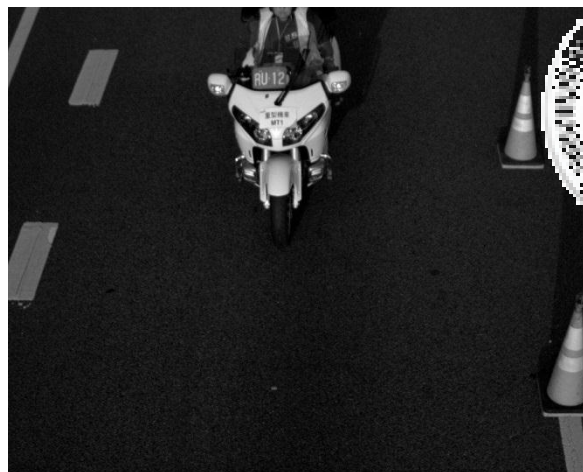
# Challenges(3) - MLFF system cost



**Bumper to Bumper < 60 cm**



**High Speed eTag detect > 160 KM/H**



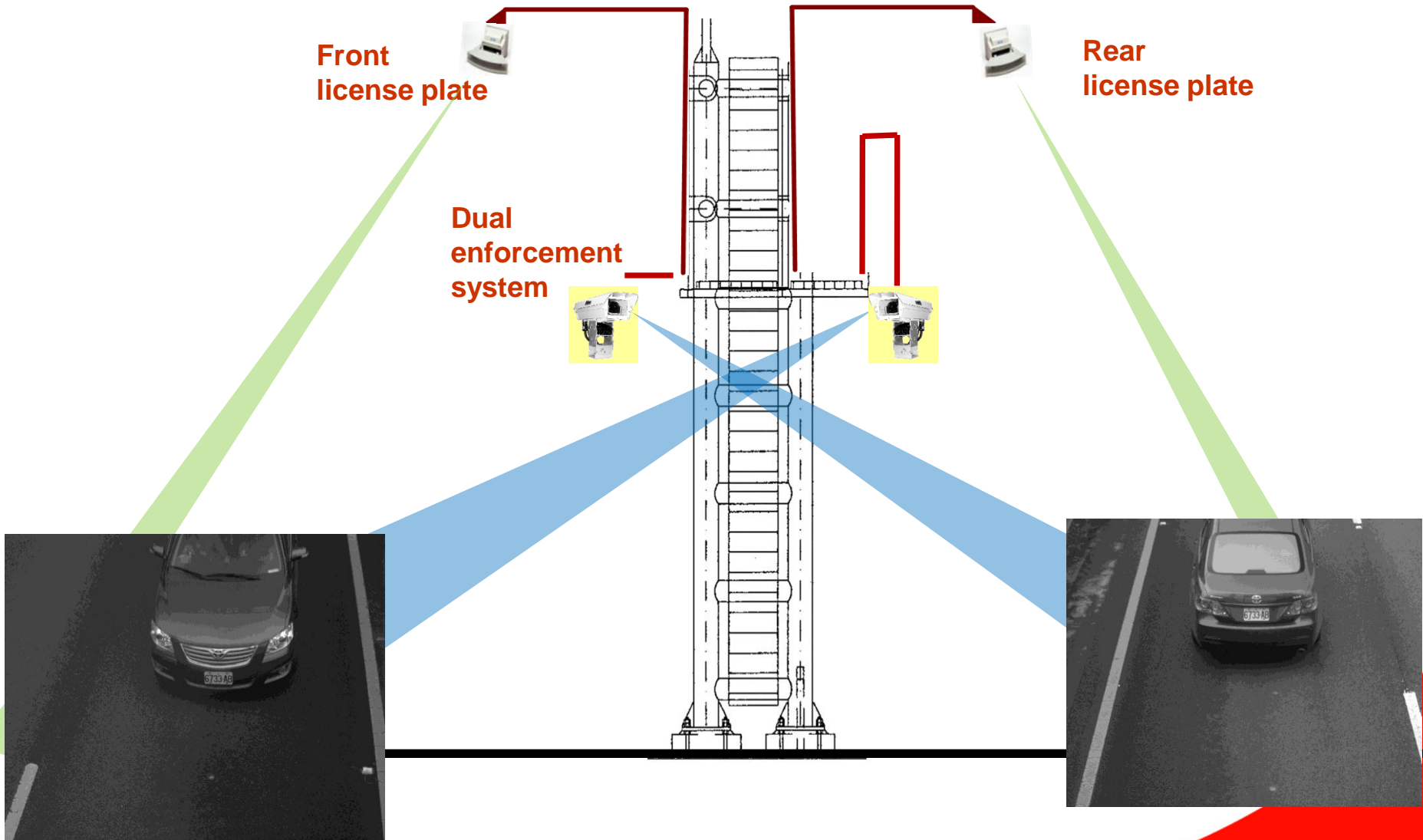
**High Speed Motor > 150 KM/H**



**High Speed Enforcement > 180 KM/H**



# Challenges(3) - MLFF system cost



# Challenges(3) - MLFF system cost

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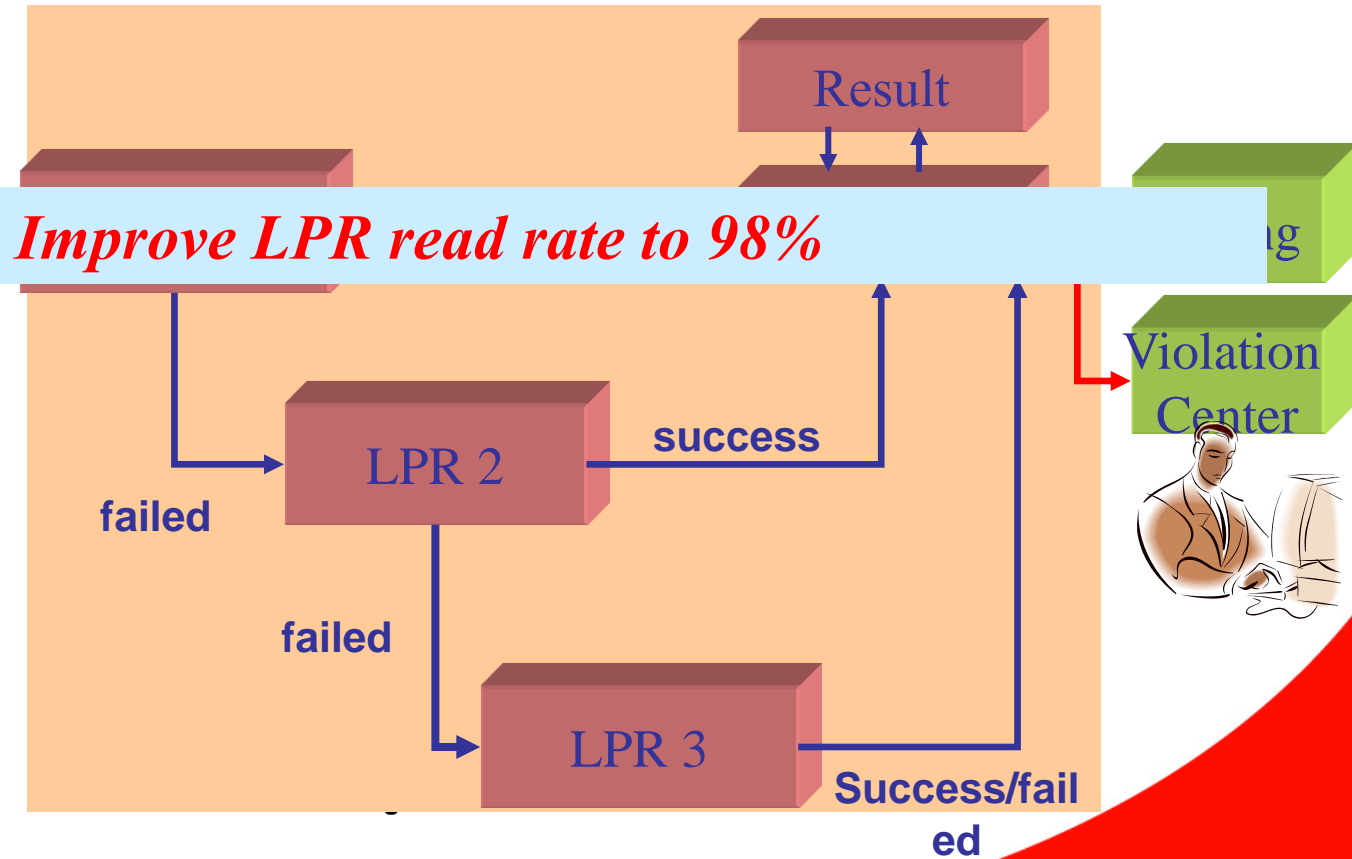


# Challenges(3) - MLFF system cost



# Challenges(4) – Automation(LPR)

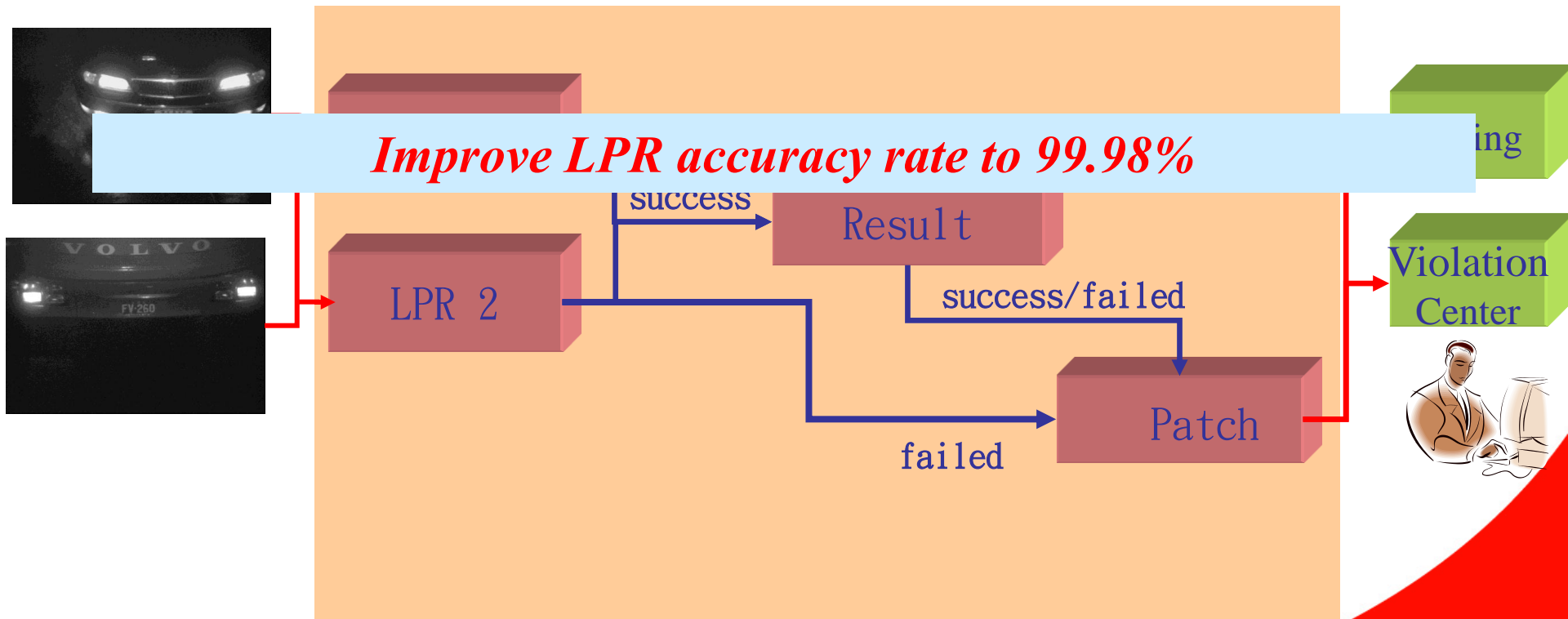
**Cascade Recognition** – to increase the read rate by using different License Plate Recognition (LPR) system to do cascade recognition





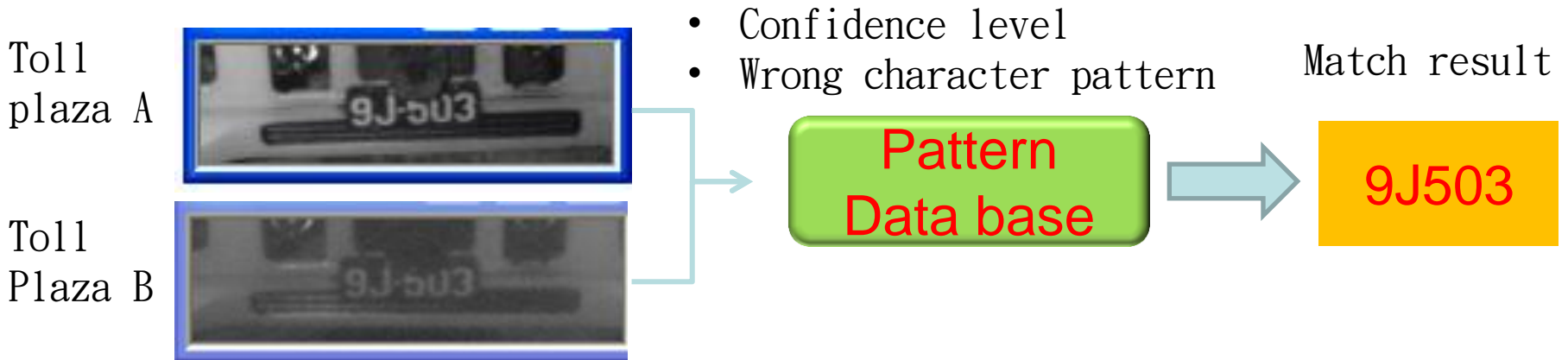
# Challenges(4) – Automation(LPR) FETC

**Parallel Recognition** – to increase the accuracy rate by using different License Plate Recognition (LPR) system to do parallel comparison



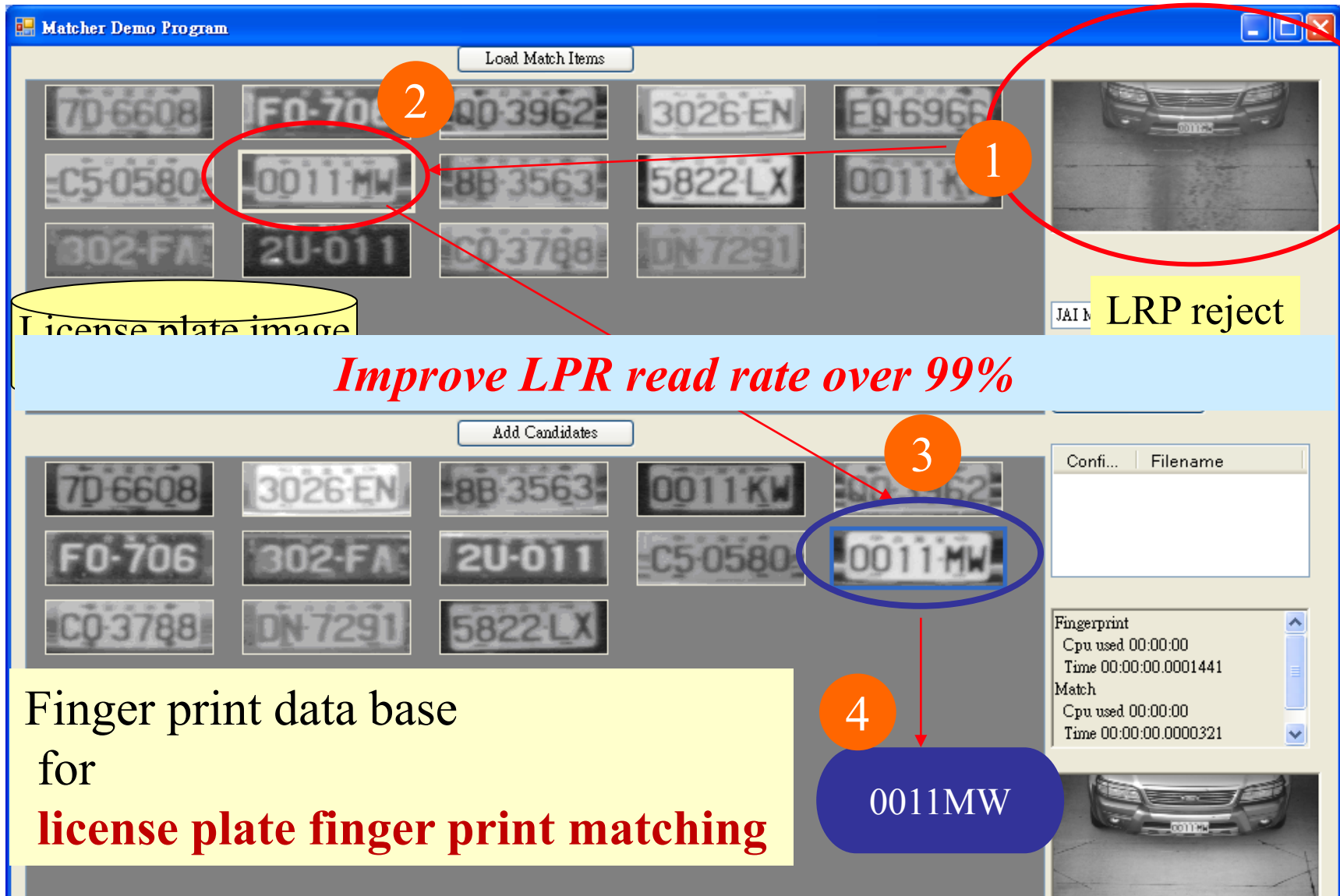
# Challenges(4) – Automation(LPR)

- Character Pattern Matching





# Challenges(4) – Automation(LPR)



The screenshot shows the 'Matcher Demo Program' interface. At the top, there is a 'Load Match Items' button. Below it, a grid of license plate images is displayed. One license plate, '0011 MW', is circled in red and labeled with a '2'. To the right, a car image is circled in red and labeled with a '1'. Below the car image, the text 'LRP reject' is visible. A yellow callout box points to the '0011 MW' license plate with the text 'License plate image'. Below this, a blue banner contains the text 'Improve LPR read rate over 99%'. Below the banner, there is an 'Add Candidates' button. Below that, another grid of license plate images is shown. One license plate, '0011 MW', is circled in blue and labeled with a '3'. Below this, a blue callout box contains the text '0011MW' and is labeled with a '4'. To the right, there is a 'Fingerprint' section with a table showing 'Cpu used' and 'Time' for both 'Conf...' and 'Filename'.

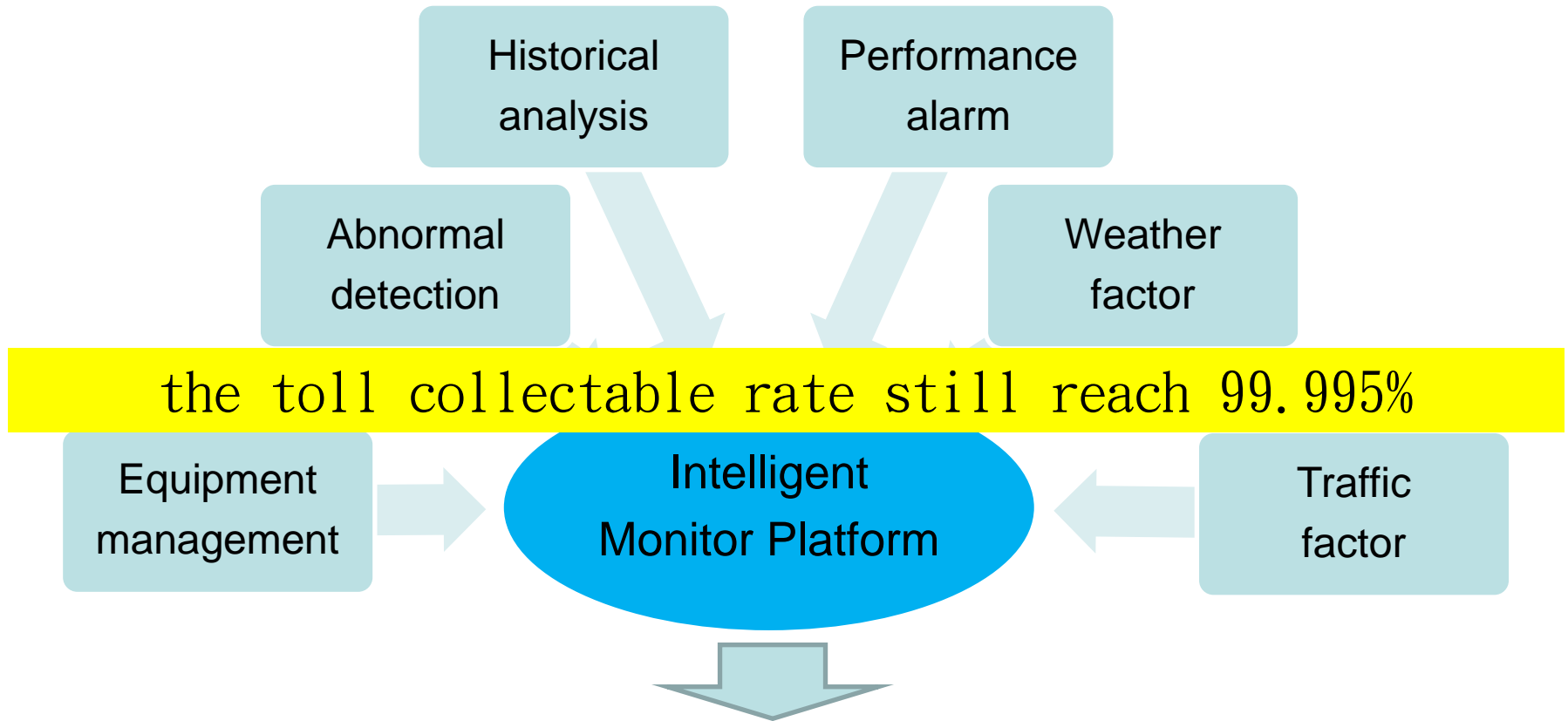
Conf...	Filename

Fingerprint	
Cpu used	00:00:00
Time	00:00:00.0001441
Match	
Cpu used	00:00:00
Time	00:00:00.0000321

Finger print data base  
for  
**license plate finger print matching**

# Challenges(5) – Preventive Intelligent



the toll collectable rate still reach 99.995%

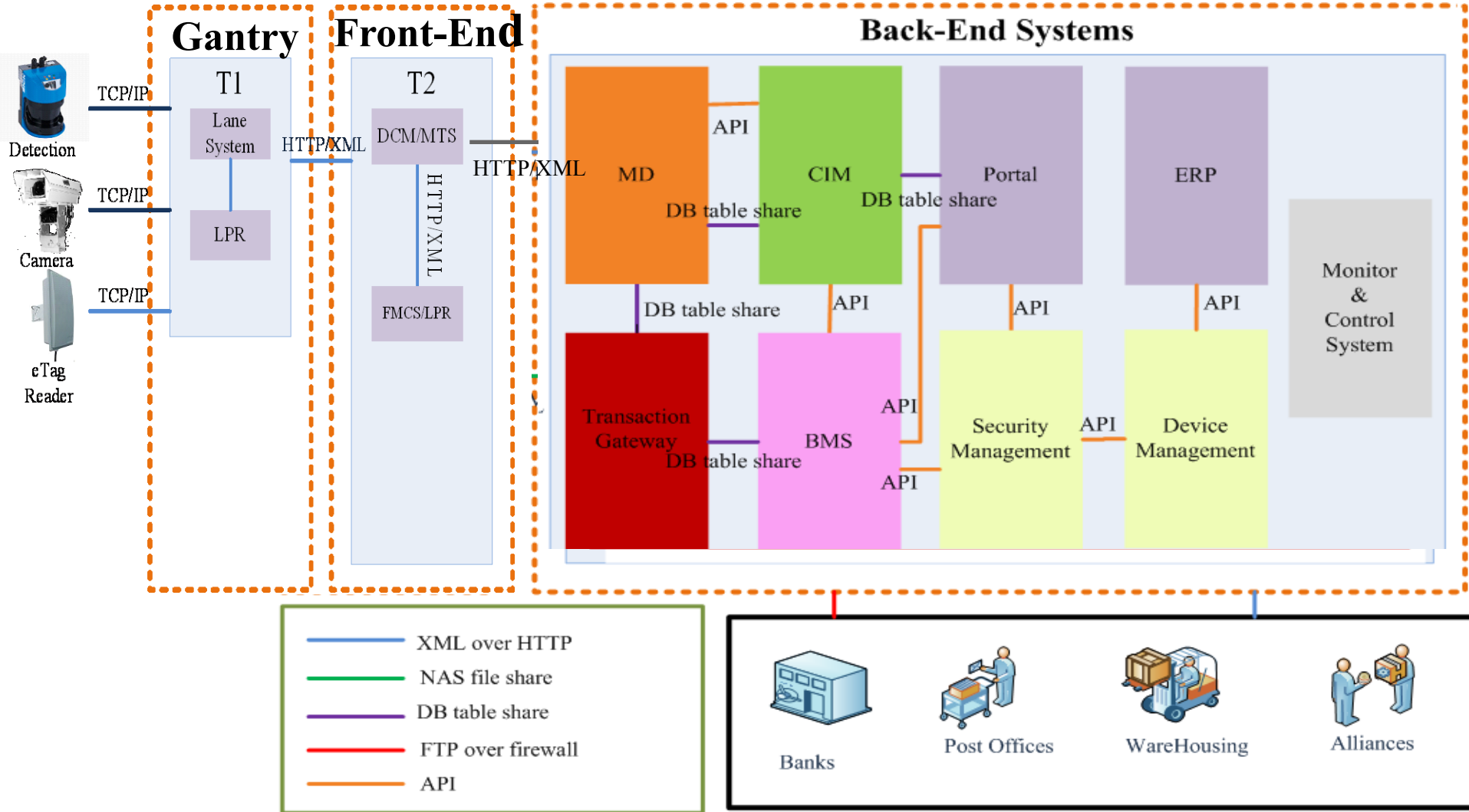
Equipment management

Intelligent Monitor Platform

Traffic factor

- Increase preventive maintenance
- Improve system performance & availability & reliability

# Challenges(5) – End to End system



# Potentials – Parking Application



# Potentials – Parking Application



Thank you.

[www.fetc.net.tw](http://www.fetc.net.tw)

