# Effortless Passenger Identification System

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# Summary of Concept

- Evaluate feasibility of radio frequency identification (RFID) technology to track transit passengers
- Technical
- Operational
- Economic

# **Application**

- Contactless fare media
- Standard requires cards to come within a few inches of a reader
- Stores personal info and fare value
- Can be costly and unnecessary

# Summary of Concept

- RFID tags can be read at longer distances than contactless or proximity cards
- Already used in pupil transportation
- Expected to see widespread adoption in specialty markets

# **Application**

- Examples where EPIS can work
  - Riders with physical or mental disabilities
  - Riders using transit fare free, university students
  - Contracted service for riders who do not pay fares, but accounting still required
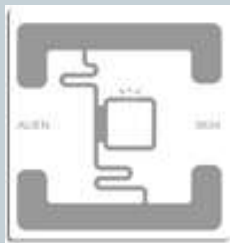
# **Application**

- EPIS functionality
  - Limited data storage
  - Stores passenger ID code
  - Time and location info can be collected
  - Used for planning, reporting and billing

# **Investigative Approach**

RFID Tag — RFID Reader — Host

RFID air interface

RFID reader interface
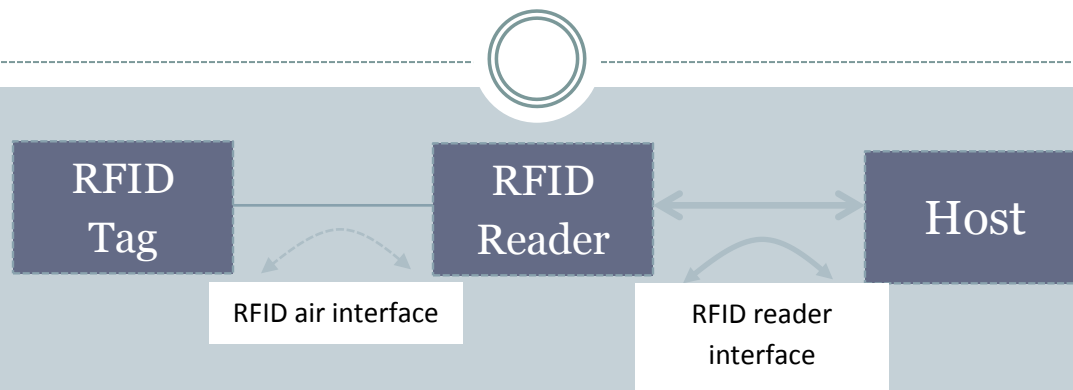


Alien Technology
ALR 9900+ reader

Alien RFID tags:    ALN-9634        ALN-9630        ALN-9654

# Controlled Testing

- MATBUS and Vocational Training Center (VTC)
  - Six volunteers boarded and alighted under different scenarios

# Controlled Testing

- Used paratransit, cutaway bus
  - Controlled testing results

| Scenario | Successful Reads |
|---|---|
| Boarding the bus while holding the RFID cards | 6 of 6 |
| Boarding the bus with the RFID cards in pockets | 2 of 6 |
| Boarding the bus while holding cell phones and RFID cards | 1 of 6 |
| Boarding the bus while holding keys and RFID cards | 6 of 6 |
| Boarding the bus while holding cell phones and keys and RFID cards | 3 of 6 |
| Boarding the bus while having some riders stand near the back antenna | 6 of 6 |
| Wheelchair rider boards holding an RFID card | 1 of 1 |
| Boarding wheelchair with RFID attached to the frame | 1 of 1 |

# Investigative Approach

- Field Testing
  - Foothill Transit, Los Angeles, CA
  - MATBUS, Fargo, ND
    - Recruited students at Rio Hondo College and North Dakota State University to carry RFID cards
    - Recruitment via email
    - RFID cards distributed at student unions
    - Required to keep travel log and take survey
    - $25 gift card to campus bookstore for participating

# Field Testing

- Foothill Transit and Rio Hondo College
  - 80 students enrolled via email in two days
  - 50 available spots, so 30 put on waiting list
  - Many students didn't know what was required
  - 10-15 were unwilling to participate due to privacy issues
  - Used Zonar Systems RFID tracking system, ZPass
  - Traditionally used for school transportation
  - Unfortunately, Zonar no longer sells or supports medium range RFID Zpass units
  - Units installed were for proximity cards
  - No usable ridership data was collected

# Field Testing

- MATBUS and North Dakota State University
  - 200 students enrolled via email in one day
  - First come, first serve approach for 50 cards
  - Tags distributed in two hours
  - No privacy concerns whatsoever
  - Used Alien Technology reader, antennas, and tags
  - Placed one antenna near the front door and one near the back door
  - Laminated tags were attached to school bags
  - Reader recorded tag ID number, time, and number of reads
  - 22 of possible 25 reads recorded successfully

# Customer Acceptance

- Disabled adult riders
- Parents of elementary age students
- University students (Rio Hondo and NDSU)
  - Focus groups and surveys
  - 14 parents surveyed
  - 59 students surveyed (15 at Rio Hondo and 44 at NDSU)
  - 5 person disabled rider focus group

# Disabled Riders

- Riders felt technology was useful and easy to use
- Cognitive abilities limited questioning
- VTC supervisors felt technology showed merit
- They believed that if RFID tag could be kept in a riders pocket or wallet it would be more effective
- Risk of loss or damage to tag attached to purse or clothing would be too great

# Parents of Elementary Age Children

- Contacted via email and completed survey online
- Respondents employees of West Fargo school district
  - Most felt technology would increase safety for students
  - Most would have child use technology if available
  - Two respondents believed technology not necessary
  - Would result in "hovering" over children too much
  - One parent had concerns about contracted bus service
  - Need strict regulations as to who could see what information
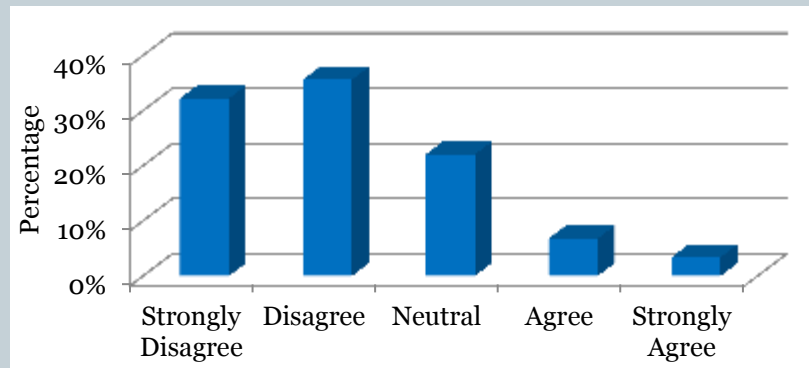
# University Students

- Completed survey as part of requirement for $25 gift card
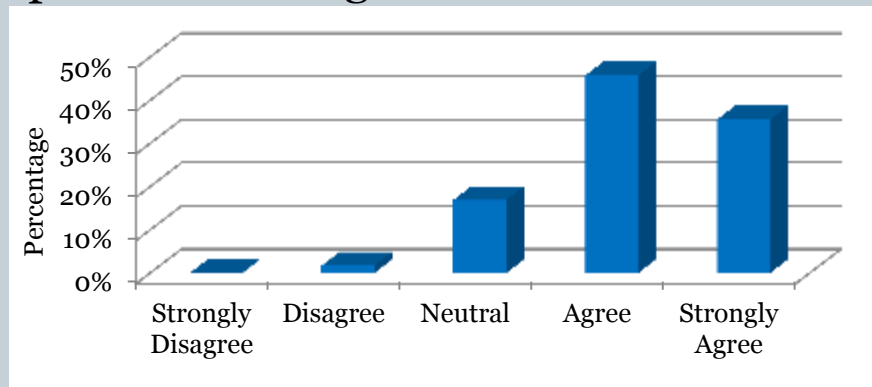
The RFID card was easy to use
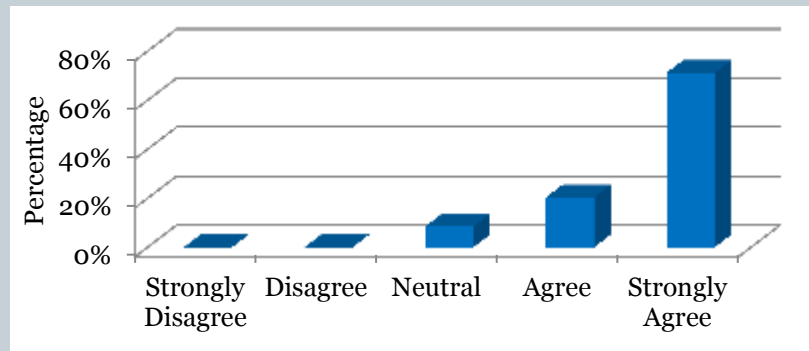


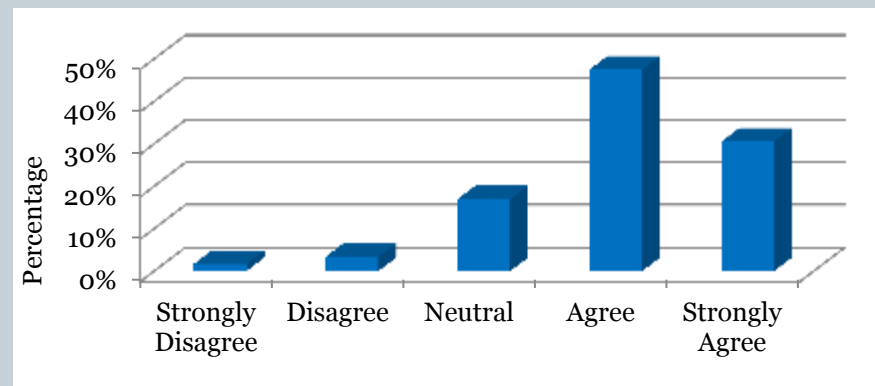Initially, I worried about privacy issues with the use of RFID cards

# University Students

RFID cards would reduce boarding times and keep buses running on time



I would use the RFID card regularly if it was available

# University Students

- General Comments
  - Someone could cutoff tag without me knowing
  - If the card could be read without being shown it would be more effective
  - Others felt card was in the way while attached to backpack
  - Worried about multiple reads when someone would get off bus near back door to let someone else board
  - Overall, students felt technology was efficient and more convenient than having to show their student ID card

# Summary and Key Findings

- Controlled testing indicated the reader received a valid signal when the card was in plain sight with no interference present
- Medium-range reader used at NDSU was nearly 90 percent effective
- Consumer acceptance groups believed technology showed merit
- Many felt card kept in wallet or pocket would be more efficient for riders
- Most felt technology would reduce boarding times and keeps buses running on schedule
- Multiple reads when riders get too close to antennas and interference from clothing, cell phones, etc. are main issues

# Thank You

*Del Peterson*

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