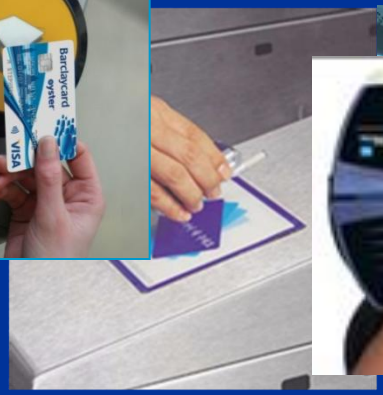
# Next Generation Fare Payment Systems

## *Technologies, Opportunities & Constraints*







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**NIST / Prague, Czech Republic**

September 28, 2010

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# Topics

1. Benefits of Mobile Form Factors
2. Influence of Payment Options on Financial Transactions
3. Current Standards and Potential New Standards
4. Key Issues

# Electronic Media – But of Course

- Provides Better Access to Ridership Statistics
- Reduction of Fraud
- Customer Convenience
- Improved Equipment Reliability
- Enhanced Payment Flexibility
- New Systems Rolling Out
  - ORCA, TAP, Q, PRESTO, EASY, TransLink, RTA…


- Yes, But does the Future Look to Mobile as that Primary Form Factor?

# Benefits of Mobile

- An internet access device
- A portable point of sale device
- A self service kiosk
- A customer service response node
- A personalized mail box
- A delivery channel for promotional messaging
- A fare payment device

# Mobile Phone – A Powerful Tool

## *The Next Wave in Transit*

- Voice
- Text Messages
- Applications
  - Directions
  - Coupons
  - Tickets
  - …
  - Transit

CFMS CONTACTLESS FARE MEDIA SYSTEM STANDARD APTA UTFS Task Force

# Mobile is Killer App for Transit

- Allows Transit Agencies with Device-Based Systems to Incorporate Mobile without Hardware or Firmware Upgrades
- Allows Wide Variability in Payment Options – only Limited by Agency Preference
- Can Reduce Card Distribution Costs
- Can Utilize its Customer Infrastructure to Drive Applications, Promotions, and Retail Profit Sharing

# How to Think of Mobile in Transit

- Mobile Provides Two Functions:
  1. Access to Transit
  2. Payment Flexibility - Not Limited to Bankcards
- Application Flexibility
  - Traditional Transit System Designs such as Device-Based or Media-based Systems
  - Account-Based & Hybrid

# Phones Provide Access and Payment

## *Two Distinct Functions*

- Provision Phone
- Select Payment
  - Credit
  - ACH
  - 3rd-Party Debit

**Ride Transit**

# Influence of Payment Options

- **Network Card Debit Instruments**
- **Build in intrinsic competition between payment providers so as to reduce costs and promote innovation**
  - M*any lawsuits of MC/Visa monopoly since 1979 on interchange fees*
  - *US legislation – Serious effort of Dodd/Frank Act to address transaction costs of MC/Visa*
  - *New US Legislation may Enable Merchants to Offer Discounts for Using Cash or other Card Brands*
- **Third-Party Debit –** Payspot, MyMoney, BillMeLater, Bling, mpasa, etc.
- **De-coupled Debit -** *Enhancements to ACH could achieve ubiquitous network…alternative to running transactions over network cards." Hoenig, Federal Reserve*
- **M-payments**
- **Un-banked Accounts -** *"Wireless carriers are the biggest recurring billers in every market…experts at processing payments" Richard Crone*

**Better to handle these options with versatile readers or versatile payment back-ends? Payment Choice of Customers**

# Versatile Settlement

- Install Transit Application on Phone OTA as Needed for Diverse Transit Applications
- Settle Variety of Payment Forms at the Back-end or with Trusted Third Party Program Manager
- Rather Deal with Variety of Back-end Payments rather than Deal with a Plethora of Varying Card Formats or be Limited to MC/V Processing Network

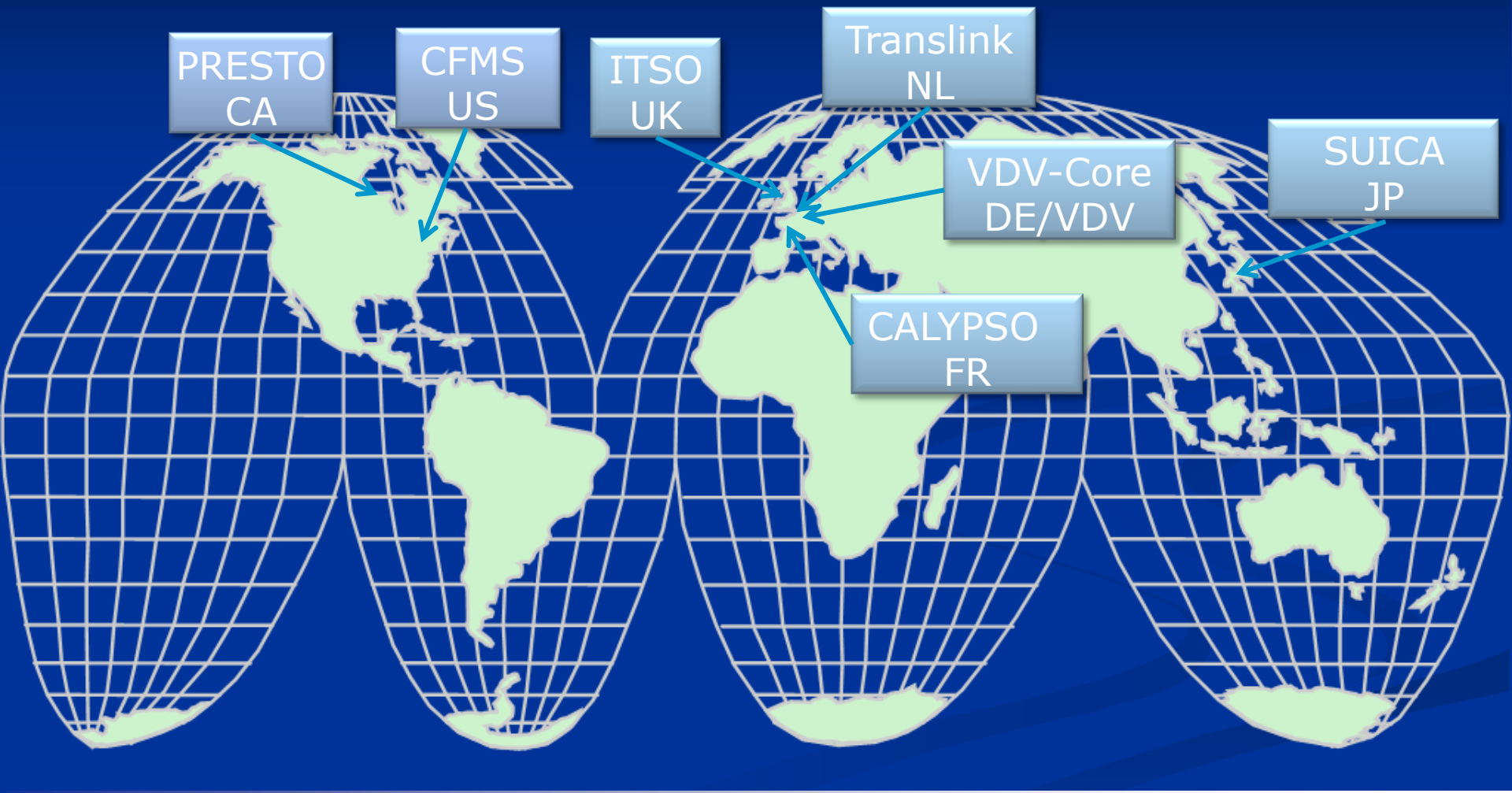
# Fare Systems in U.S.

- Most are Device-Based Systems that Permit MC/V Charging at Back-end
- Some Agencies Looking at Adding Capability to Use MC/V Network Cards as Direct Payment and Access
- Mobile Phones May Change the Equation for Payments

# Features of Most Systems


- Purchase a new card
- Reload an existing card
- Review account information
- Change payment options.
- Review balance and passes
- Register card
- Set up threshold autoload (automatic reload)
- View transaction and purchase history
- Link other cards to this account

# Global Standards for Smartcard Implementation




Oyster, Octopus, Suica, etc.



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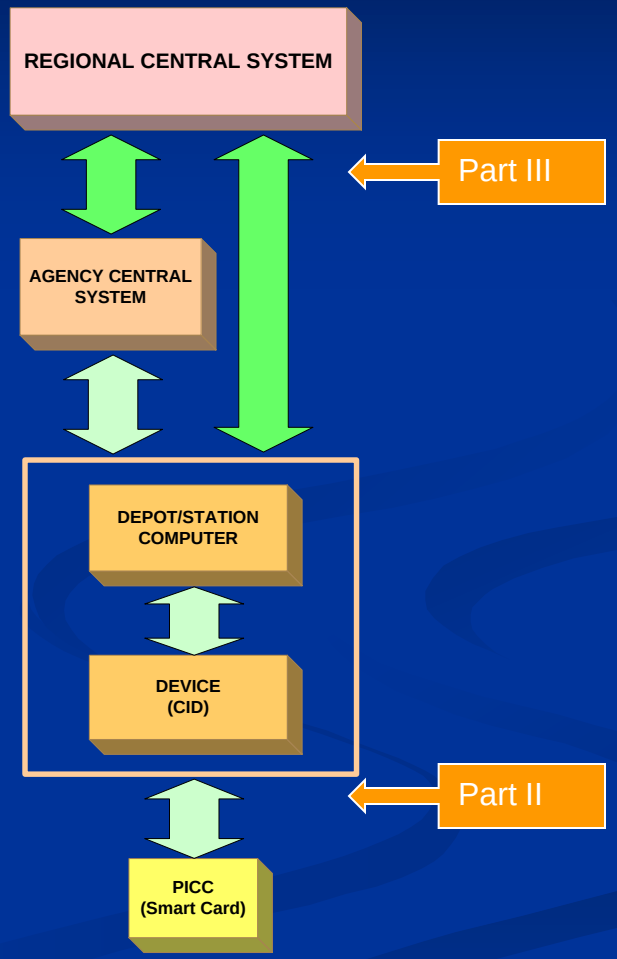
# General Description of CFMS
## *What CFMS Does*

- Accommodates most known fare products and related services used in the US.
- Enables multiple transit agencies within a region to accept each other's fare media.
- Once developed, data structure and associated software logic can be applied to other projects/systems.
- Uses open standards to enable open sourcing from multiple vendors.

**Interoperable**

# CFMS - General Features

- Fare Media Structure
- Data Format - Elements/Objects
  - Directory Index Object
- Compliant ISO/IEC 14443, ISO/IEC 7816, ISO 3166
- Agreed upon APDU (Application Protocol Data Unit)
- Back Office Messages
- 256 Fare Types Capability
- **Open architecture** – key to promoting competition



# Basic Areas of Mobile NFC Development

- Standards
  - Transit Patron Interface
  - Security
- Business Rules and Risk
- Hardware and SIM Chip Operation

# What is Next in Standards Internationally?

- **Tying Regions Together utilizing Existing Infrastructure and Architectures – Global Platform**
- **Building Better Security Measures – AES and Mutual Authentication**
- **Looking at Mobile Phone Architectures –** *(existing device-based architectures can play in mobile game without infrastructure changes)*

# Proposed Multi-Application on Mobile

- NFC is Built to Conform to ISO 14443 (Electronic Interface) and so are Current Fare Collection Systems
- Implementation - carrier agnostic
- Top-up loading - OTA
- Provisioning / deletion of application – OTA
- Power not required for fare access or payment
- Balance query from phone - near real time
- Security through mutual key authorization
- Transit agencies not issuers of application to phone

# Int'l Mobile NFC Trials - Examples

- Guangdong, China – NFC pilot for transit, grocery shopping, and parking in June 2006
- Frankfurt, Germany – NFC pilot for transit in summer 2007
- London, England – NFC pilot for transit information via smart posters in August 2007; 2nd pilot for transit and additional applications from November 2007 – May 2008
- Hannover to Berlin, Germany – NFC pilot in August 2008; 2nd pilot in December 2008
- Vienna, Austria – NFC pilots in September 2007 and January 2009 for transit, parking, and vending machines
- Nice, France – NFC mobile payments in 2010



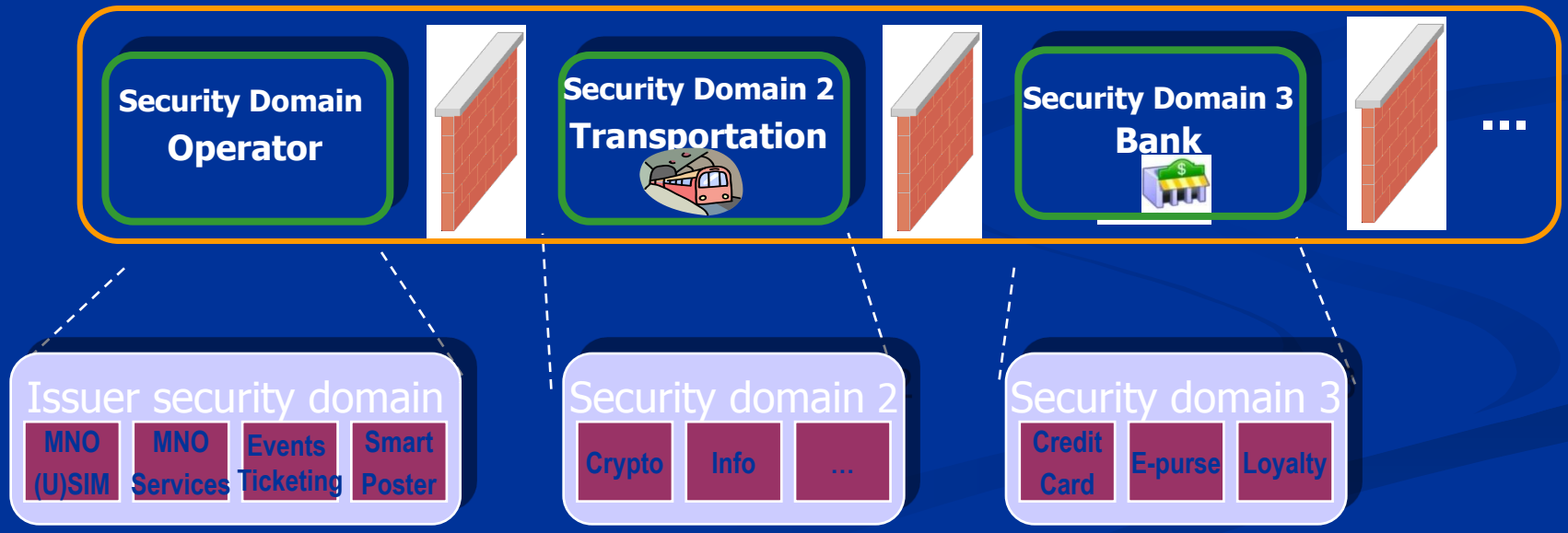
55 MNOs Participating/supporting Pay-Buy-Mobile - 20 Ongoing Trials

# Handset Mfg. Involvement

- Several NFC Handset players (and potential players) in the market:
  - Nokia
  - Samsung
  - LG
  - ZTE
  - Sagem Wireless
  - Phonelabs
  - Apple

# Int'l Mobile Architecture - Proposed

- GSM (Global System for Mobile Communications) mobile telephony standard
- UICC (Universal Integrated Circuit Card) or (SIM Subscriber Identify Module card) for the secure element (SE) – 64 kb
- Use of Global Platform – integration and coordination of platforms akin to a Trusted Service Manager






Courtesy GSMA

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# Example : The UICC-centric Model Ecosystem

Potential NFC service fee

Mobile Subscription fee

MNO

One time fee for UICC Slot (alternative scenario)

**Customer**
**(Card Holder & mobile subscriber)**

Payment for Fare product & application

Potential NFC service fee

One time fee for UICC Slot

TSM

Fee per operation for updating card data

One time fee for UICC Slot (alternative scenario)

Payment for Fare product & application

Commission fee

**Application & Product Retailer**

**Application & Product Owner**

Existing monetary flows

New monetary flows

# Fundamental Objectives of Standards

- Ensure Transit has Sufficient Control of Standardization to Prevent Introduction of Proprietary Material and Methods
- Provide a Basis for Transit to Leverage its Large Customer Base
- Provide a Mechanism for Integrating Fare Collection Systems with Mobile, without Major Updating of Equipment or Firmware

# Key Questions to Standardization

- Where are gaps in current standards?
- Is there agreement within the industry about the role and extent of standardization?
- Where can international standards be applied?
- Who has controlling interest and what are implementation drivers?
- Will current fare collection systems need to be reconfigured for mobile application? If so, what migration paths are possible and where can standards accelerate acceptance?
- What can be said about how the customer interface should be designed to support customer needs as well as transit agencies?

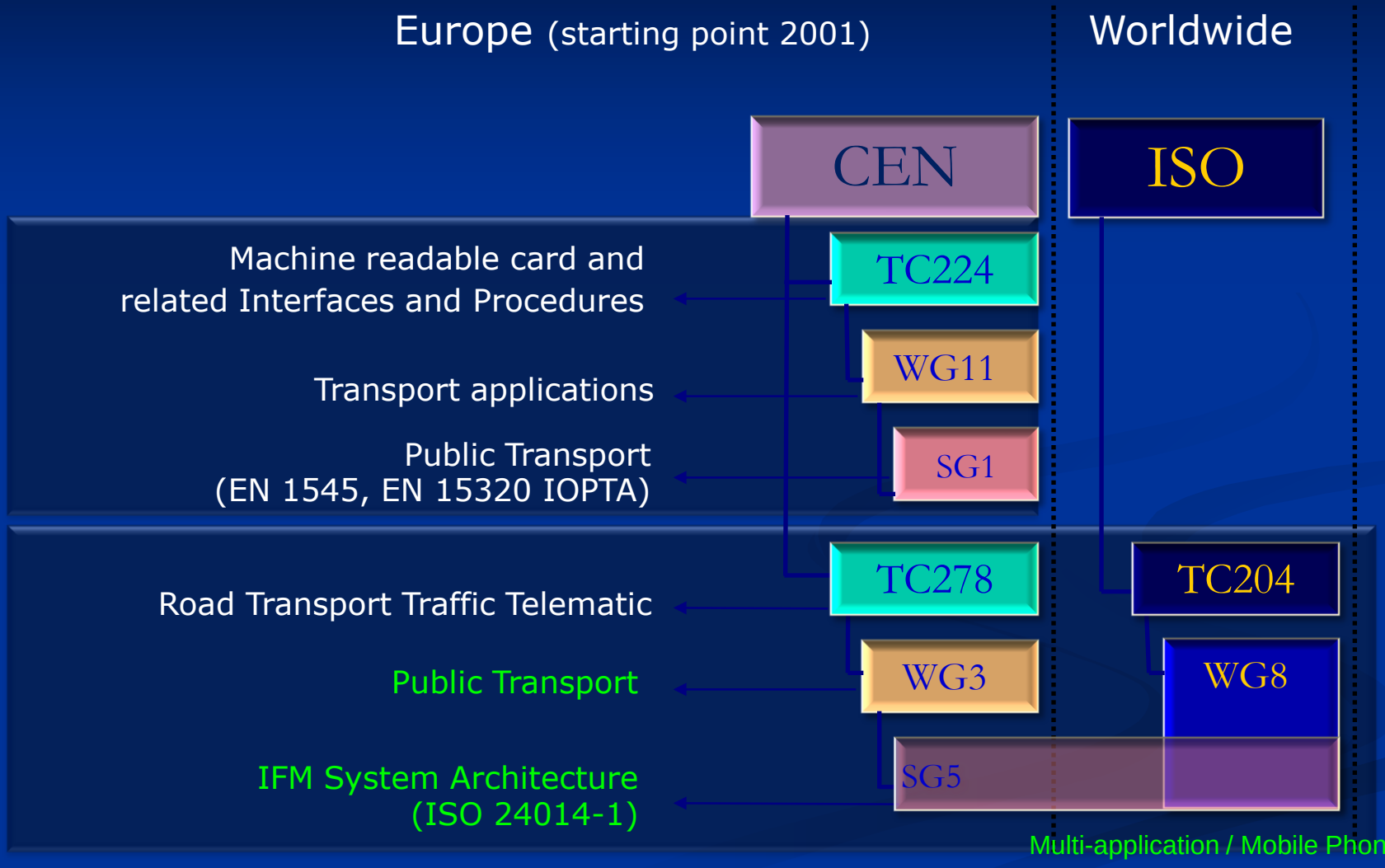
# Potential Roles of Technology & Communication Architecture

- Communication
  - Trusted Service Manager
  - ISO 7816-4 APDU (TIA 1107 for Management Files and Applets)
  - NFC Platform
  - Global Platform / Java
  - ETSI
- Application Location
  - Embedded Secure Element (SE)
    - Integrated
    - Removable
  - Universal Integrated Circuit Card (UICC)
    - CPU / ROM / RAM / EEPROM
  - Subscriber Identity Module (SIM) and Dual SIM
- Mobile Architecture Variations will Influence Partner Rolls
  - TSM
  - Communications Protocol
  - Ownership
  - Cost of Processing

# Categorization of Issues

- Hardware
  - Which CPU Location Makes Sense for Transit? Are their Preferred Approaches?
  - NFC the Logical Choice?
- Business Organization
  - How Does Transit Insert Itself? TSM? Directly?
  - How are Fees Paid and by Whom?
- Security
  - What Approach?
  - Who Responsible?
- Standardization
  - Hardware
  - Software
  - User Interface – The Customer Experience
  - Control of Data
  - Security

# International Standards Development



# Further Information…

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