WoW: Wallet on Wheels

Contents

- **Scope** of services
- **Methods** and Technologies
- **Business** & Stakeholders

Why Wallet-on-Wheels?

Why we need Wallet-on-Wheels?

- Convenient **cashless** payments when travelling
- 'Micro-payments' - **too small for credit cards**
- **Enhanced security** using Car's credentials
- Better way to pay for **automotive** services!!

Why not do it all with Smartphones?

- True - MoM (Mobile Money) is more general… but
- Cars are **less vulnerable**
- Automotive services utilize the **car's instruments**
- **Separates** travel expenditure from private usage

What are the WoW Growth Areas?

- On-the-road (fuel, toll…)
- Driver's roadside assistance
- In-car information (LBS, Navigation, route-news, route-weather)
- In-car entertainment (streaming audio)
- Car maintenance (tyres, garage…)
- Roadside micropayments (snacks)
- Off-road transport (eTicketing, parking)
- Travel related (hotels…)
- Enterprise information (delivery schedule…)
- ….more when easy-pay is in place!

US Federal Reserve report states that "concerns about the security of the technology were the primary reason given for not using mobile payments (42%)"

Why Now?

Ready Business:

- Mobile-Money is backed by **mainstream banking**
- Transport **contactless** eTicketing is successful
- There is ecosystem of cashless **retailers**

Pressing Issues:

- Rampaging **cyber-fraud** demands improved security
- Limited automotive **payment facilities** choking growth of car-related services

Ready Technology:

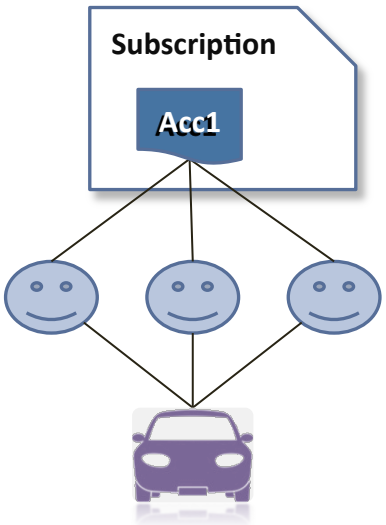
- Cars on-board **processing power** and **smart UI**
- **Car communications** is becoming universal
- **M2M communication** is now established

Proven and Specified Technologies:

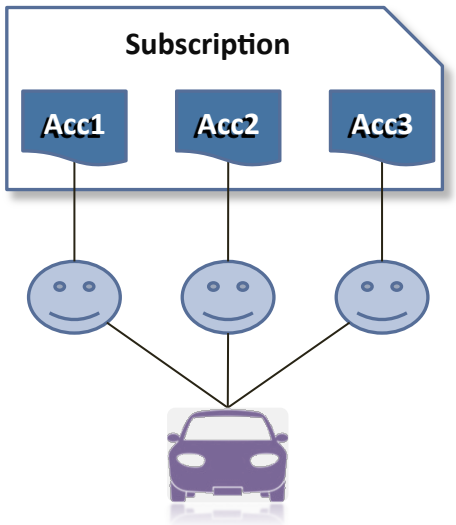
- User Interfaces (touch-screen dashboard, voice command)
- Car communications (3G/4G, NFC, Bluetooth, WLAN)
- Car embedded UICC (Universal Integrated Circuit Card)
- Car SMS (TDM!) and IP Messaging
- PKI (Public Key Infrastructure) for certification
- M2M provisioning Over The Air (OTA)
- M2M Communication Identity Module (MCIM) - proposed
- Generic Boot Strap (GBA), AKA (Authentication Key Agreement - RFC 3310) in and ISIM (IMS SIM) procedures

Cars & Users

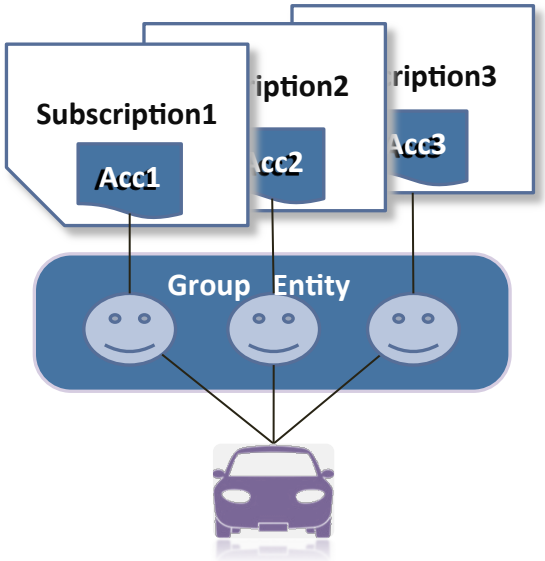
Account = managed credit and payments
Subscription = authentication and budget setting
User = temporary or permanent driver, with own PIN and application parameters



A. Shared Account
e.g. family members



B. Shared Subscription
e.g. car hire or car pool



C. Shared Vehicle
e.g. enterprise assigned driver

Two Main principles:

- Separation of account and subscription
- Users may be temporarily or permanently associated with a car

Cars and Fobs

Extending Fob Facilities with Smartcard Functionality

- Key fobs use NFC for communicating with point-of-sales
- Fobs can be used as a contactless method for transport eTicketing and more…
- WoW provides means of reloading credit safely, possibly for specific purposes

Car Key Pays for Parking

Car Key Open Hotel Room

Combining Security Fob and Key Fob

- Fobs are used to generate random security number
- Fob is 'something the user has' (has-is-knows)
- Fobs can be used for Twin-set (Two-Factor) confirmation

Cars and the Enterprise

Enterprise Usability

- Activate **built-in Identity** for assigned driver
- Set pre-pay **capping**
- Define **permitted services**
- **Select authorized suppliers**
- Pool car Pre-pay - **credit stays with the car**
- Car rental - include **initial credit**
- Pre-pay for web services **separately from 'on-account'** pay (e.g. fuel, parking and eTicketing)

Enterprise Advantages

- **Control** travelling expenses
- Bulk **discount** from suppliers
- **Save admin** costs of expenses claims

Automotive Advantages

- Differentiate car **fleet packages**
- Enable **direct sales** to assigned drivers
- Educate drivers with **promotional offers**

MNOs Advantages

- Negotiate bulk **corporate fleet** agreement
- Corporate customers **churn less** than consumers
- **Less price-sensitive** than consumers

Mobile Money SP Advantages

- More **transaction volumes**

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MoM, Comms &M2M

Mobile Communication Requirements

- **Car 3G/4G and TDM**
  - Universal coverage, incl. GSM/CDMA
  - Ubiquitous while travelling
- **Car Local Connectivity**
  - NFC to key fob /smartphone /tablets
  - WLAN for wider reach, including enterprise WLAN
- **Car SMS – Essential Messaging**
  - Notify support centres
  - Transaction confirmation
- **Car communication Requirements**
  - Secure comms, encrypted data
  - Minimal roaming (financial implications)

M2M Technologies

- **Car Embedded SIM**
  - Tamper-proof TRE – Trusted Environment for eUICC
  - Sealed before leaving the factory!
  - Mandatory emergency 'eCall' from 2015 in EU
- **MCIM Based OTA** (Over The Air)
  - M2M Communication Identity Module (MCIM)
  - Secure provisioning (IMSI/IMPI) as in TR 33.813
- **Global SIMs**
  - ITU Recommendation E.212 for global MCCs (Mobile Country Codes), known as MCC 901

Mobile Money (MoM) Authentication

- Contactless Payments
- Chip and PIN
- Non-repudiation

- Connected/disconnected security tokens
- Two-Factor Authentication

Security Credentials

Threats to Identity /Equipment /Credit

- High business risk with adoption of BYOD
- Growing cyber fraud, especially for financial services
- Discredited IMEI, due to wide-spread cloning

Existing Methods

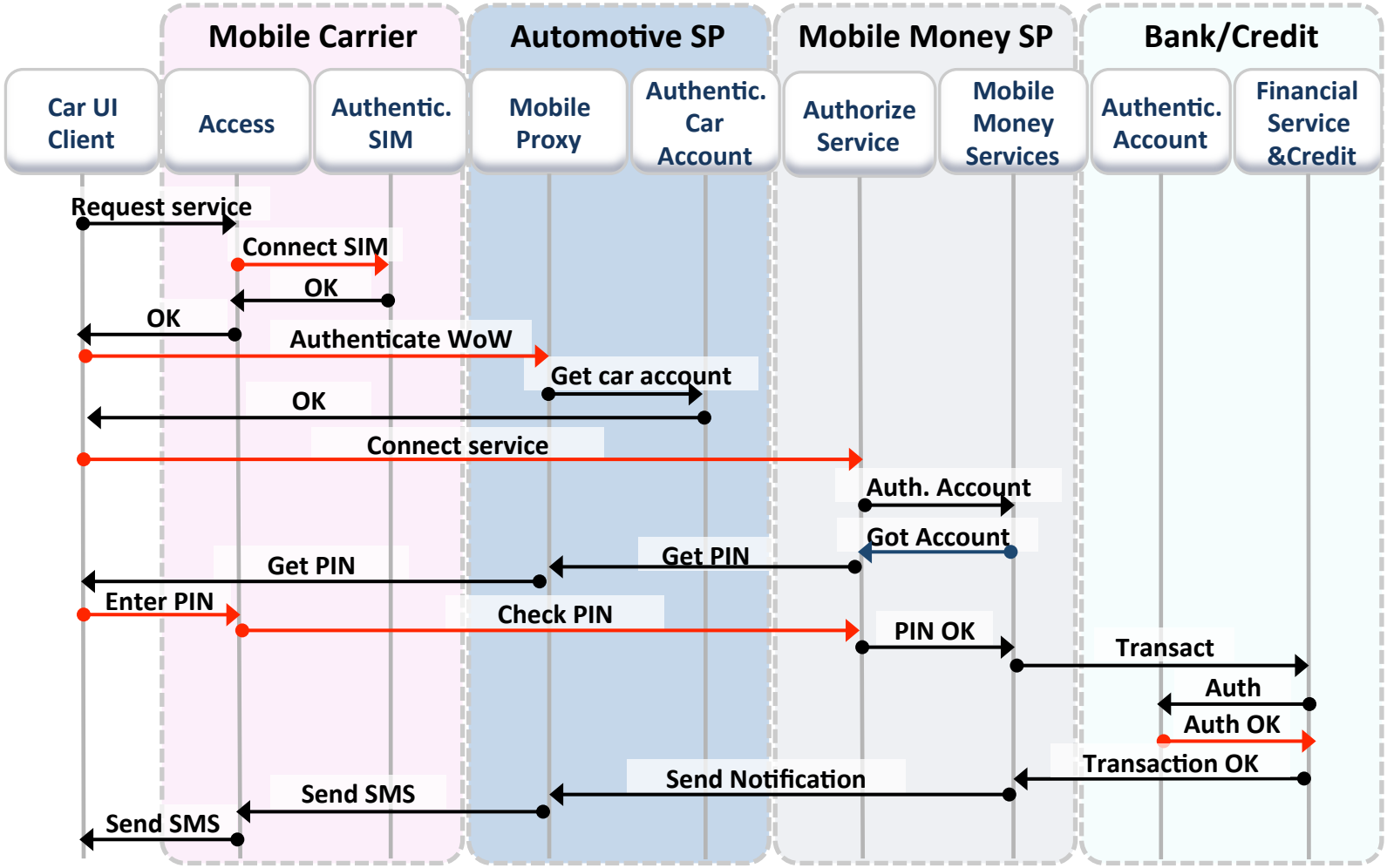
- Car IMSI and MSISDN are not disclosed to drivers!
- Firmware TRE is tamper-proof identity
- Encryption can be turned on for certain payload

Proposed Extra-safe Mechanisms

- Install additional WoW Identities/algorithms for in TRE
- Enable changing MNO SIM
- Implement MCIM OTA option with pre-installed credentials
- Provide ISIM (GBA and PKI) for mutual authentication
- Implement Twin-step /Twin-set (or two-factor) authentication

"The epidemic of **car-stereo thefts in the 1990s** now seems like ancient history"… Criminologists credit the **decline** to the decision of car manufacturers to install stereos **at the factory**". Times Magazine (March 25, 2013)

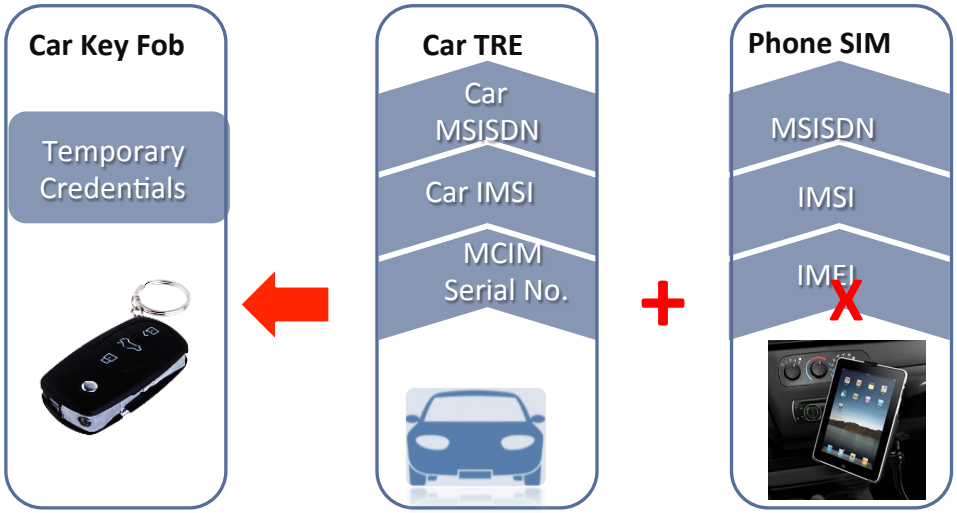
Authentication Levels

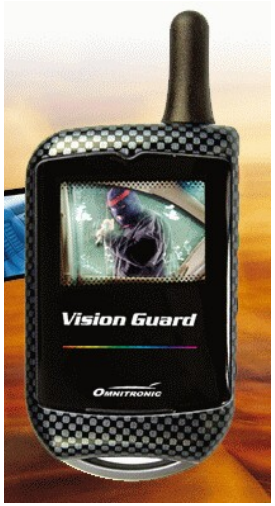


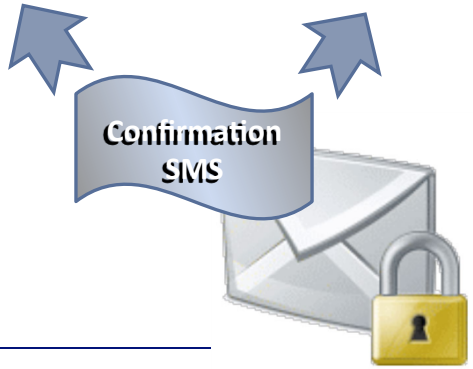
Multiple Devices with WoW

User Interfaces

- Touch-screen dashboard
- Tethered phones with mobile apps
- Key fobs as smart-cards







Essential Messaging

- Non-repudiation SMS ('I confirm payment')
- System messages to Call Centre ('car is upside down')
- Car messages to phone ('Car break-in is in progress')
- Phone messages to car ('where is my car?')

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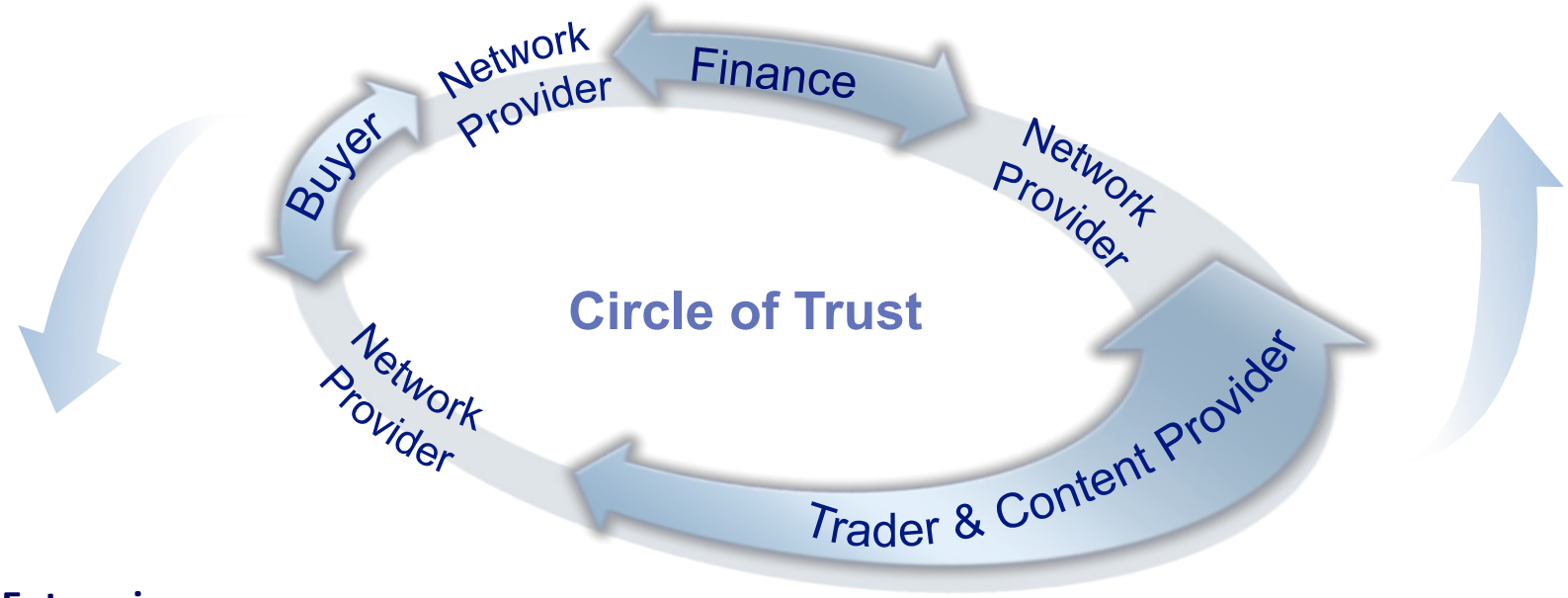
Stakeholders Roles – Circle of Trust

Mobile Network Operator (MNO):
- Provides connectivity
- May provide location-based services
- May provide pre-pay services

Finance Service Provider:
- **Chosen by the service provider**
- Brings ecosystem of traders
- Provides links to banks and credit agents



The Enterprise:
- **Selects car-makes** (not MNO)
- Assigns drivers accounts and budgets
- Authorizes suppliers

Automotive Service Provider:
- **Selects MNO** by shipping destination
- Installs SIM in the tamper-proof area
- Provides car-specific services

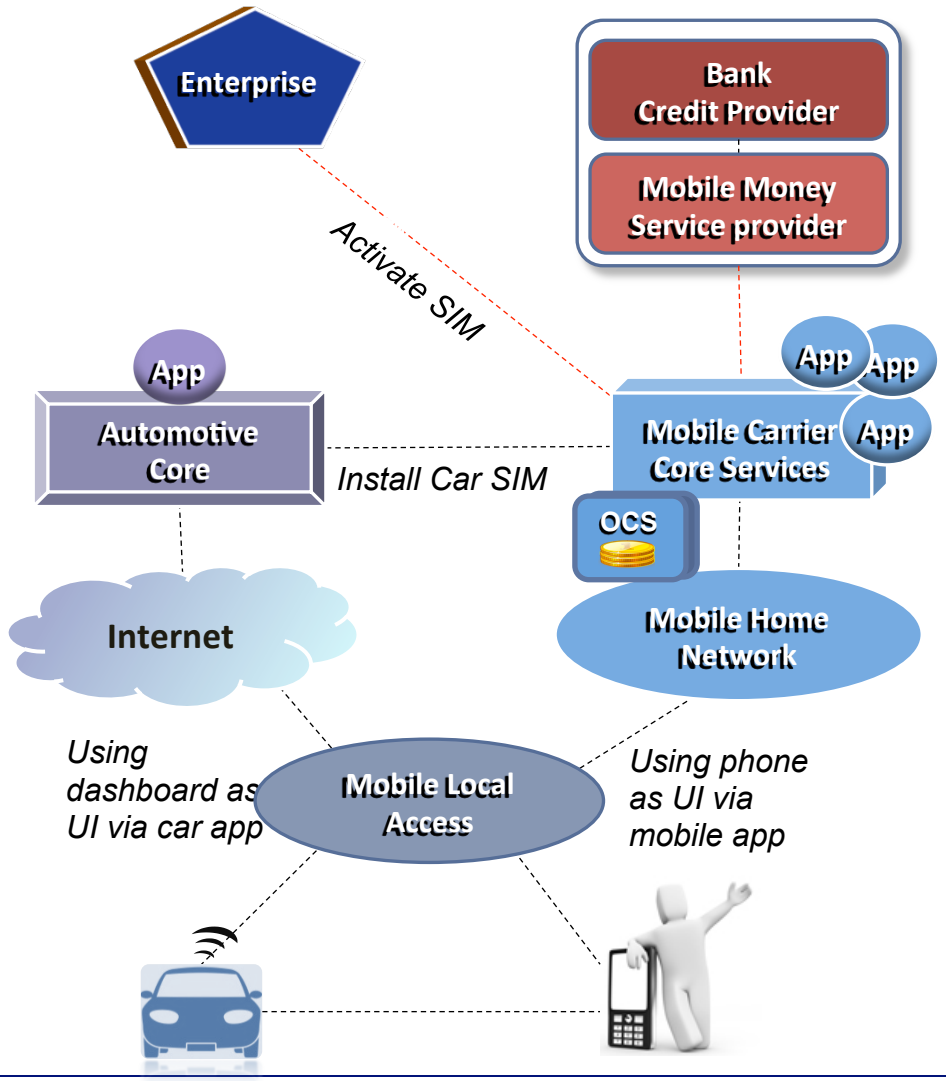
MNO-Centric WoW

MNO Options

- MNOs offer services to cars that have ***their*** embedded UICC SIMs
- Like automotive, MNO need to reach drivers
- MNOs may offer MoM on phones, but drivers may be on other networks than the car
- MNO will still support the automotive own services

MNO Motives

- Rekindle the corporate market
- Re-use of mobile Pre-Pay platform
- Leverage connectivity coverage
- Gain global automotive service providers



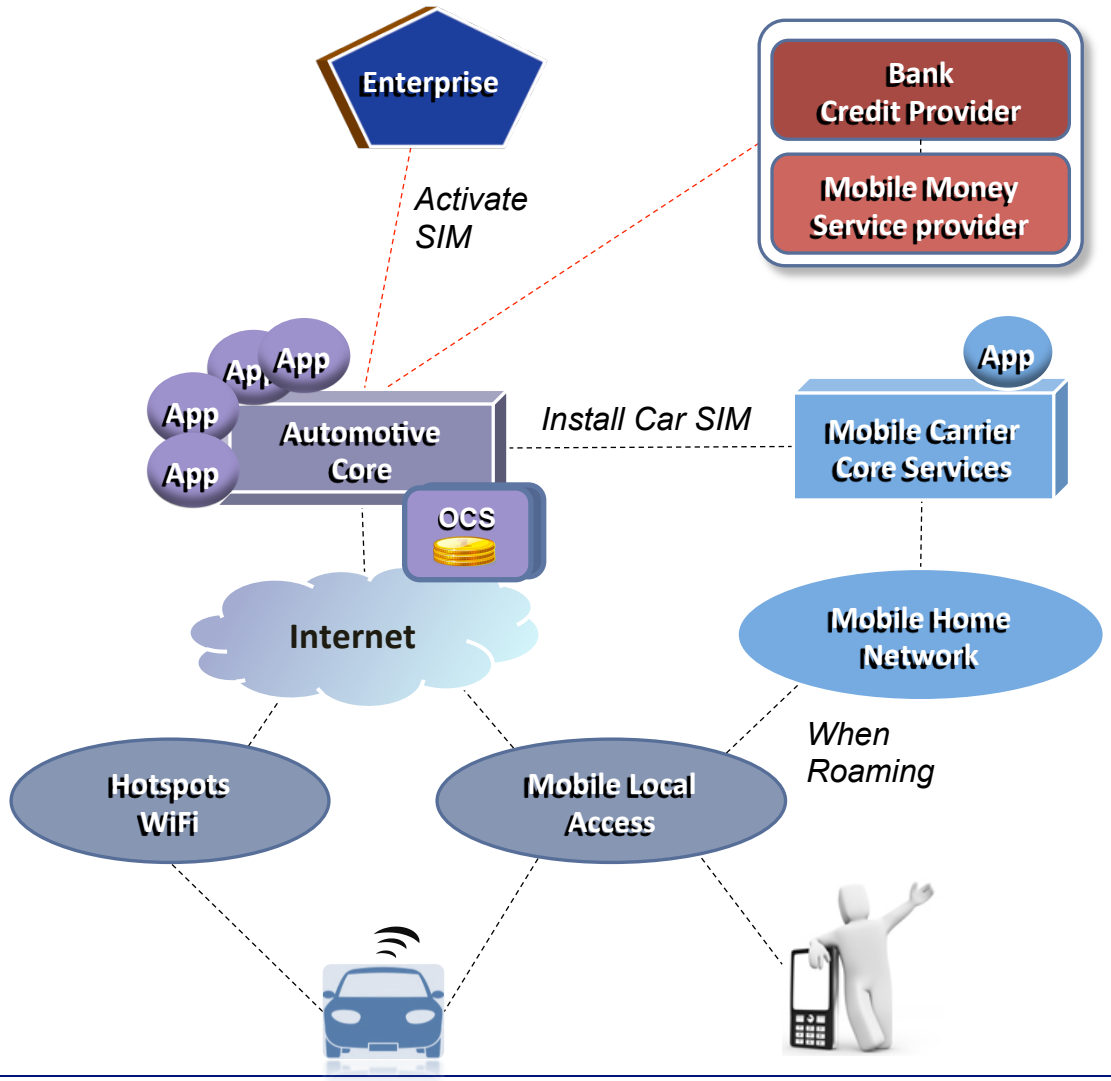
Automotive Centric WoW

Automotive SP Options

- Changing roaming partners
- Connection to local WiFi hotspots
- Offer mobile apps for tethered smartphone
- Offer own automotive services as well as general services(browsing, financial transfer)

Automotive SP Motives

- Enhances car competitiveness
- Enables launching new services during the car's long lifetime
- Maximises car capabilities services
- Optimises communication costs



Issues and Limitations

- WoW necessitates **collaboration**
- WoW service is limited to **car users only**
- MNOs can only support those cars that **had their SIMs** installed at the factory
- Service adoption is constraint by the **rate of selling new cars** that have embedded UICC (cannot be retrofitted)
- Automotive SPs only support **their own make** of cars
- Permanent **roaming** (occurs when factory-set SIMs end up in the wrong country) requires MCIM - MCIM is abandoned!

Summary

- **The WoW idea** - two interwoven principles:
  - **Cars identity** with cars 'owning' accounts (Pre-Pay or Post-Pay)
  - **Car security** by extending car credentials to financial services
- **Methods** - combining and extending several **proven** technologies plus **unimplemented** standards, but use them in a new way:
  - **Separate** WoW Identity from SIM in the eUICC
  - Implement **OTA changing of MNO**
  - Link firmware of **Fob, Car eUICC and tethered phone**

- **Services** - a rich environment for **car-related monetary** services
- Will open up **long tail** services
- **Opportunities** - for **both** MNOs and Automotive Service Providers
- **Market** – private and corporate, but the enterprise is the big cherry
- **Timing** – well, it is already **on its way**…

'Shades' of Camel Pre-Pay

Thank You!

Rebecca Copeland

Venice, 16th October 2013