# COMP327
# Mobile Computing
## Session: 2013-2014

**Lecture Set 10 - mCommerce**

# In this Lecture Set

- M-Commerce

  - E-Commerce on a mobile device

  - Challenges and Opportunities

- Payment Systems

  - Payment mechanisms

# E-Commerce

- Traditionally concerned with allowing users to buy goods over the web

    - Emerged in the late 90ies, with significant market uptake in the earlier noughties

    - Saw significant market growth year on year (aprox 20-25%) compared to traditional retail (~5% growth)

- Emerging as a convenient means of managing services and discovering alternate providers

    - Price comparison sites allow users to evaluate the market, rather than having to "collect fliers from the high street"

    - Has allowed niche retailers to emerge and gain exposure

    - Augments traditional services with new capabilities

        - E-Government services (paying bills, filing tax returns)

        - Banking and Utilities management

# M-Commerce Scenarios

- Augmenting brick-and-mortar commerce

  - Use of RFID or NFC to detect goods

    - Can acquire additional information about the good

      - E.g. product information, price, reviews
      - Additional services such as preview (e.g. for music)

  - Using QR codes to identify, obtain or provide information

    - **Q**uick **R**esponse Code

      - Quicker than URLs; can be captured from billboards or printed media
      - Can encode numeric, alpha-numeric or kanji characters

    - Can display, as well as acquire visual codes

      - Airlines are increasingly using e-ticketing for boarding cards
      - Can use optical scanners to read barcodes from a mobile device
      - Deployments include Spanair, Air France, Lufthansa

- Advantages

  - Informed choice when purchasing goods

# M-Commerce Scenarios

- Electronic Banking, Payment and e-ticketing
  - WAP Solo
    - Provides a means of payment to services via WAP for identified ticketing sites
    - Payments either from your bank account or via credit cards - including 3rd parties
  - iMode Felicia
    - Wireless payment scheme
      - Similar to use of Oyster card
      - Used for shopping, transportation, ticketing, membership card, etc
  - SMS payment and alerts
    - Warnings when bank limits are approached or new payments are instructed

- Advantages
  - Shorter queues with lower operating costs
  - Relax need for on-the-spot revenue collection technologies
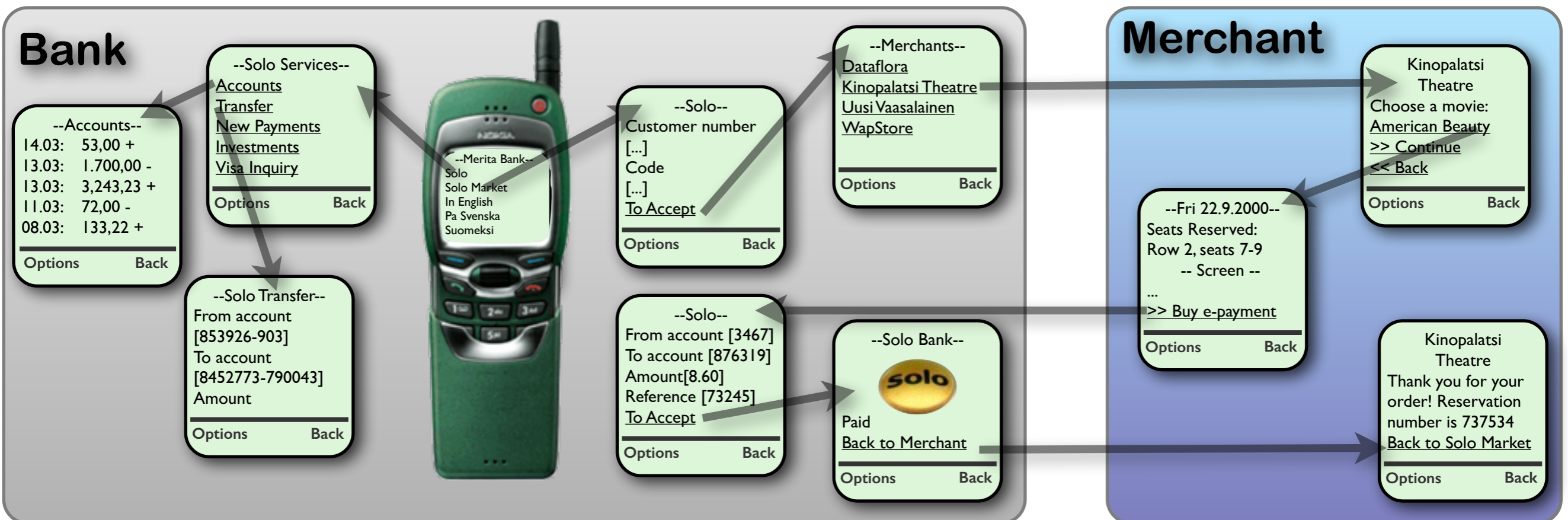    - e.g. coin-operated parking meters

# M-Commerce Scenarios

- Killing "dead-time"
  - Provide access to media on-demand
    - Video access such as TV subscription
      - Available in Japan and Korea since 2005
      - More than 20m TV phones in Japan and 8m in Korea
    - News Media Access
      - Increasing number of Publishers are charging for access to online variants of print news

- In App Purchasing
  - Music Stores such as iTunes allow access to new content
  - "Free" applications can provide basic functionality, with extended functionality for additional cost
    - E.g. new levels for games, or upgrading to the "Pro" version

# Case Study:
# Noreda's WAP Solo

- WAP based payment and banking system from Noreda Bank
  - Launched in Scandinavia in October, 1999; >2M users within first 24 months
  - Payments either from users bank account or via credit cards - including 3rd parties
- Services:
  - Traditional banking services
  - Check balance, pay bills, news, check credit card activity, stock trading
  - But also shopping mall (>600 merchants) , e-salary, loans, insurance, etc.

**Bank**

**Merchant**

--Solo Services--
Accounts
Transfer
New Payments
Investments
Visa Inquiry

Options          Back

--Accounts--
14.03:   53,00 +
13.03:   1.700,00 -
13.03:   3,243,23 +
11.03:   72,00 -
08.03:   133,22 +

Options          Back

--Merita Bank--
Solo
Solo Market
In English
Pa Svenska
Suomeksi

--Solo--
Customer number
[...]
Code
[...]
To Accept

Options          Back

--Merchants--
Dataflora
Kinopalatsi Theatre
Uusi Vaasalainen
WapStore

Options          Back

Kinopalatsi
Theatre
Choose a movie:
American Beauty
>> Continue
<< Back

Options          Back

--Solo Transfer--
From account
[853926-903]
To account
[8452773-790043]
Amount

Options          Back

--Solo--
From account [3467]
To account [876319]
Amount[8.60]
Reference [73245]
To Accept

Options          Back

--Solo Bank--

solo

Paid
Back to Merchant

Options          Back

--Fri 22.9.2000--
Seats Reserved:
Row 2, seats 7-9
     -- Screen --
...
>> Buy e-payment

Options          Back

Kinopalatsi
Theatre
Thank you for your
order! Reservation
number is 737534
Back to Solo Market

Options          Back

# Mobile Payment: General Considerations

- User Interface Constraints:

  - Tiny keypads make credit card details much more difficult to enter

    - Less of an issue with more modern smart phones, though still time consuming

  - Secure end-to-end TLS connection is not always available

    - Problematic in early WAP scenarios

- Opportunities:

  - Mobile phone can be used as a *Personal Trusted Device* that replaces your wallet

  - Can also pay non-physical services, e.g. charitable donations via SMS

# Mobile Payment Mechanisms

- Four primary models for mobile payment:
  - Premium SMS based transactional payments
  - Mobile Web Payments
  - Contact-less Payment (Near Field Communication)

- Variants of these also exist
  - TextPayMe, mPark, stored value systems

- Increasing adoption
  - Mainly in Europe and Asia
  - Estimated market of $60B by 2013

# Premium SMS based transactional payments

- Payment via an SMS message to a short code

  - Premium charge applied to mobile phone bill

  - Phone-based goods are often delivered through MMS

    - e.g. Music, Ringtones, Wallpapers, but also 2D Barcodes for e-ticketing

  - Challenges:

    - Poor Reliability - messages may get lost (no delivery guarantee)

    - Slow Speed - SMS delivery can be slow, making the consumer wait

    - High Setup and Running Costs - includes delivery of goods via MMS

    - Low Payout Rates - After running costs, payout to merchant as low as 30%

    - Low Follow-on Sales - limited mechanism, with little user support



A Big Thank You!
A big thank you to the UK mobile phone operators, who have made it possible for us to receive the full £5 you have donated: 3, O2, Orange, T-Mobile, Virgin and Vodafone.

# Mobile Web Payments

- Payment made via a web site or via embedded code within the app
  - Uses WAP to support communications
  - A variety of implemented payment systems exist to simplify transactions, though require setting up accounts
    - PayPal, obopay, TextPayMe, Google Checkout etc

# Mobile Web Payments

- Several Advantages to using Mobile Web Payments

  - Follow-on sales

    - Web or App can return user to the store, other services or related goods.

    - Access to re-usable URLs encourages repeated visits

  - High Customer Satisfaction

    - Confidence in using a widely adopted and brand-familiar approach

  - Ease Of Use

    - Familiarity with a previously used mechanism

    - Requires information known a-priori, or accounts are set up that require little further input

# Credit Card

- User can provide credit card details for one-off payments
  - Familiar payment mechanism, used by most e-Commerce stores
  - User enters card details, billing address, and (if different) a delivery address
  - Many banks also require $3^{rd}$ party authentication

- Can be tedious and error prone from a small device
  - leading to lower success or conversion rates
  - By having the retailer retain card details, payments can be simplified
    - increases conversion (i.e successfully completed transaction) rate
    - experience becomes similar to Direct Operator Billing

- Other "peripheral" based approaches emerging
  - E.g. SquareUp for credit card payments on smartphones

# Online Payment Systems

- Online payment systems allow online transactions, and act as a proxy

  - Online account is paired to a $3^{rd}$ party bank account

    - Credit may be held by the payment system, but can be "topped up" from the bank account

    - Excess credit can be paid back to the bank

  - Authentication performed using an account id and password/pin

- Augments existing banking services

  - New payment systems can be adopted without uptake from high-street banks

    - Flourished with the advent of Auction Marketplaces such as eBay

- Examples:

  - PayPal, Amazon Payments and Google Checkout

# MicroPayments

- Financial transactions involving very small sums of money

  - From a few pennies to a small number of pounds

  - Often used for purchasing online content, or making regular payments

    - music, video, toll-payments, etc

- Standard payment systems problematic for small payments

  - Typically every payment incurs a transaction fees

    - Transaction fee for small payments becomes significant

- Require some billing mechanism to support payments over several transactions:

  - Pre-paid accounts

  - Accumulated Balance Payment Systems

# MicroPayments

- Pre-paid accounts

  - MicroPayments can be drawn from this pre-paid account

    - NetBill research project at CMU explored this approach in 1997

  - Still used for systems such as Skype, etc

- Accumulated Balance Payment Systems

  - Accumulate small charges, then bill periodically

    - Familiar to utility users (e.g. phone bills)

  - Assumes Direct Operator Billing, as user needs account

  - Example: Apple Store

    - Payments accrue over a fixed period of time, and then are billed as a single transaction

    - Supports the retail of music tracks (e.g. at 79p), apps (from 59p), rentals, etc

# Contact-less Payment Systems

- Uses Near Field Communication (NFC) mechanisms such as RFID to communicate with receivers

    - Device is "passed" near to receiver, to perform transaction

        - May require some authentication using a PIN

    - Payment is then made via a pre-paid account, or billed directly

- Main adoption within mass-transit networks

    - Edy/Suica enabled phones used on Japanese Rail Network

    - Oyster Cards used on London Transport Network

# Other payment systems

- Other payment forms have been used
    - Pre-paid accounts
        - User sets up an account and deposits credit
        - Payments are drawn from account
        - User notified when account is low, or automatic re-deposit method used
        - Often used with contact-less payment systems
            - Example: M6 Toll charges use from a pre-paid user account. When credit is low, a single transfer is made to bank account to top up user account
    - SMS-supported payment systems
        - Uses SMS to instruct payment
        - May involve "gluing" another payment system to a user

# Examples of SMS-supported payment systems

- mPark (mobile Parking)

  - Parking Meter Payment System using SMS

    - Deployed in Edinburgh, Newbury and Glasgow so far

  - User activates the parking meter, which displays a unique code

  - This code is then sent via an SMS message identifying the user

  - User is then billed through a registered account, but can also be notified of reminders, etc

- Other similar systems exist

  - E.g. Liverpool City Council "*Phone and Pay to Park*" scheme

# Exercises...

- The Desktop and Mobile E-Commerce experience can differ wildly. Describe one limitation and one advantage of using a mobile device for e-commerce.

- Network costs for 2G communications can seriously hamper the use of credit-card payments, especially when using mobile devices with numeric keypads

  - Describe a scenario whereby communication costs can be reduced when paying for goods, and give details of how the payment could be made

- In-App purchasing is a mechanism whereby applications can sell additional services directly from the application.

  - Discuss why micropayments may be desirable in such applications, and by means of an example, give a brief explanation of how micropayments work.

- How does a mobile device augment traditional commerce? Speculate on how RFID sensors could be used to transform a mobile device into a "self-pay" point-of-sales device?

  - How could a store differentiate between legitimate purchases and shoplifted goods?

# To Recap...

- In this lecture set, we covered:
  - An introduction to E-Commerce
    - Evolution of the B2C e-commerce site
    - Comparison of the Desktop and Mobile experience
  - M-Commerce Scenarios
    - Case Studies
  - Payment Systems
    - SMS, Credit Card, Pre-payment, Micropayment, and Web-based
    - Contact-less payment systems
  - Apple's In-App Payment Framework

# Further Reading

- *M-Commerce*
  Norman Sadeh (Wiley, 2002)
  - Chapters 1 and 6

- *Apple's Development Site*