Charging and Billing (C&B)
## Schedule

<table>
<thead>
<tr>
<th>Date</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>14.03.2008</td>
<td>Course introduction. Big picture. (HH)</td>
</tr>
<tr>
<td>19.03.2008</td>
<td>Consumer customers (HH)</td>
</tr>
<tr>
<td>21.03.2008</td>
<td>No lecture (Easter)</td>
</tr>
<tr>
<td>26.03.2008</td>
<td>No lecture (Easter)</td>
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<tr>
<td>28.03.2008</td>
<td>Enterprise customers (HH)</td>
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<tr>
<td>02.04.2008</td>
<td>Operators (AK)</td>
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<td>04.04.2008</td>
<td>Transport pricing (AK)</td>
</tr>
<tr>
<td>09.04.2008</td>
<td>Mobile operator competition (HH/TB)</td>
</tr>
<tr>
<td>11.04.2008</td>
<td>Content pricing (HV)</td>
</tr>
<tr>
<td>16.04.2008</td>
<td>Investments (TS)</td>
</tr>
<tr>
<td>18.04.2008</td>
<td>Interconnect and roaming (HH)</td>
</tr>
<tr>
<td>23.04.2008</td>
<td>Charging and billing (HV)</td>
</tr>
<tr>
<td>25.04.2008</td>
<td>Regulation (TS)</td>
</tr>
<tr>
<td>30.04.2008</td>
<td>Spectrum, course wrap-up (TS)</td>
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</tbody>
</table>
Definitions

Charging: To set or ask (a given amount) as a price
Billing: Request for payment of a debt

Price is cost of one unit (of usage), tariffs define how prices and usage combine into charges, that are billed from the user.
Traditional payment systems

US market - Value and volume of payments

Source: U.S. Census Bureau, 2002
Traditional payment systems
Finland

- Role of cash decreasing very slowly
- Mass of micropayments to be optimized
### Traditional payment systems

**Key features**

<table>
<thead>
<tr>
<th></th>
<th>Cash</th>
<th>Credit card</th>
<th>Debit cards</th>
<th>Accumulating balance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Cost per transaction</strong></td>
<td>low</td>
<td>high</td>
<td>high</td>
<td>low</td>
</tr>
<tr>
<td><strong>Merchant fixed cost</strong></td>
<td>low</td>
<td>high</td>
<td>high</td>
<td>high</td>
</tr>
<tr>
<td><strong>User fixed cost</strong></td>
<td>0</td>
<td>high</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td><strong>Merchant fee</strong></td>
<td>0</td>
<td>3-5%</td>
<td>low</td>
<td>low</td>
</tr>
<tr>
<td><strong>Account required</strong></td>
<td>no</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td><strong>Anonymous</strong></td>
<td>yes</td>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
<tr>
<td><strong>Risk for consumer</strong></td>
<td>yes</td>
<td>limited</td>
<td>limited</td>
<td>no</td>
</tr>
<tr>
<td><strong>Risk for merchant</strong></td>
<td>no</td>
<td>yes</td>
<td>no</td>
<td>yes</td>
</tr>
</tbody>
</table>
E-commerce

Basic business sectors

Business-to-Business (B2B)
– 90% of all e-commerce

Consumer-to-Consumer (C2C)
– 1% of all e-commerce

Business-to-Consumer (B2C)
– 10% of all e-commerce

Role of network operators
– Access and transport service provider
– Charging for small content transactions of consumers
# E-commerce

## Revenue models

<table>
<thead>
<tr>
<th>Revenue model</th>
<th>Examples</th>
<th>Revenue source</th>
</tr>
</thead>
<tbody>
<tr>
<td>Advertising</td>
<td>Yahoo.com</td>
<td>Fees from advertizers in exchange for advertisements</td>
</tr>
<tr>
<td>Subscription</td>
<td>WSJ.com</td>
<td>Fees from subscribers in exchange for access to content</td>
</tr>
<tr>
<td></td>
<td>Sportsline.com</td>
<td></td>
</tr>
<tr>
<td>Transactions</td>
<td>eBay.com</td>
<td>Fees for enabling or executing a transaction</td>
</tr>
<tr>
<td></td>
<td>E-Trade.com</td>
<td></td>
</tr>
<tr>
<td>Sales</td>
<td>Amazon.com</td>
<td>Retail sales of goods, information, or services</td>
</tr>
<tr>
<td></td>
<td>Sears.com</td>
<td></td>
</tr>
<tr>
<td>Affiliate</td>
<td>MyPoints.com</td>
<td>Fees for business referrals</td>
</tr>
</tbody>
</table>

Source: Laudon&Traver, 2003
E-commerce

U.S. online payment market – merchants view

- VISA has over 50% marketshare of all Internet payments (ref. ”Verified by VISA”)

Source: Gartner Group, 2002
E-commerce

Online credit card process

1. Consumer makes purchase

2. SSL Internet

3. Request transaction

4. Verify balance

5. Issuing bank credits merchant account (batch)

6. Monthly statement with debit for purchase

- Weakness in authentication (Secure Socket Layer ⇒ Secure Electronic Transaction)
- High cost (e.g. 0.2-0.3€ per transaction ⇒ earlier minimum purchase price)
E-commerce vs. digital content
Japanese online market – wired vs. mobile in 2001

- Mobile content market: ¥110B
- Mobile e-commerce market: ¥115B
- Wired content market: ¥32B
- Wired e-commerce market: ¥706B

Source: ECOM, Natsuno, 2003
Digital content
Digital wallet – core technology

• Digital wallet
  – authenticates the consumer digitally (certificates, SET, etc)
  – stores and transfers value
  – secures the payment from consumer to merchant

• Potential benefits
  – one-stop-shopping for transactions and bill presentment
  – user information pre-set ⇒ better usability (*single sign-on*)
  – real-time integration of the complete transaction chain
  – enables small payments (< 5€) in Internet

• Two basic digital wallet approaches
  – client-based wallet for consumers (e.g. MasterCard Wallet)
  – server-based wallet for merchants (e.g. MSN Wallet/MS .NET)
    – consumers resist storing personal information in servers!

• Successful standard missing (e.g. Liberty Alliance, 3GPP)
Digital content
Mobile super distribution

Legend
DRM = Digital Rights Management
MRV = Mobile Rights Voucher
= Content path
= Control path

- Mass delivery of legal mobile content with low cost (e.g. peer-to-peer MMS)
- Micropayment mediation for a large number of retailers (content aggregation)
- Operator/clearing house gets the rights clearing revenue from content retailers
- Usage rules in MRV control the usage of a content object (e.g. music)
- Mobile operator can integrate DRM with existing charging (pre/postpaid)
Operator charging and billing

Basic concepts

- **Charging**: a process where subscriber accounting information is retrieved for billing purposes
- **Billing**: generate and send a bill to subscriber based on certain tariffs
- Charging and billing are key components of *Business* and *Operations Support Systems* (BSS/OSS)
- Traditional circuit-switched charging is based on subscriptions and **Charging Data Records** (CDR) generated by network elements
- Packet-switched networks involve **Internet Protocol Data Records** (IPDR, cmp. CDR) for new services such as IP telephony, public WLAN, digital cable, and content
What is a Subscription?

• For instance
  – A wire and a hole in a switchboard
  – A phone number
  – A SIM card
  – An IP address

• An agreement with customer to provide a range of services
  – not at all a technical issue

• A portfolio of communication products offered to the customer
### What can a Subscription contain?

<table>
<thead>
<tr>
<th>Service Category</th>
<th>Core Services</th>
<th>Capabilities &amp; Features</th>
<th>Customer Segments</th>
<th>Time Frame</th>
<th>Channels</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voice / Voip</td>
<td>Local / Long dist International Unified messaging Conferencing</td>
<td>Call forward Caller ID Follow me Virtual TN Push-to-Talk Location IM / Chat Balance</td>
<td>Region 1 Region 2</td>
<td>Summer Winter</td>
<td>Olympics Anniversary Week-end Special Stores Call Center Self Service Retail Virtual operators</td>
</tr>
<tr>
<td>Mobile</td>
<td>Minutes SMS, MMS, WAP Streaming GPRS, HSDSP</td>
<td>Speed SLA</td>
<td>Teen Young adult Family Traveller</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Data xDSL</td>
<td>Internet access eMail, Webspace Security</td>
<td>Basic service Sport package</td>
<td>Enterprise SME Home office</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TV / Video</td>
<td>IPTV, DigiTV, VoD Conferencing</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Office</td>
<td>Storage, Firewall ASP applications</td>
<td></td>
<td></td>
<td></td>
<td>Source: Pasonen, 2005</td>
</tr>
</tbody>
</table>

**Thousands of Products In Portfolio!**
TeleManagement Forum and eTOM
(enhanced Telecom Operations Map - standard)

Source: Pasonen, 2005
Rating, Pricing, Billing, Charging

Source: Pasonen, 2005
Operator charging and billing

Traditional system

Billing
- Accounting system
- Administration module
  - Billing module
  - Fraud control module
- Customer care module
- Roaming/interconnect module
- Credit control module
- Rating module
- CDR processing module

Business & operational support processes

Network management

Charging
- Mediation device
- Network infrastructure

Bill flow

Customers

CDR flow
## Operator charging and billing

Cost breakdown – example mid-size operator (3–5M subs)

<table>
<thead>
<tr>
<th>Category</th>
<th>Unit price</th>
<th>#</th>
<th>Total per year</th>
<th>Comments</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>OPEX, billing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Personnel</td>
<td>90 000</td>
<td>100</td>
<td>9 000 000</td>
<td></td>
</tr>
<tr>
<td>Post-processing</td>
<td>3 000 000</td>
<td>1</td>
<td>3 000 000</td>
<td></td>
</tr>
<tr>
<td>Pre-paid/inter-operator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Marketing</td>
<td>200 000</td>
<td>1</td>
<td>200 000</td>
<td></td>
</tr>
<tr>
<td><strong>CAPEX/billing</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Billing system</td>
<td>20 000 000</td>
<td>5</td>
<td>4 000 000</td>
<td>Divided over 5 years</td>
</tr>
<tr>
<td>Software upgrades</td>
<td>20 000 000</td>
<td>0.1</td>
<td>2 000 000</td>
<td>10% of purchase price</td>
</tr>
<tr>
<td><strong>OPEX, charging</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Installation and maint.</td>
<td>90 000</td>
<td>10</td>
<td>900 000</td>
<td></td>
</tr>
<tr>
<td><strong>CAPEX, charging</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Charging system</td>
<td>4 000 000</td>
<td>5</td>
<td>800 000</td>
<td>20% of billing system</td>
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<tr>
<td>Software upgrades</td>
<td>4 000 000</td>
<td>0.1</td>
<td>400 000</td>
<td>10% of purchase price</td>
</tr>
<tr>
<td><strong>CAPEX, total</strong></td>
<td></td>
<td></td>
<td>7 200 000</td>
<td></td>
</tr>
<tr>
<td><strong>OPEX, total</strong></td>
<td></td>
<td></td>
<td>13 100 000</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td></td>
<td>20 300 000</td>
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<tr>
<td><strong>CAPEX % of total C&amp;B costs</strong></td>
<td></td>
<td></td>
<td>35 %</td>
<td></td>
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</tbody>
</table>

Source: Gartner Group, Comptel, Swan 2003
Operator charging and billing

Cost analysis

- Total cost per bill (on paper) in traditional C&B can be several euros
- New features in mobile such as GPRS, prepaid, and multi-access roaming add C&B costs significantly (30% ?)
- Mobile operators fight the high C&B cost by offering their service to others or by outsourcing it
- Production cost of mobile C&B transaction can be reduced by
  - avoiding paper bills (electronic bills)
  - removing credit losses (post-paid ⇒ pre-paid/real-time)
  - eliminating history (digital credit ⇒ digital cash)
  - aggregating for settlement (digital wallet)
  - automating the top-up process (digital wallet)
Operator charging and billing
Mobile pre paid process

Top-up side
- Pre-paid phone cards
- Automatic Teller Machines
- On-line digital wallet

Payment side
- Physical goods & services
- Digital goods & services

Credit account
Mobile payments and strategy

It is not only about billing, it is about:

- authentication (ID)
- authorization (means to conduct actions)
- payments (exchange of money for value offerings)

→ it is about visibility and trust ~ brand

Who wins?

- Network operators have networks and lots of infrastructure already in place
- Device manufacturers control software and platforms (Nokia)
- Credit card companies have the biggest unified user domains
- Traditional banks have the closest relationships with customers (though in undeveloped countries most trade is unofficial)