

## *Lecture 11*

### Application Domains IV: Mobile Brokerage



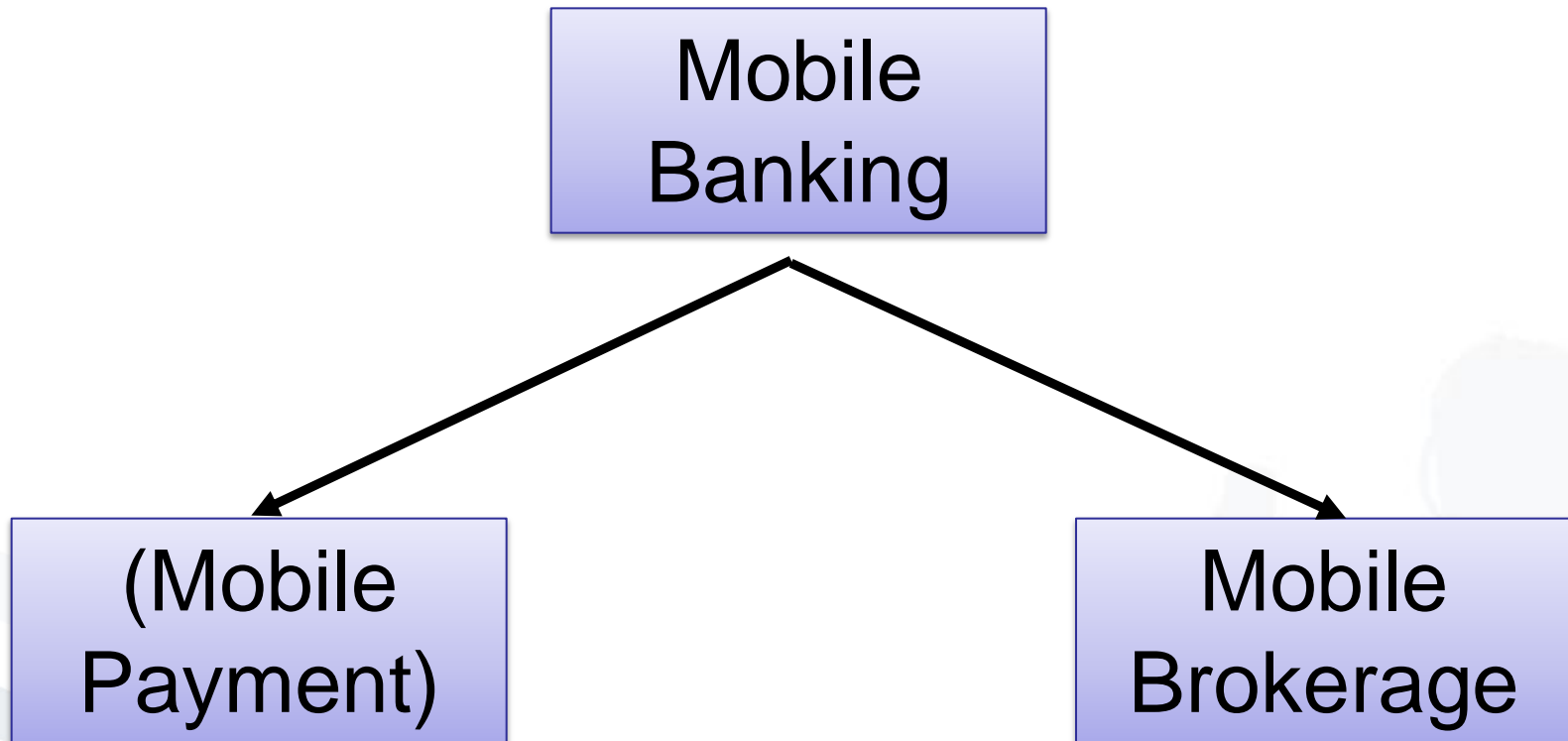
Mobile Business II (SS 2010)

Prof. Dr. Kai Rannenber

Chair of Mobile Business & Multilateral Security  
Goethe-Universität Frankfurt a. M.

- Introduction
- Mobile Brokerage Processes
  - Information Acquisition
  - Order Routing
- Exemplary Service & Infrastructure Designs
  - Protection Goals
  - Traditional Architecture Design
  - A Novel Architecture Design
- Conclusion

# A Classification for Mobile Banking



## Mobile Brokerage yesterday...

- *Mobile Banking/Broking were expected to be one of the „killer applications“ for mobile commerce in the past.* [Durlacher 1999; Ericsson 2001]

## Problems:

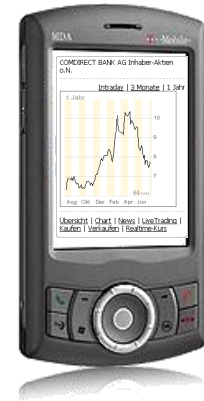
- Most of the time, mobile brokerage services were reproductions of existing, web-based applications with a limited set of available features.
- Low bandwidth, i.e. time consuming
- High communication costs
- Limited functionality
- HCI problems (e.g. display quality)



## Mobile Brokerage today...

- *Some* of the major problems solved:
  - Faster data services (GPRS/UMTS)
  - Lower costs for data services (e.g. data flat rates)
  - Enhanced functionality (new devices with larger screens and better browser software)
- However:

Most of the current mobile brokerage services are simple reproductions of existing online brokerage websites.

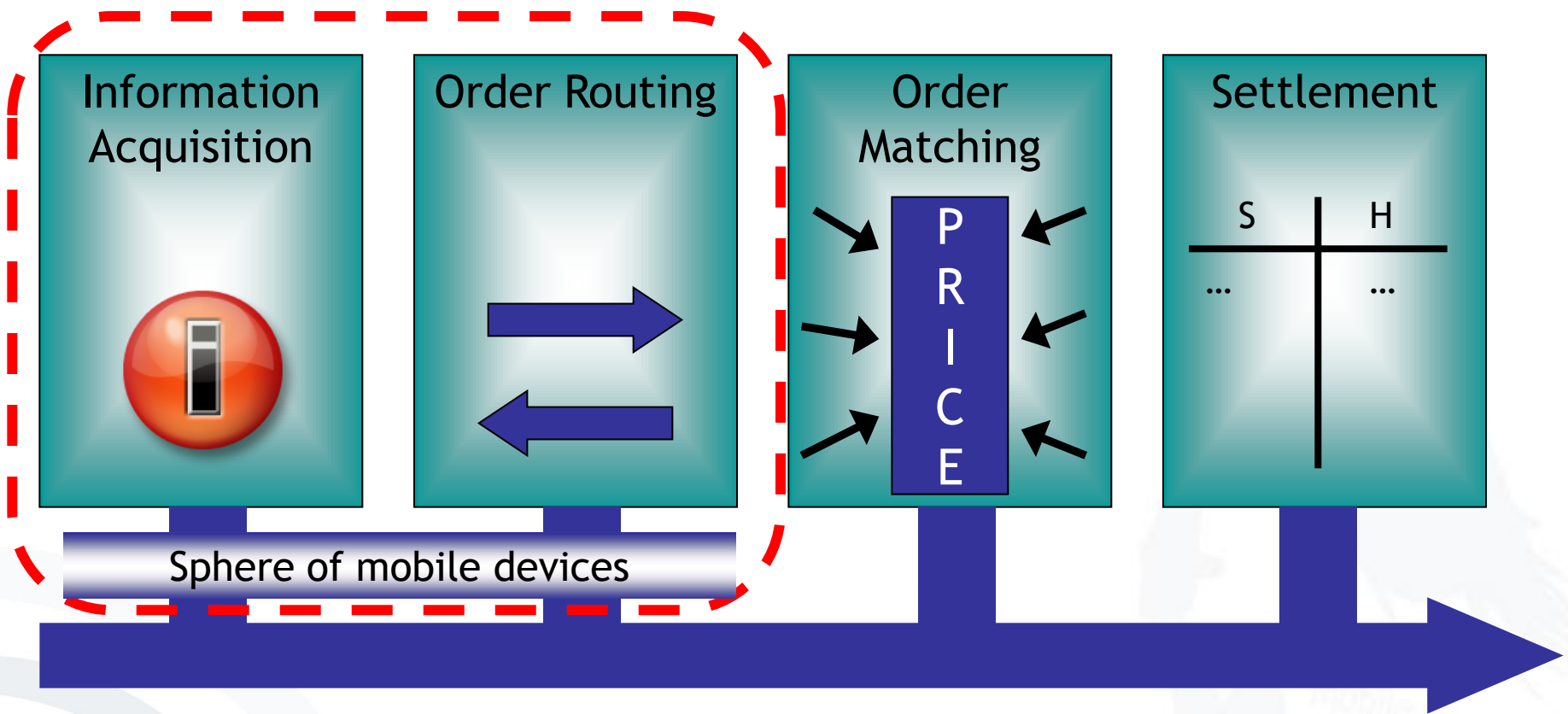


- Example: Notification Services
  - Account balance warnings
  - Completed money transfers
  - Completed stock orders
- *„These proactive and “simple” alerting services reduce call centre costs up to 70-90% (25c vs. \$2.77 averaged)“*  
[JupiterResearch 2004]
- ***But:*** Currently existing mobile brokerage services are still rudimentary and primarily focus on the reduction of costs (e.g. reduction of call-center calls).

[Pavich 2004]

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# Trading Phases of Stock Trading



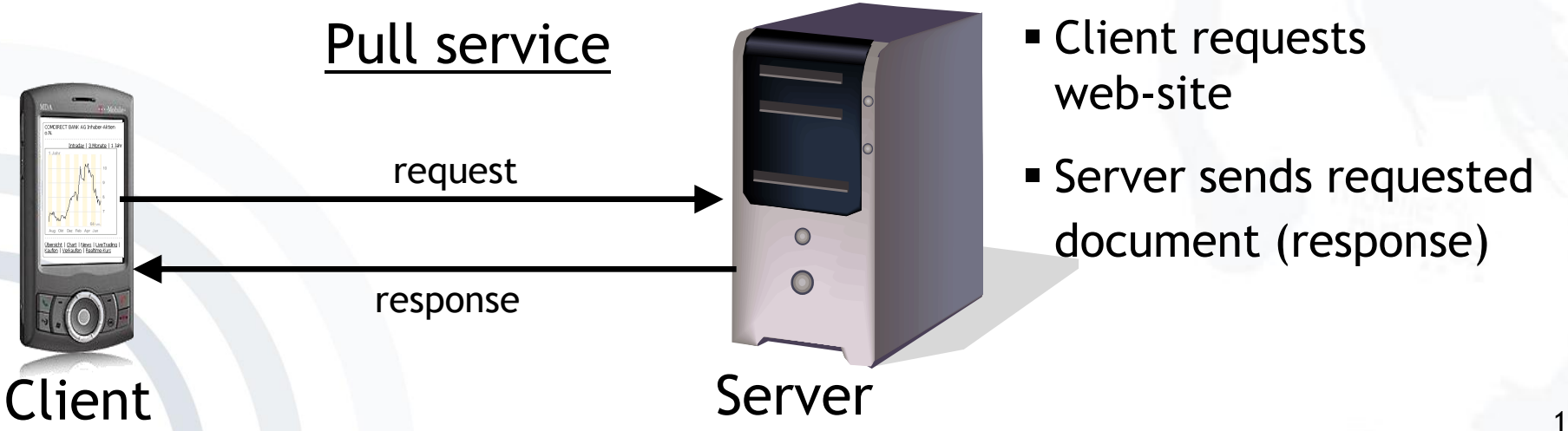
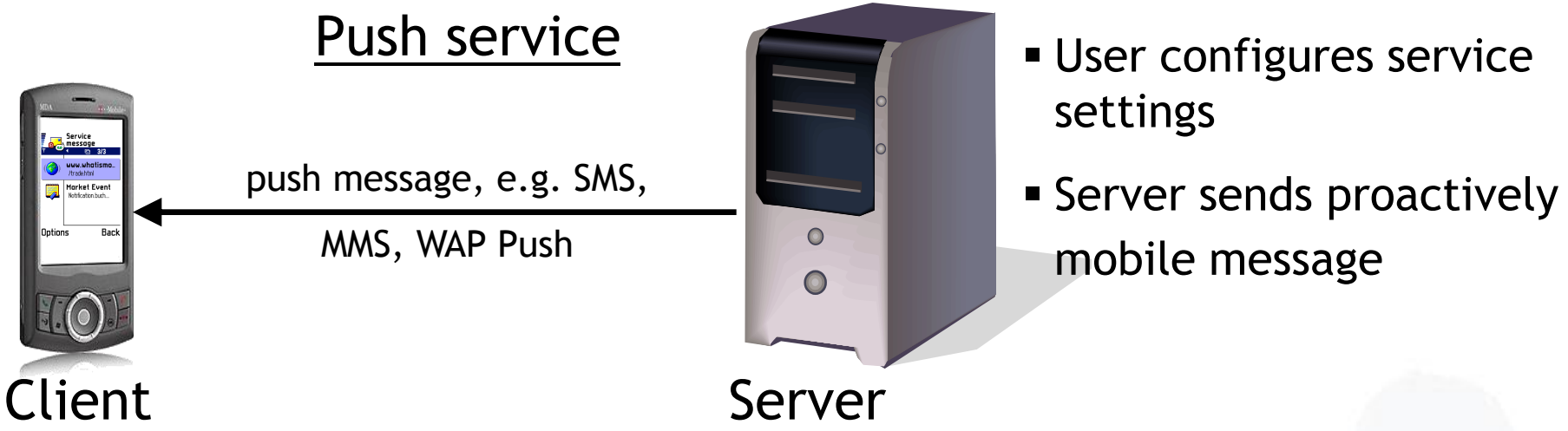
Trading Process ([Based on: Picot 1996])

- Introduction
- Mobile Brokerage Processes
  - Information Acquisition
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## Acquisition of Information:

- Used to cover the situational information demand
  - ***Passive acquisition of information:***  
All necessary information for the decision is automatically delivered to the investor (so called *push services*).
  - ***Active acquisition of information:***  
All necessary information for the decision is acquired proactively by the investor (so called *pull services*).

# Push vs. Pull Services



Kunden-Login ▶ Home | Kurse & Märkte | Jobs | Presse | Aktuelles | Kontakt | Service & Beratung vor Ort | Suche | Europa

**Deutsche Bank**

Aktien & Anleihen | Fonds | Zertifikate | News | Virtuelles Depot | Kursabfrage ▶

→ Depot1 | Watchlist

## Ihr Portfolio: M-Commerce

[Übersicht](#) [Details](#) [Transaktionen](#) [WP-Historie](#) [Cash-Historie](#) [SMS-Limits](#) [E-Mail-Limits](#) [Ihre Daten](#)



▶ [Logout](#)

**SMS-Benachrichtigungen**

Wenn Sie die Up- und Down-Limits Ihrer Titel eingeben, benachrichtigen wir Sie per SMS, sobald die Limits erreicht sind. Die SMS-Limits sind kostenpflichtig und werden bequem über Ihre Handy-Rechnung eingezogen. Zur Einrichtung Ihres SMS-Gateways klicken Sie bitte [hier](#).

Ihre SMS-E-Mail-Adresse:  
nicht eingetragen bzw. noch nicht bestätigt

Max. Anzahl SMS am Tag:  
0

NAME WKN	STÜCK ANTEIL	WP-TYP	BÖRSE	DATUM ZEIT	AKTUELL WRG.	LIMIT UP WRG.	LIMIT DOWN WRG.	AKTIV
<a href="#">SAP</a> 716460	10 7,27%	Inlandsaktie	XETRA	04.04. 16:27	74,69 EUR	<input type="text" value="0,00"/> EUR	<input type="text" value="0,00"/> EUR	<input type="checkbox"/>
<a href="#">GERLING KONZERN A...</a> 841895	35 0,63%	Inlandsaktie	XETRA	20.03. 13:32	1,85 EUR	<input type="text" value="0,00"/> EUR	<input type="text" value="0,00"/> EUR	<input type="checkbox"/>
<a href="#">ADVANCED MICRO DE...</a> 863186	250 16,56%	Auslandsaktie	Frankfurt	04.04. 16:26	6,80 EUR	<input type="text" value="0,00"/> EUR	<input type="text" value="0,00"/> EUR	<input type="checkbox"/>
<a href="#">IXOS Software</a> 506150	55 2,41%	Inlandsaktie	XETRA	04.04. 16:22	4,50 EUR	<input type="text" value="0,00"/> EUR	<input type="text" value="0,00"/> EUR	<input type="checkbox"/>
<a href="#">INTL BUSINESS MAC...</a> 851399	16 11,92%	Auslandsaktie	Frankfurt	04.04. 16:18	76,50 EUR	<input type="text" value="0,00"/> EUR	<input type="text" value="0,00"/> EUR	<input type="checkbox"/>

- ***Scenario:***  
An investor holds stocks of the company XY Inc.
- Private investors are not able to continuously monitor market developments or critical market events.
- ➔ Therefore, relevant information should be identified & delivered automatically to investors.

Kunden-Login Home | Kurse & Märkte | Jobs | Presse | Aktuelles | Kontakt | Service & Beratung vor Ort | Suche | Europa

**Deutsche Bank**

Ihr Portfolio: M-Commerce

Übersicht Details Transaktionen WP-Historie Cash-Historie SMS-Limits E-Mail-Limits Ihre Daten

Aktuelle Positionen

Wert aktuell: 10.248,70 Performance: 248,70  
Performance in %: 2,49

Sortiert nach: Name Go

NAME WKN	KAUF		AKTUELL					TRANSAKT.		
	STÜCK ANTEIL	Ø KURS WRG.	WERT WRG.	KURS WRG.	DATUM ZEIT	BÖRSE	DIFF. DIFF. %	WERT (EUR)	PERFORM. SEIT KAUF	KAUF / VERKAUF
ADVANCED MICRO DE... 863186	250,00 16,54%	5,80 EUR	1.450,00 EUR	6,79 EUR	04.04. 16:04	Frankfurt	0,03 0,44%	1,70 Tsd.	248 17,07%	+
<b>GERLING KONZERN A... 841895</b>	<b>35,00 0,63%</b>	<b>1,80 EUR</b>	<b>63,00 EUR</b>	<b>1,85 EUR</b>	<b>20.03. 13:32</b>	<b>XETRA</b>	<b>-0,20 -9,76%</b>	<b>64,75</b>	<b>2 2,78%</b>	<b>+</b>
INTL BUSINESS MAC... 851399	16,00 11,99%	78,05 EUR	1.248,80 EUR	76,90 EUR	04.04. 16:05	Frankfurt	0,30 0,39%	1,23 Tsd.	-18 -1,47%	+

The notifications are triggered by the backend which monitors portfolio status & external data sources (e.g. news-feeds).

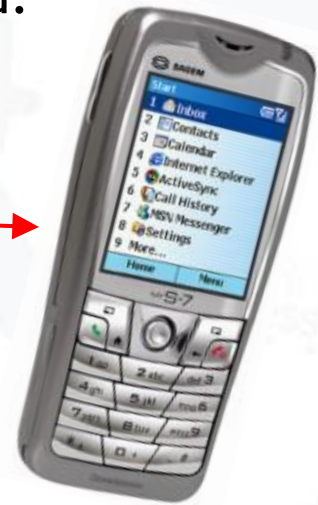
➔ Smart integration of existing backend systems required.

[Source: www.deutsche-bank.de]

Ad Hoc Nachrichten

DATUM	ZEIT	NACHRICHTEN
04.04.	10:53	Hugin ad-Hoc: ONAXIS
04.04.	10:52	DGAP-Ad hoc: Thüga AG
03.04.	14:31	<b>DGAP-Ad hoc: Gerling-Konzern Allgemeine</b>
03.04.	13:15	DGAP-Ad hoc: Kolbenschmidt P...
03.04.	12:35	euro ad hoc: e-ms new m... AG (english)

Weitere Meldungen  
Anzahl: 200, Seite 1 von 10  
1 2 3 4 5



[Source: www.deutsche-bank.de]

- **Exemplary scenario:**  
During stock exchange trading hours, an ad hoc disclosure is published.
- This can trigger a mobile push notification to be sent, e.g. a WAP Push Message:



- ***Exemplary scenario:***  
Investor receives a notification about the ad hoc disclosure published (by means of a mobile push service).
- In order to evaluate this notification, the user requests additional information regarding the disclosure and/or the capital market development.
- ➔ Since the event (i.e. the ad hoc disclosure) might promptly affect stock prices, timely information provisioning is required.



# Active Information Acquisition I: Financial Information (Pull) Services

COMDIRECT BANK AG Inhaber-Aktien  
o.N.




Intraday | 3 Monate | 1 Jahr



[Übersicht](#) | [Chart](#) | [News](#) | [LiveTrading](#) |  
[Kaufen](#) | [Verkaufen](#) | [Realtime-Kurs](#)

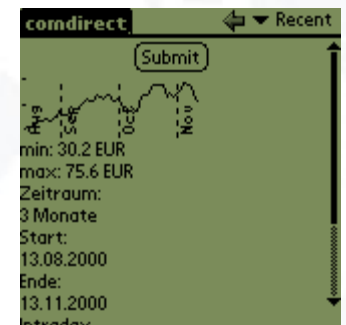
COMDIRECT BANK AG Inhaber-Aktien  
o.N.

kurz | lang

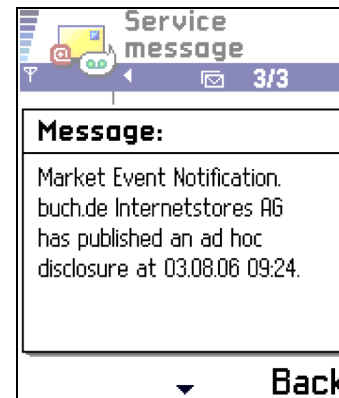
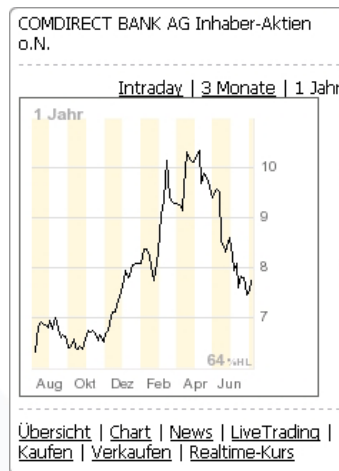
Aktuell	7,80 EUR
Zeit	04.07.06 12:16
Diff. Abs.	-0,01
Diff. %	-0,13 %
Tages-Vol.	185.202,93
KGVe	31,82
DIVe	3,98%
Analystenbewertung	
Kaufen:	 4
Halten:	 5
Verkaufen:	 2
Chartanalyse	Kaufen bei 8,90
Schluss Vortag	7,81
Eröffnung	7,88
Hoch	7,88

Current mobile brokerage services provide similar functionalities compared to their online banking counterparts.

These services and the early WAP-based services don't have a lot in common.



- Mobile *financial information* (pull-) & *notification* (push-) services can deliver relevant information in time and therefore can provide additional value to customers.



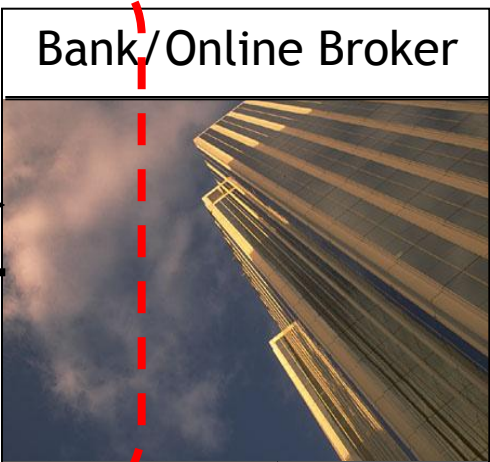
## Influence of mobile information services in the Information Phase

- ➔ ***Increased market transparency:*** All market participants (incl. private investors) can access all relevant information simultaneously.
- ➔ ***Increased information efficiency:*** Information being relevant for a decision can be delivered promptly to a large number of recipients/customers using a mobile information service.
- ➔ Decrease of the transaction costs due to the increased market transparency and information efficiency.

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- ***Order Routing:***  
Transmission of all necessary data relevant for a transaction, by the user to the bank or online broker.
- Within a multi-stage communication process, the customer is authenticated and the transaction is authorised.
- ***Goal:*** Fast, secure and error-free Order Routing

# Example Order Routing



Order

Confirmation

Order Routing

Confirmation



Transmission to the Stock Exchange

Transmission to the Clearing Centre

Trading of securities such as stocks, warrants, bonds etc.

Authorization via “transaction number (TAN)” required.

Inlandsorder  
**Verfügbar** 3.000,14 EUR  
**Kontostand** 3.000,14 EUR

---

1/3

Kauf ▼

ISIN/WKN

Stück/Nominale

Börse ▼

Limitart ▼

ggfs. Limit

kein Orderzusatz ▼

Gültigkeit ▼

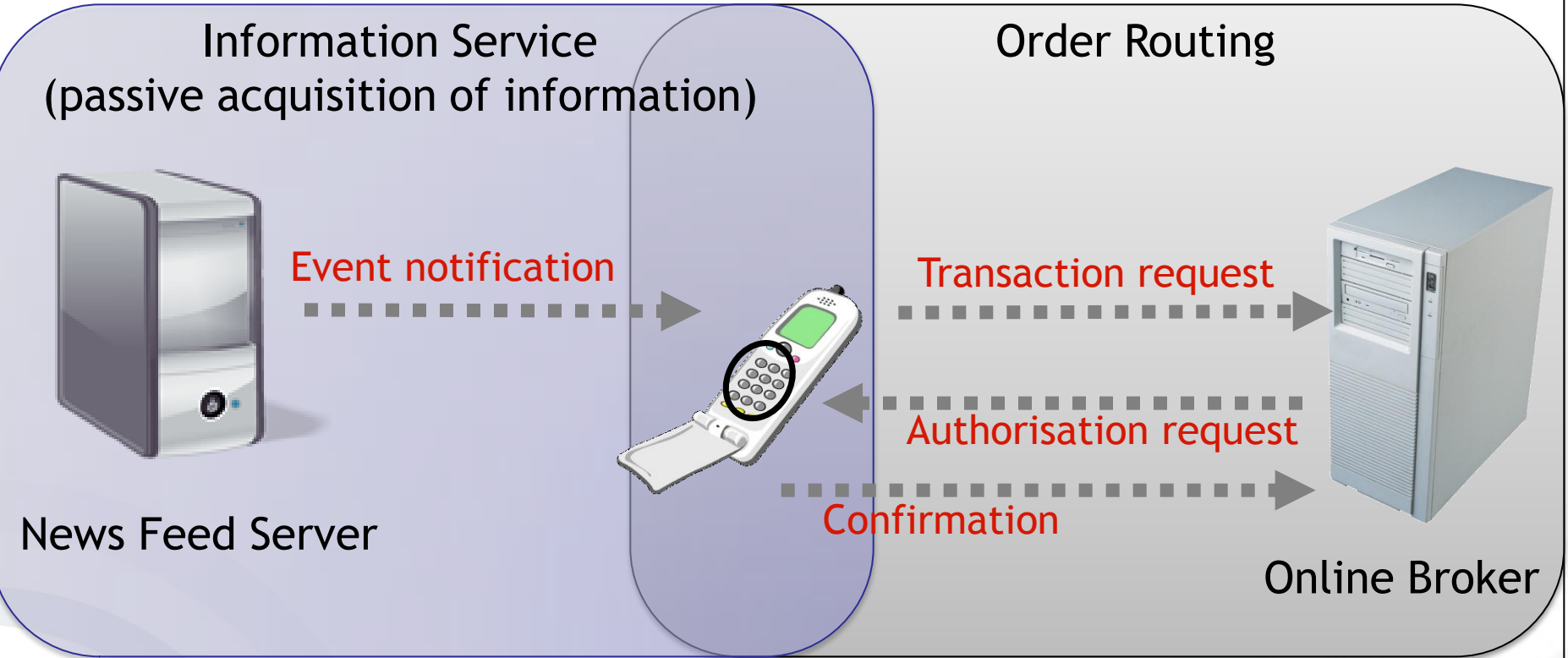
Schritt zurück **Weiter**

[Source: [www.comdirect.de](http://www.comdirect.de)]

- Confirmation services can provide information regarding transactions performed.
- Standard push messaging services (e.g. SMS) can be used.
- Such services can provide timely information and reduce call-center calls.



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[Muntermann et al. 2005]

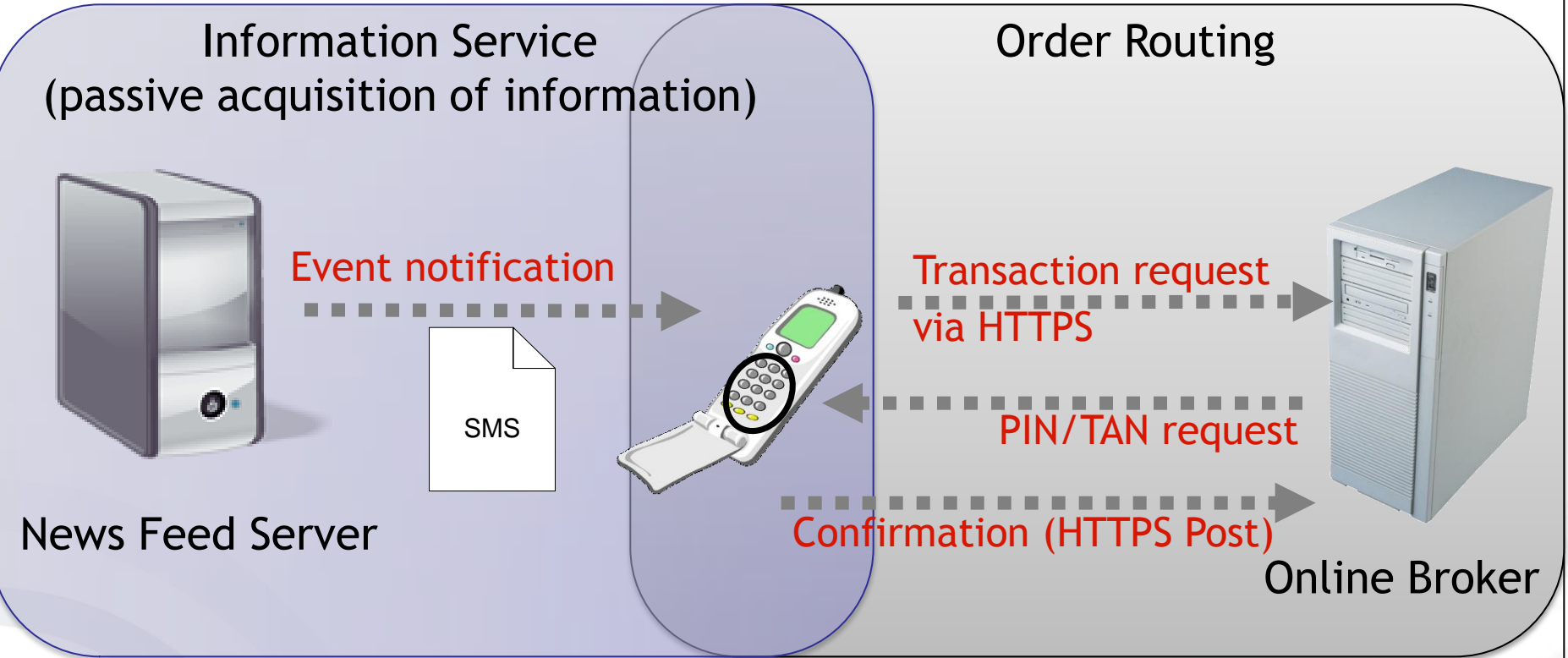
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  - Protection Goals
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## General protection goals regarding IT systems:

- **Confidentiality**  
Describes the protection against unauthorized acquisition of information, i.e. that information becomes known to the wrong persons.
- **Integrity**  
Loss of integrity results from unauthorized modification of information, i.e. the information has been changed unintentionally or on purpose.
- **Accountability**  
The loss of accountability is the consequence of unauthorized noncommitment, i.e. a responsible person or system cannot be identified definitely.
- **Availability**  
A loss of availability can be caused by unauthorized, but noticed, influence on the system's functionality. In consequence, information or data required cannot or be accessed anymore or access is delayed.

- Introduction
- Mobile Brokerage Processes
  - Information Acquisition
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  - Traditional Architecture Design
  - A Novel Architecture Design
- Conclusion

# Traditional Architecture Design



[Muntermann et al. 2005]

- Information services inform the investor of potential gains or losses on his portfolio.
- The Investor might be unable to provide the necessary credentials to react in time.
- The information the investor receives might have been tampered with.

## IT Security Properties

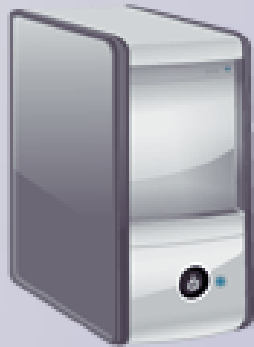
- **Confidentiality**  
No information to unauthorized entities
- **Integrity**  
No unauthorized manipulation
- **Accountability**  
No unaccountable activities
- **Availability**  
Resources in time available

## Financial Information via SMS

- **Confidentiality**  
SMS messages go unencrypted through many systems.
- **Integrity**  
An SMS message comes as is.
- **Accountability**  
SMS sender fields can be forged.
- **Availability**  
No guaranteed delivery times

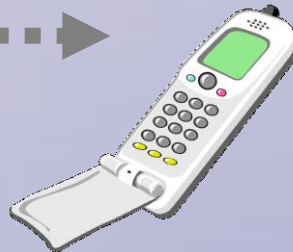
Using this one channel as is might be a bit optimistic.

### Information Service (passive acquisition of information)



News Feed Server

Event notification



- ✗ **Confidentiality**  
SMS messages go unencrypted through many systems.
- ✗ **Integrity**  
No integrity control provided.
- ✗ **Accountability**  
SMS sender fields can be forged
- ✗ **Availability**  
No guaranteed delivery times

[Muntermann et al. 2005]

4.4.2003 20:28 Uhr

Der Tag

Wirtschaft & Börse

Interaktiv

Marktplatz

**Suche**

Übersicht

Politik

Irak-Krieg 

Wirtschaft

Sport

Vermischtes

Kult & Kultur

Bücher

Wissen & Medizin

Computer

IT News

AutoMobil

Meinungen

Hintergründe

Wetter

n-tv Sendungen

Als Startseite! 

Sonntag, 16. März 2003

Gefälschte SMS

### "Modern Talking" ausgetrickst

Dieter Bohlen und Thomas Anders, gemeinsam als Duo Modern Talking erfolgreich, sind auf üble SMS-Fälschungen hereingefallen. Beide erhielten, wie die "Bild am Sonntag" berichtet, fingierte Mitteilungen auf ihren Handys.

Demnach sandte ein Unbekannter im Namen des Managers der Plattenfirma BMG die Nachricht an Anders, dass Bohlen Modern Talking platzen lasse. Bohlen wiederum erhielt eine vermeintliche SMS von Anders: "Du tust mir Leid mit deinem kranken Gehirn. Meine Anwälte werden Anzeige erstatten. T.A."



Fingierte Nachrichten können sie nicht auseinander bringen: Thomas Anders (l.) und Dieter Bohlen.

■ [Bildergalerie Modern Talking](#) -   
das erfolgreichste deutsche Pop-Duo

## One Example for Loss of Accountability

Anonymous text messages (SMS) can be sent over portals on the Internet.

*This service is offered as:*  
„Anonymous Revenge SMS“

## Faking an SMS is easy...

WILLKOMMEN BEI SPORTLOGOS.DE kostenlose Logos und Klingeltöne für Dein Handy!!! - Microsof...

Adresse [http://www.sportlogos.de/index\\_anonyme.php](http://www.sportlogos.de/index_anonyme.php)

**SPORTLOGOS.DE**

**WAS GEHT'N HIER AB?**

- Wir verschenken jeden Tag 250 Logos, Klingeltöne oder SMS-Grüßkarten. Das **FREICODOMETER** links zeigt an, wie viele Teile noch frei sind. ...
- 2 x pro Tag wird aufgefüllt; um ca. Uhr 13.00 und ca. Uhr 20.00. Jetzt **anmelden** und mitmachen.
- Oder bring doch einfach Freunde mit zu sportlogos. Für jede Bestellung Deines(r) Freundes (in) winken kostenlose Credits. **More Infos...**

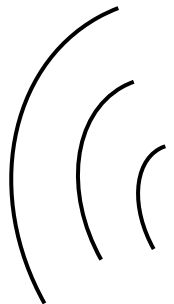
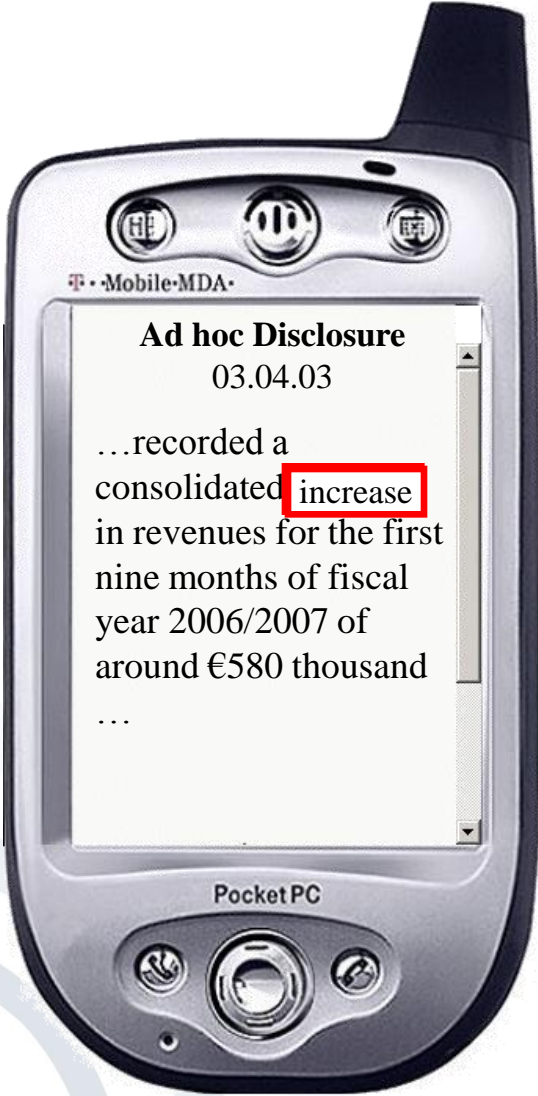
**Laß Deiner Kreativität mal einfach freien Lauf und maximaler SMS Spaß ist Dir sicher ;-)))**

**Hier ein paar Tips, wie man mit anonymen SMS richtig Spaß haben kann.**

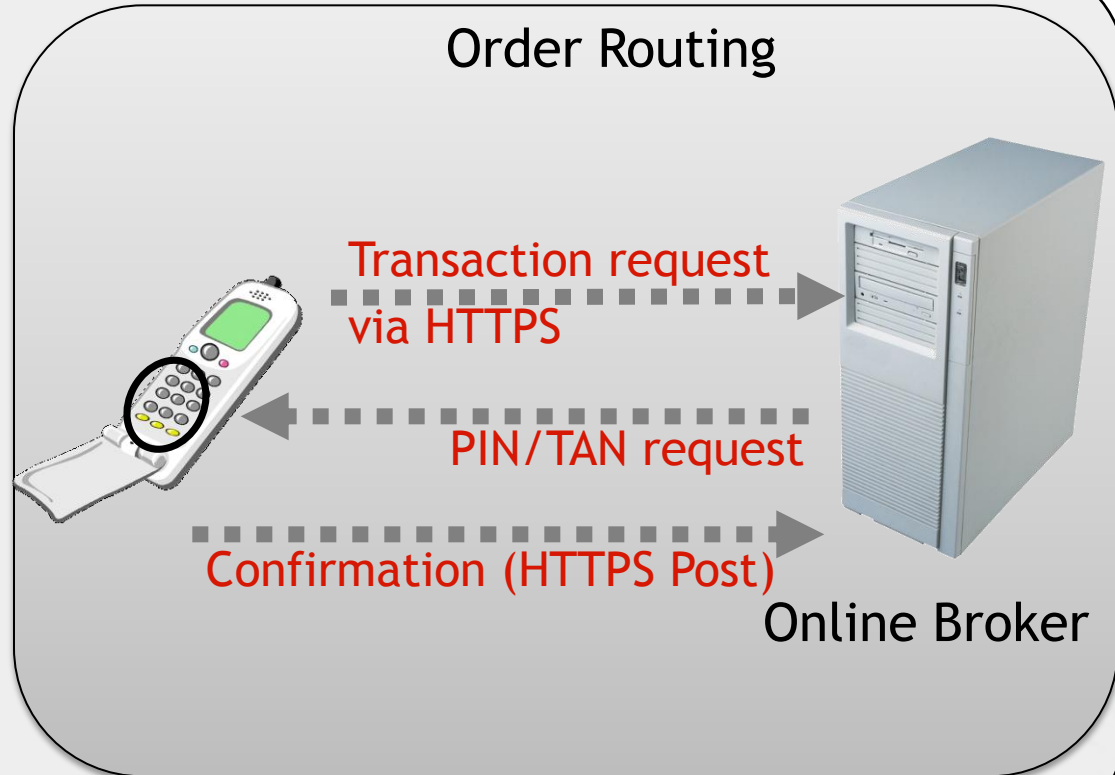
- Du hast einen heimlichen Schwarm und traust Dich nicht ihn / sie direkt anzusprechen ! --> anonyme LOVE SMS ....**
- Oder Du möchtest einen Freund verarschen und schreibst ihm eine Liebes SMS mit dem Absender irgend einer tollen Flamme! --> anonyme FAKE SMS ....**
- Ihr wollt euch für schlechte Noten an einem Lehrer rächen !!! --> anonyme RACHE SMS ....**

- Fake SMS sendable from mobile device logo portal
- Marketed as
  - „Revenge SMS“
  - „ ... if you want to take revenge against your teacher for bad markings.“

... possible Consequences



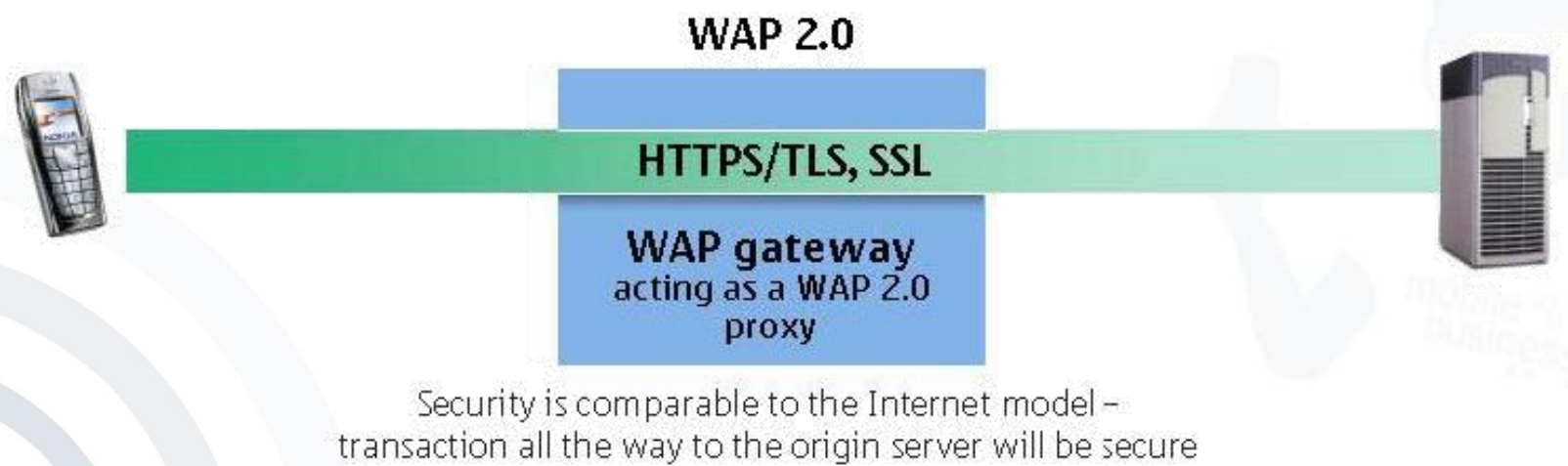
- ✓ **Confidentiality**  
HTTPS provides encrypted communication.
- ✗ **Integrity**  
No integrity protection
- ✗ **Accountability**  
TAN not bound to the intended transaction
- ✗ **Availability**  
Can not be guaranteed (e.g. denial-of service attacks)



[Muntermann et al. 2005]

- The investor might be unable to react because necessary credentials are missing (TAN list left at home).
- The user is forced to carry the credential all the time, because he never knows when an investment decision has to be made.
- This poses a risk for potential loss or theft (Someone is running around with my TANs ...).

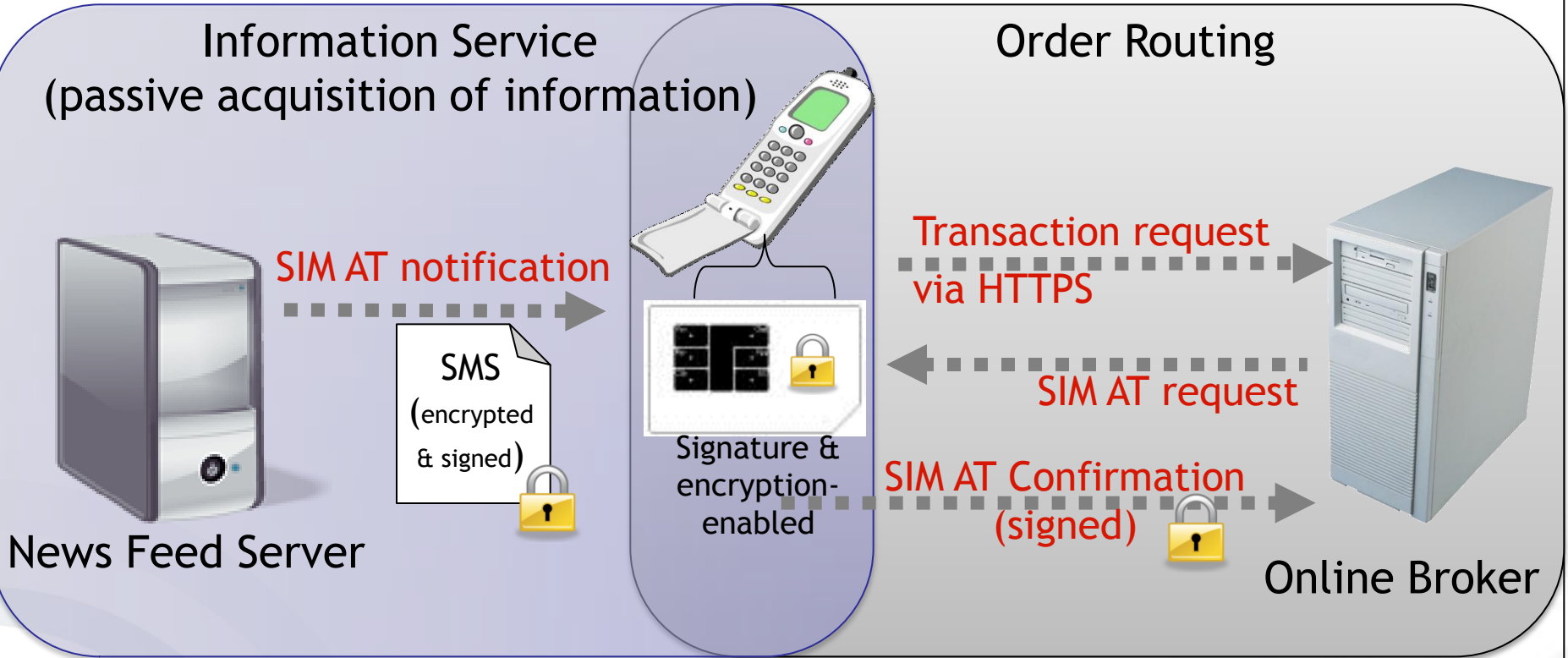
# ... Further Problems arise from use of legacy Infrastructures (WAP 1.x)



[Source: Forum Nokia 2003]

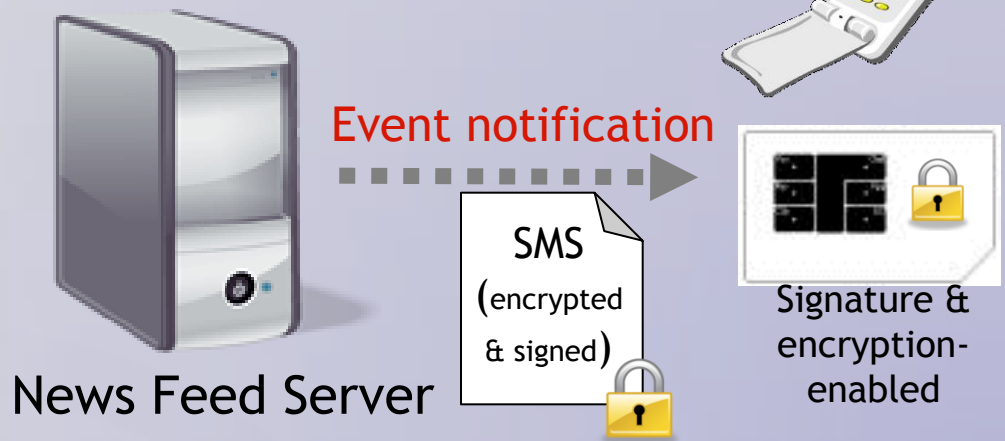
- Introduction
- Mobile Brokerage Processes
  - Information Acquisition
  - Order Routing
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  - Protection Goals
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# A Novel Signature-based Architecture Design



[Muntermann et al. 2005]

#### Information Service (passive acquisition of information)



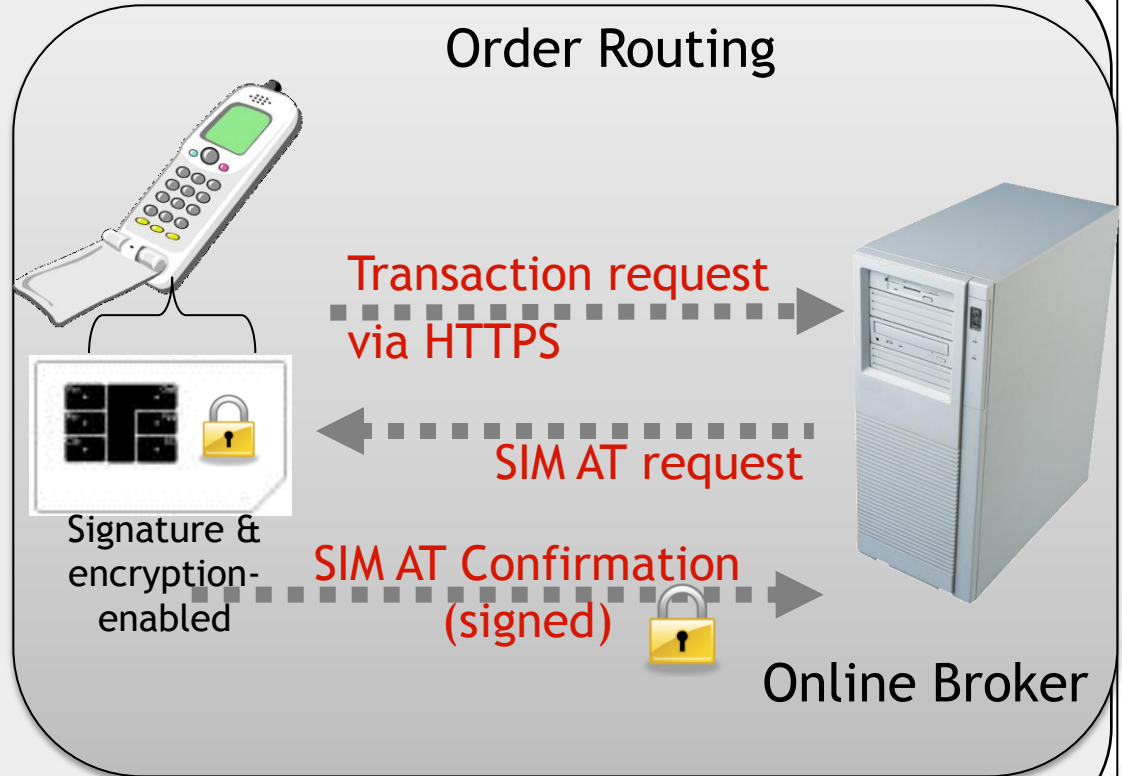
- ✓ **Confidentiality**  
SMS is sent encrypted to the SIM.
- ✓ **Integrity**  
Checked via the SMS signature
- ✓ **Accountability**  
Checked via the SMS signature
- ✗ **Availability**  
No guaranteed delivery times

[Muntermann et al. 2005]

The novel mobile signature-based architecture design achieves further protection goals:

- *Integrity & Accountability* can be checked via the mobile signature.
- *Confidentiality* can be achieved via SMS encryption.
- *Availability* depends on the mobile network connectivity.

- ✓ **Confidentiality**  
HTTPS provides encrypted communication.
- ✓ **Integrity**  
Protected via mobile signature
- ✓ **Accountability**  
Can be checked via the server's certificate and the signed confirmation.
- ✗ **Availability**  
Can not be guaranteed (e.g. denial-of service attacks).



[Muntermann et al. 2005]

The novel mobile signature-based architecture does not address further protection goals but it solves the PIN/TAN problem:

- Necessary credential always available (signatures used instead of TANs).
- ➔ No TANs can be stolen.
- ➔ Signature-enabled SIMs (+SIM AT) works with (almost) any mobile phone.

[Muntermann et al. 2005]

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- Mobile brokerage services provide new opportunities to private investors.
- Intelligent integration of data sources and system is needed.
- Compared to M-Payment, *usefulness* can easily be demonstrated.
- Protection goal analysis & architecture designs can enhance security capabilities AND system usability.

- Forum Nokia (2003):  
Nokia WAP Phone Security, Version 3.3, 2006-06-23.
- Muntermann, J. (2005)  
Automated Mobile Alerting Services - Towards A Level Playing Field in the Financial Community, in: Journal of Electronic Commerce Research (6:3), pp. 241-250.
- Muntermann, J.; Rossnagel, H. and Rannenber, K. (2005)  
Mobile Brokerage Infrastructures: Capabilities and Security Requirements, in: D. Bartmann et al. (Eds.), Proceedings of the 13th European Conference on Information Systems, Regensburg, Germany.
- Pavich, B. (2004)  
The Importance of Being Alert, US Banker (114:8), pp. 58-59.
- Picot, A.; Bortenlänger, C. and Röhrl, H. (1996)  
Börsen im Wandel, Knapp, Frankfurt am Main.
- Rannenber, K.; Pfitzmann, A. and Mueller, G. (1999)  
IT Security and Multilateral Security, in: G. Müller and K. Rannenber (Eds.), Multilateral Security in Communications -Technology, Infrastructure, Economy, Addison-Wesley-Longman, Reading, MA, USA, pp. 21-29.
- WAP Forum: Wireless Application Protocol WAP 2.0 Technical White Paper.