

RESEARCH & TECHNICAL PRESENTATION ASSIGNMENT 2

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Abstract

This assignment reviews the different types of research. We'll give an example for each type of research. We'll also study the usage of *fish-bone* diagram as a conceptual framework. We'll focus on the *mind-map* and draw that for a particular point.

Assignment 2 key words. *Theoretical Research, Practical Research, Incremental Research, Conceptual Framework, Mind Map, Computer Engineering, Software Engineering.*

Practical Problems

1. An Illustration of Research in Computer Engineering

Provide examples for the different methods of research in computer engineering. These examples must cover all types of research in computer engineering including: ***Theoretical Research***, ***Practical Research*** and ***Incremental Research***.

Solution

Firstly, we'll review the different methods of research in science & engineering. Then we'll exemplify each.

- **Theoretical Research** – In this type of research, the whole effort is made to expand the borders of pure science. Its important to mention that the focus is neither on the application of this science nor the quality of human life. The goal of this type of research is to provide the fundamentals of pure science.
- **Practical Research** – This type of research will make use of the explained *Theoretical Research* to improve the quality of human life. It also provides solutions to the existing complications. The goal of this type of research is to apply the science on the day-to-day life problems.
- **Incremental Research** – Incremental research looks for the usage of above techniques to implement them as a real-life product. The focus is to make use of the two mentioned techniques in the industries.

<i>Type of Research</i>	<i>Example</i>	<i>Reference</i>
Theoretical	Request for authorization	ATM
Theoretical	Repeat authorization request	ATM
Theoretical	Respond to authorization request	Central Computer
Theoretical	Request for fund	ATM
Practical	Repeat fund request	ATM
Practical	Respond to financial request	Central Computer
Practical	Request for account report	ATM
Practical	Respond to account report	Central Computer
Incremental	Reverse a card-to-card transaction	ATM
Incremental	Rollback a card-to-card transaction	ATM
Incremental	Request for public announcement due date	ATM
Incremental	Respond to the public announcement	Central Computer

Table 1.1: Demonstration of proposed examples of different research types.

Some of the best examples of each of these research techniques are provided in the table 1.1. These examples are the results of my investigation through the *Google Scholar* and other references that are available in the final column.

1. Authorization Message

- Authorize the card pass phrase
- Determine if funds are available
- Determine if the destination card exists in a card-to-card transaction

2. Financial Message

- Post funds to the accounts in card-to-card transactions
- Post funds to the accounts in *POS* transactions
- Fund posting approvals

3. Reversal & Rollback Message

- Reverse the previous authorization action
- Rollback the previous financial message

4. Administrative Message

- Transmit the administrative messages and advices
- Public announcements on the *ATM*

5. Network Management Message

- Secure key exchange

A complete example of a fund request is described in the figure 1.2. **Firstly**, the *ATM* sends an authorization request to the central computer. **Secondly**, The central computer responds to the incoming request. **Thirdly**, in case the authorization is successful, a fund request is sent to the central computer. **Fourthly**, the fund request is validated and the reponse is sent to the *ATM*. In the situation, the user might ask for a reversal. If that happens, the reversal requests/responses are transferred.

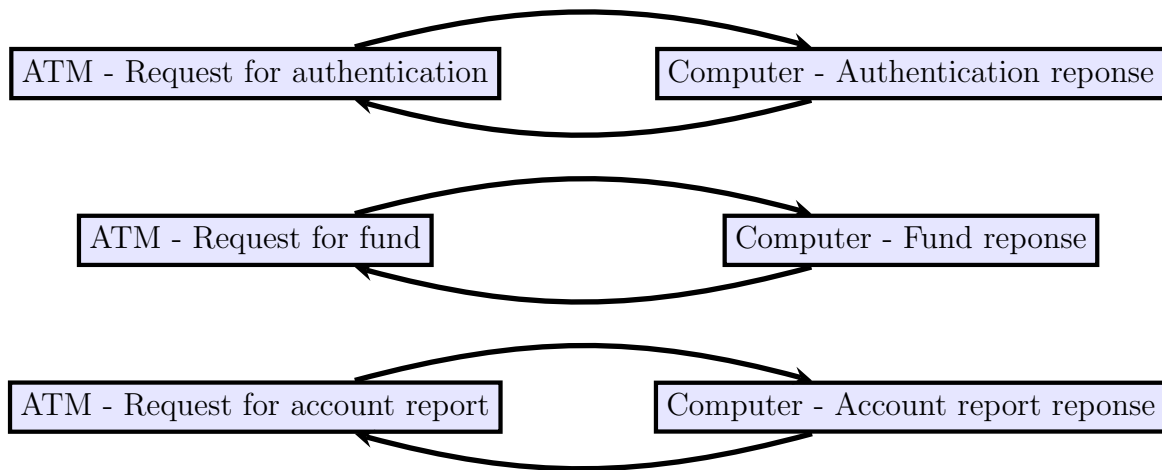


Figure 1.1: A complete fund request flow diagram.

Please refer to the beginning of this solution for the assumptions about the *transport* layer.

2. HFC & Collision in Downstream

Given an *HFC* communication medium, find out whether the transmission rate is *dedicated* to one user or it is shared among users in the network. Is it possible for a downstream in an *HFC* channel to have collision? Describe your answer.

Solution

As the description for the *HFC*(*Hybrid fiber-coaxial*) medium specifies, the combination of both *optical fiber* and *coaxial cable* is used in a broadband network. As an example for the functionality of this medium, the television channels are sent from the cable system's distribution facility, the **headend**, to local communities through optical fiber subscriber lines. At the local community, a box called an *optical node* translates the signal from a light beam to electrical signal, and sends it over coaxial cable lines for distribution to subscriber residences.

HFC Transmission Rate HFC bandwidth is shared among users. So, each user on a tail-end of the coaxial cable can use the same transmission rate as others.

Collision in Downstream The downstream channel, provides the data from a single source called head-end. Then the data is distributed among the residences. Thus, there are no collisions in the downstream channel.

3. Dial-up, ADSL, FTTH, HFC Modems

The modems titled here are widely used as a home-access to the Internet. Provide an example of *maximum transmission rate*. Describe whether these rates are shared or not.

Solution

Table 1.2 provides various *transmission rates*(*Bitrate*) for each of these modems.

<i>Modem</i>	<i>Bitrate</i>	<i>Usage</i>
Dial-up	33.6(kbit/s) – 48(kbit/s) – 56(kbit/s)	Unshared
ADSL	8.0(Mbit/s) – 12.0(Mbit/s) – 24(Mbit/s)	Unshared – Shared
HFC	100(Mbit/s)	Shared
FTTH	1(Gbit/s)(Google Fiber)	Unshared(one single home)

Table 1.2: Bitrate samples for different types of modems.