



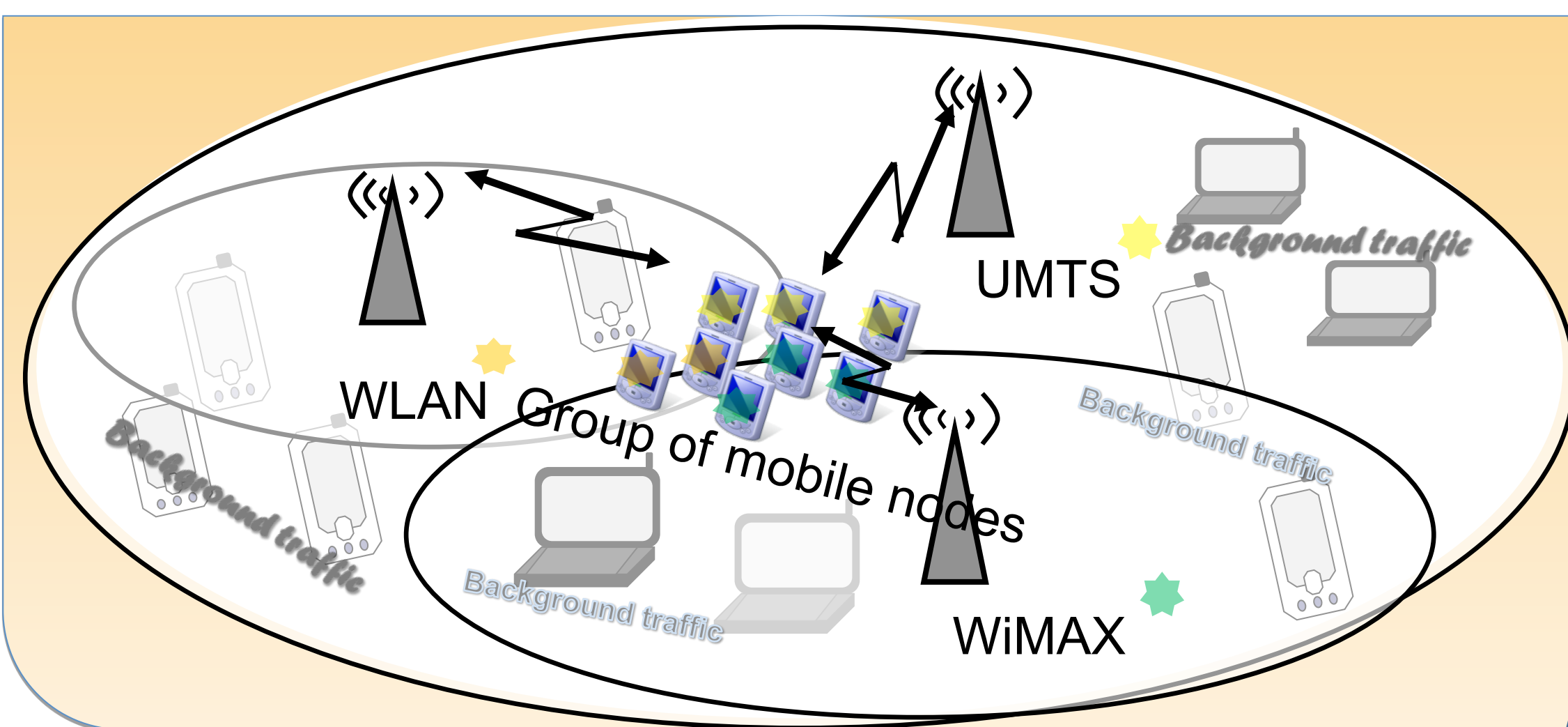
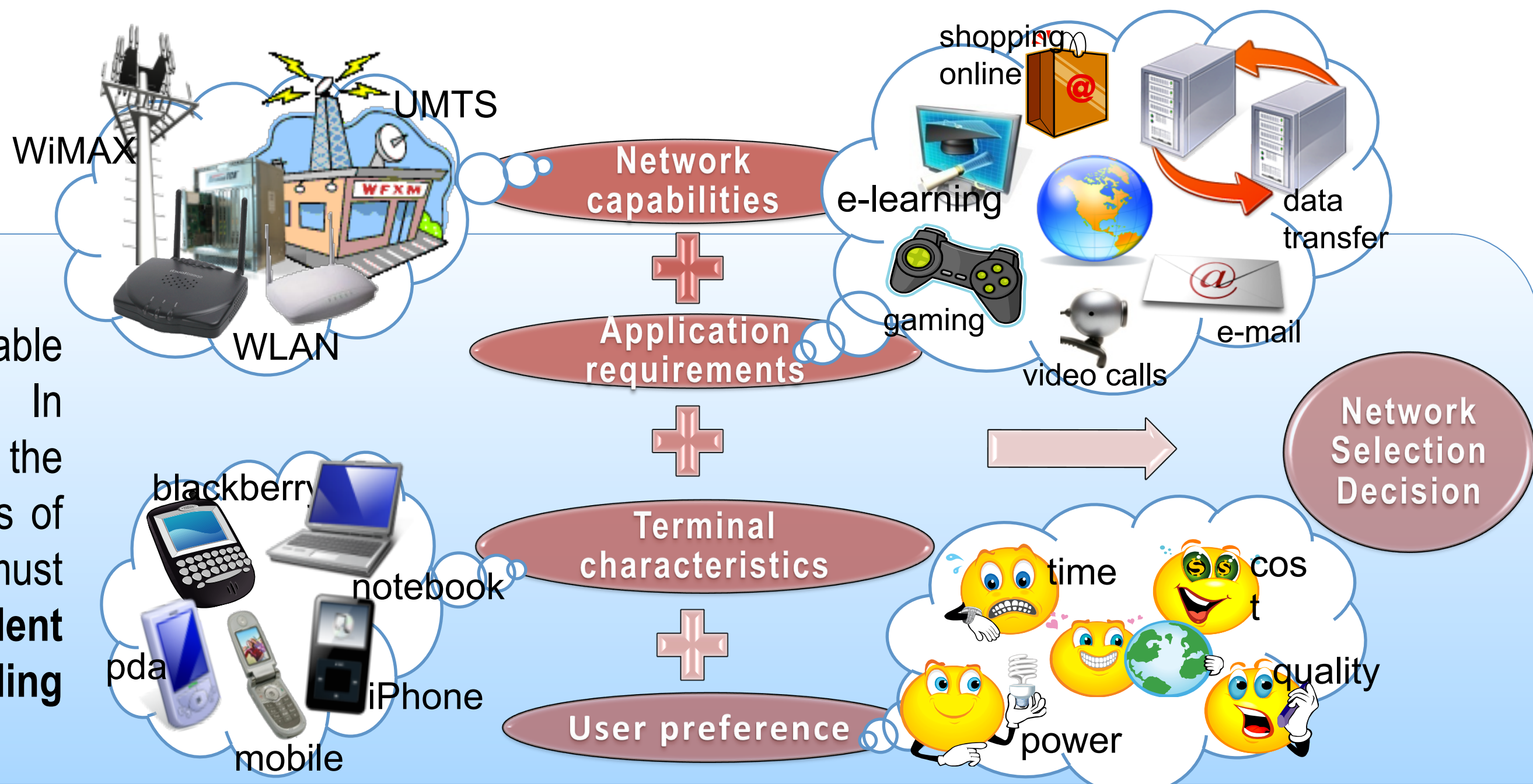
# Performance of Handover for Multiple Users in Heterogeneous Wireless Networks



M. Fiterau, O. Ormond, G.-M. Muntean,  
Odysseus Summer Program,  
Performance Engineering Laboratory,  
Dublin City University

## 1. Problem

A **mobile device** must decide which of the available wireless networks to use to transport its data. In **infrastructure-based heterogeneous networks**, the mobile device has **no information** about other users of the network. Yet, a good network selection decision must be made even in the event of a **group of independent users in the same local area simultaneously handing over between radio access networks**.

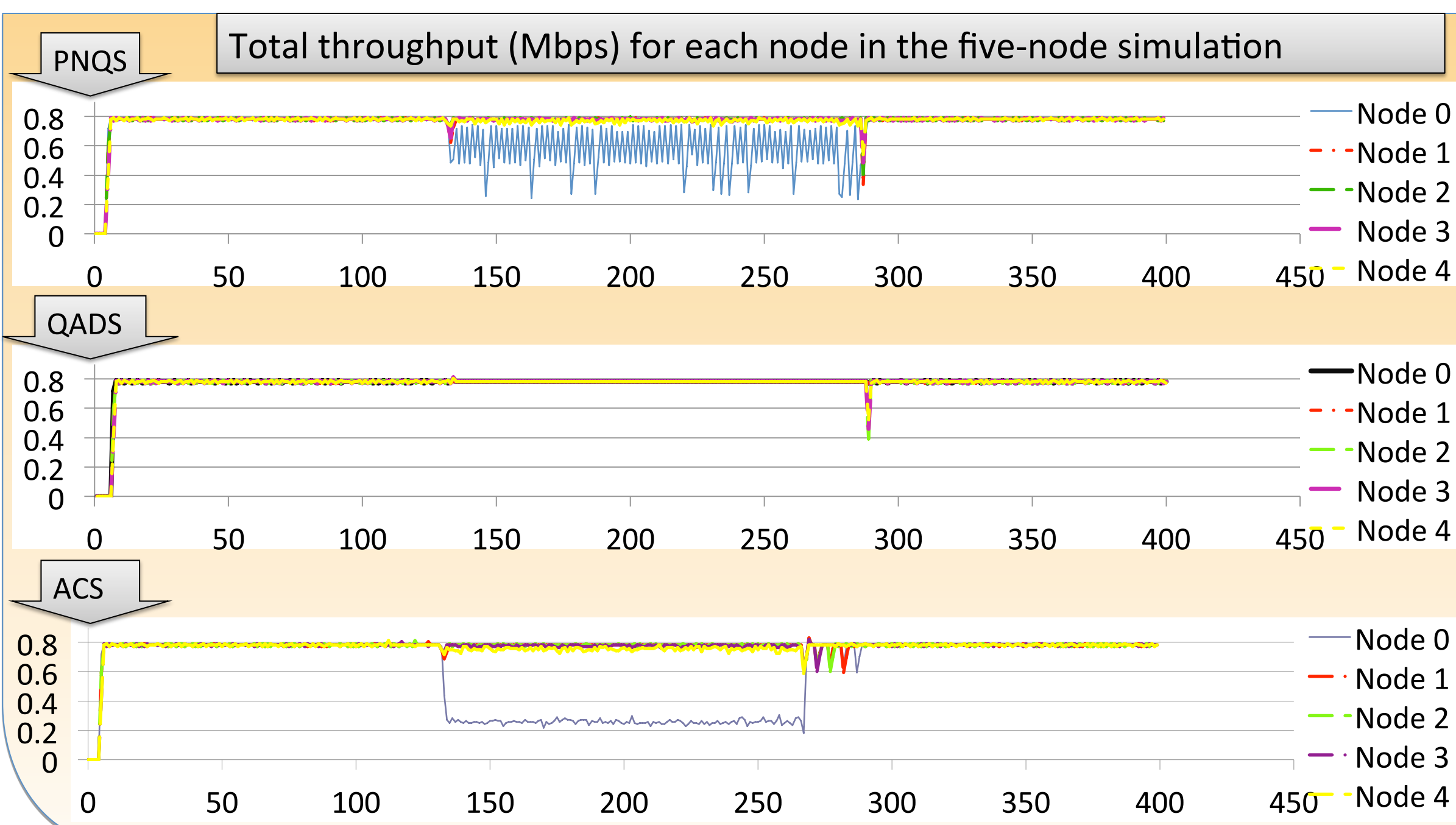
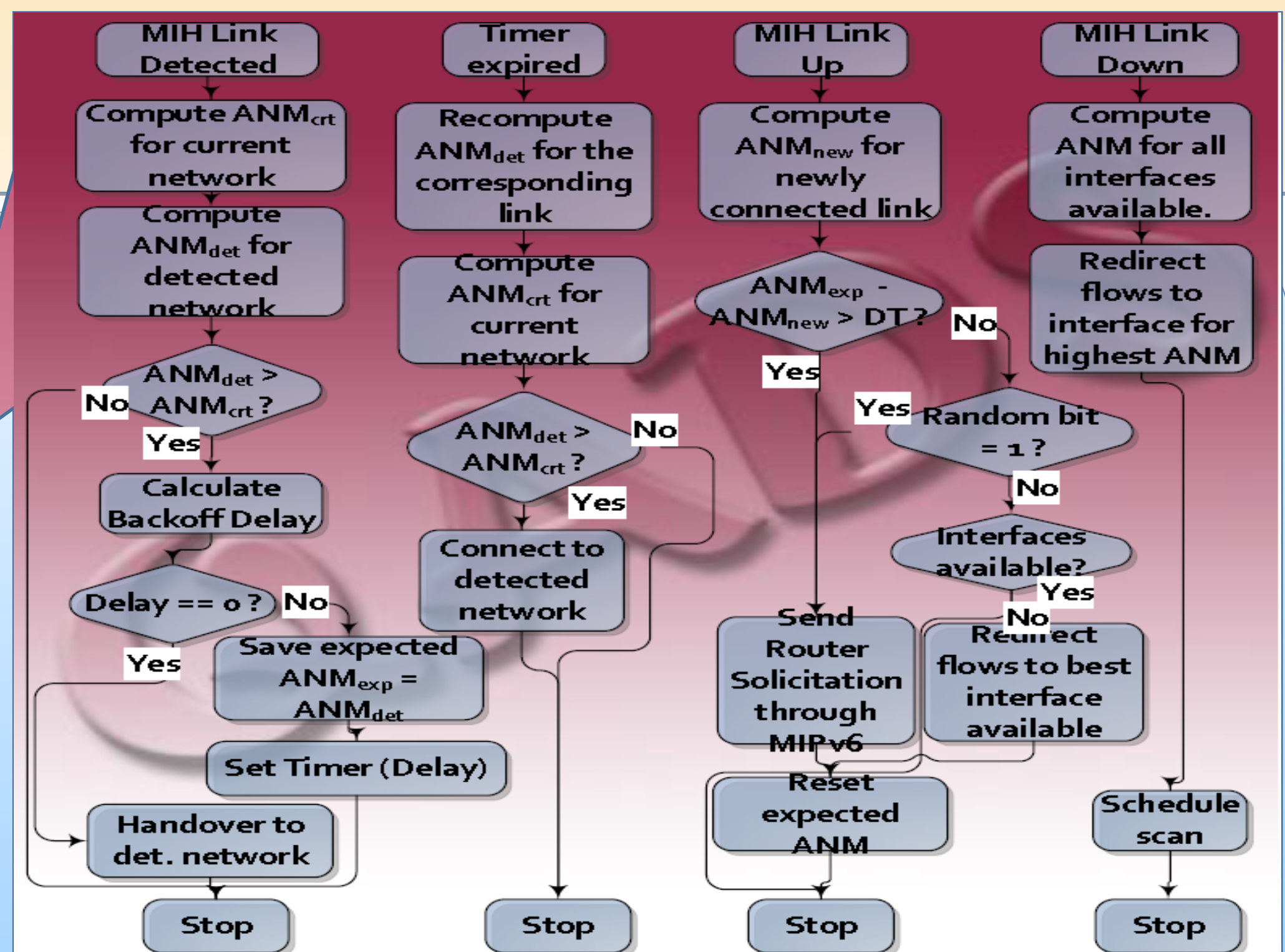
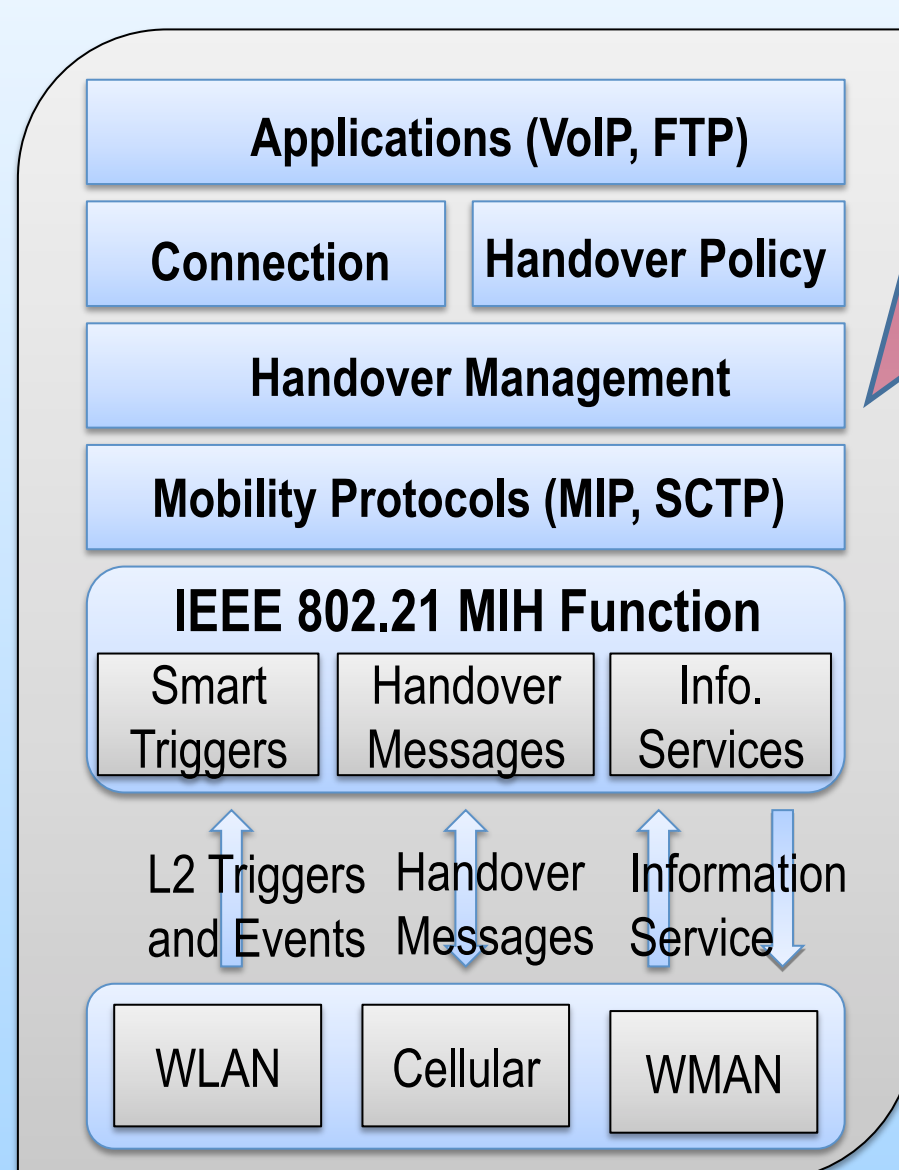


## 2. Solution

The applied **quality function** represents the **level of service** that a network can provide to the mobile device at a given time. The handover is **delayed** based on the value of this function, allowing the **users that best fit the network to connect first**. A **random decision** is used as a discriminator between nodes in network selection.

## 3. Implementation

**Group handover** is detected by monitoring link parameters and comparing the **expected value** of the quality function before the delay to the **actual value** once the connection has been established. In the event of a group handover, a **random variable** decides the network to which the data session should be directed.



## 4. Testing

The QADS extension was designed for the **NS-2 simulator**. Compared to the **ACS** network selection strategy, **QADS** provides an increased **overall throughput** and decreased **packet loss**.

The solution is superior to the **PNQS** algorithm in that it **avoids ping-pong**.

Performance indicators for the nine-node simulation			
Performance Indicator	ACS	PNQS	QADS
Average Throughput (Mbps)	5.9805	6.7166	6.8821
Standard deviation of overall throughput	1.6282	0.9945	0.8552
Total traffic (Mb)	2392	2686	2752
Total data loss at AP (Mb)	57.231	21.289	13.201
Data loss (% of total traffic)	2.3923	0.7923	0.4797

## 5. Summary

**QADS** – novel algorithm that tackles the problem of group handover

**Marked improvement** in individual /overall throughput, decrease in packet loss compared to alternatives

Future work includes further **testing, design and development**, and an **analytical evaluation** of the problem