Operating System **Hsu PO-CHUN**
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Prof. Pai H. Chou Submitted: Dec. 24, 2017
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Assignment 13

1 Problem 1

[20 points] What are the main differences between capability lists and access lists?

1.1 Answer

A list containing the set of rights which are used to access the object of any is known as **access list**. For each object there is a different access list.
A list containing the set of operations which are used to access the object of any domain and object list is known as **capability list**. User is not allowed to make any changes in the list.
The best example to understand these lists is lock-key system in which the key values are never modified by the user of the system.

2 Problem 2

[20 points] Consider a computing environment where a process is given the privilege of accessing an object only n times. Suggest a scheme for implementing this policy.

2.1 Answer

Add a counting semaphore object with acquire accessing right but no release accessing right.

3 Problem 3

[20 points] Capability lists are usually kept within the address space of the user. How does the system ensure that the user cannot modify the contents of the list?

3.1 Answer

A capability list is considered a protected object and is encapsulated by OS. The user must access it in indirectly way. The operating system ensures the user cannot access the capability list directly.

4 Problem 4

[20 points] 14.3 Consider a computer system in which computer games can be played by students only between 10 P.M. and 6 A.M., by faculty members between 5 P.M. and 8 A.M., and by the computer center staff at all times. Suggest a scheme for implementing this policy efficiently.

4.1 Answer

Partition the system into student domain, faculty member domain and computer center staff domain. Set up a dynamic protection structure that changes the set of resources available with respect to the time allotted to the three categories of users. As time changes, so does the domain of users eligible to play the computer games. When the time comes that a users eligibility is over, a revocation process must occur. Revocation could be immediate, selective (since the computer staff may access it at any hour), total, and temporary (since rights to access will be given back later in the day).

5 Problem 5

[20 points] 14.8 Discuss the need for rights amplification in Hydra. How does this practice compare with the cross-ring calls in a ring-protection scheme?

5.1 Answer

The ring-based protection scheme requires the modules to be ordered in a strictly hierarchical fashion. It also enforces the restriction that system code in internal rings cannot invoke operations in the external rings. This restriction limits the flexibility in structuring the code and is unnecessarily restrictive. The capability system provided by Hydra not only allows unstructured interactions between different modules, but also enables the dynamic instantiation of new modules as the need arise.