Identification

Project Administration

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A Multics project, known by its unique project-ID, is a vehicle for grouping persons working towards a common goal and (perhaps) sharing common data. The file system's access control mechanism is designed to respect the concept of project, so that access to the file system may be granted by person, by project or any combination thereof. Normally, associated with each project there is a private dedicated project-directory; by convention, the project-directory is normally appended off >udd, and its name is normally the project-ID itself. For example, the project-directory of project ProgLing is >udd>ProgLing. However, as is the case with all other conventions mentioned below, the implementation is such as to allow the system administrator and the project administrator to organize the resources and data-bases of their projects in any way that suits their peculiar requirements; i.e., the conventions mentioned here are not programmed into the system, but inputted in form of parameters which may easily be replaced (see "System Administration-Projects"). Normally, the home-directories (i.e., default working directories) of the project's users are appended off to the project-directory. For example, user Smith.ProgLing has the home-directory >udd>ProgLing>Smith.

Access to Multics depends upon a person's association with a pre-defined quality, namely his project; it is this association which establishes his user identity, and hence his range of access privileges in the system.

The project administrator has the ability to add users to his project. Normally, such users are persons which are already known to the system ("registered persons"). However, with the system administrator's approval, the project administrator may also have the privilege of establishing new (and temporary) person identities, so as to allow non-registered persons to become users of his project. Also, a project administrator may choose to admit (at his own cost and risk) any person as a valid user of his project, by waiving his right for the system-provided service of positive person identification. Users of such a project are said to have "unauthenticated person identities". Also, subject to the system administrator's approval, a project administrator may confer upon his users certain privileges, such as membership in a party line group (assuring a certain degree of guaranteed access to the system), immunity to preemption (i.e., to autmmatic logouts) etc.
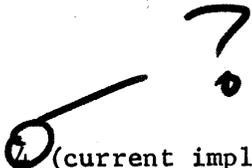
The system administrator may declare up to (current implementation restric-tion) system users as registered administrators of a single given project. The registered project administrator's privileges are a) 'rewa' access privileges in the project directory, b) the right to redefine the project through submission of a new Project Definition Table (PDT), c) the right to define a temporary (non-registered) person identity (person-ID + password) in the system, and d) the right to delegate project-redefinition privileges (non-registered administrator) to any user within his project. Privileges (c) and (d) are subject to the system administrator's approval and have not yet been implemented.

Of the above, only the mechanism for project definition need be discussed, privilege (c) is not yet implemented, and privilege (d) is part of the project definition mechanism.

A project is defined by its associated PDT; it is a binary system table (see attached PDT declaration) which is the main data base used by login control to establish a user's identity. The project's PDT resides in the project-directory and is protected from the project administrator by ring-brackets (0,0,0); it is thus accessible only to the system control process and to the system administrator. The project administrator, however, has the right to submit a new PDT to the system control process, which accepts it (subject to appropriate validity-checking within the system control process) and replaces the old PDT for the new. The system/user control mechanism is designed such that process redefinition may be done on-line, and takes effect immediately without necessitating any system pause or user logout. The only case in which a logged-in user gets preempted because of a project redefinition is when his user identity has been voided by that project redefinition. The project administrator generates a new PDT by first updating his symbolic Project Master File (PMF) and then using the cv_pmf command to convert the ASCII PMF into a binary PDT. Command cv_pmf checks the PMF for errors (syntactical, logical or omission) and prints out adequate diagnostics if any such errors are found (it prints out messages concerning all the errors found; that is, the detection of an error does not incapacitate its ability to detect further errors). If any error was found, it prints the message "FATAL ERROR. CONVERSION UNSUCCESSFUL." If no errors were detected, it prints "CONVERSION SUCCESSFUL".

The project administrator defines the weight (in load units) of a user. A load unit corresponds to the burden placed upon the system by a user who engages in modest computation and who restricts himself to the usage of a small set of system-approved commands (in other words, in order to be able to get a minimum amount of useful service out of Multics, a user has to tax the system's capacity by one load-unit.) An example for a one-unit user is the user who confines himself to the "Basic" system. Normal Multics users, who are expected to make use of the entire spectrum of available commands, are rated as 2-unit users. Certain users, or perhaps certain system daemons may perhaps be rated at 3 units or more (the present implementation does not rate users at more than 2 units.) In order to give a user a 1-unit rating, it must be guaranteed that he will effectively be unable to become more burdensome than his rating implies; this is achieved by starting his process in a special-purpose listener which confines his ability to interact to a small set of approved commands. Thus, an easy and sure way to establish the user's "weight" is to look at his process' initial procedure; effectively, the System Administrator's Table (SAT) contains a list of (known as user weight table) procedure names which are known to be associated with non-standard weights. A logged-in user whose initial procedure is in the SAT's user weight table is rated at that specified weight. A user whose initial procedure does not figure in the user weight table is given a default rating of 2 load units.

The system administrator also specifies a number of "primary lines" which may be assigned to different projects. A primary line corresponds to a guaranteed user-session slot in the system, i.e., a project which possesses a single primary line has guaranteed access to the system for a single user-session, regardless of current system load. If the system is completely full, a login attempt by a user who has a right to a primary line causes the preemption of some logged-in user who does not enjoy this privilege (standby user). The current preemption rule selects the oldest standby user as candidate for preemption.

A projects may be assigned one or more primary lines. This however does not imply that all users associated with that project are eligible for primary line privileges; rather, a subset of the users in the project is declared by the project administrator to have

the party-group line attribute, expressed by means of a state variable in their PDT entries, and only these users may make claims to the project's primary line(s). The primary lines of a project are assigned to that project's party-group line members on a first come, first served basis. When all the project's primary lines are in use, its remaining users having the party-group line attribute are logged in on a standby basis. When a primary line user logges out, his primary line is automatically awarded to the oldest logged-in user of that project belonging to the party line group (assuming that there exists such a logged-in user.) The system administrator defines the maximum number of primary lines in the system. This number must be kept lower than the maximum number of available user-session slots, and should therefore be less than one half of the maximum system capacity expressed in load units.

The project administrator has the option of awarding certain privileges ("attributes") to the users in his project. Certain of these attributes are very special, e.g., the nobump attribute which makes a user invulnerable to preemption. There is nothing to stop a project administrator from awarding any number of attributes to his users, however the system does not respect those attributed unless approved by the system administrator. This is done by specifying an "attribute mask" per project which defines the attributes which that project's administrator may award his users.