

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{o_1, \dots, o_k\} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{o_1, \dots, o_k\} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.

Outline for April 20, 2004

1. Example: DG/UX UNIX
 - a. Labels and regions
 - b. Multilevel directories
 - c. File object labels
 - d. MAC tuples
2. BLP: formally
 - a. Elements of system: s_i subjects, o_i objects
 - b. State space $V = B \times M \times F \times H$ where:
 - B set of current accesses (*i.e.*, access modes each subject has currently to each object);
 - M access permission matrix;
 - F consists of 3 functions: f_s is security level associated with each subject, f_o security level associated with each object, and f_c current security level for each subject
 - H hierarchy of system objects, functions $h: O \rightarrow P(O)$ with two properties:
 - If $o_i \neq o_j$, then $h(o_i) \cap h(o_j) = \emptyset$
 - There is no set $\{ o_1, \dots, o_k \} \subseteq O$ such that for each i , $o_{i+1} \in h(o_i)$ and $o_{k+1} = o_1$.
 - c. Set of requests is R
 - d. Set of decisions is D
 - e. $W \subseteq R \times D \times V \times V$ is motion from one state to another.