January 11, 2021 Outline

Reading: *text*, §3.3

Assignments: Homework #1, due January 22
Project selection, due January 22

1. Take-Grant Protection Model
   (a) Counterpoint to HRU result
   (b) Symmetry of take and grant rights
   (c) Islands (maximal subject-only *tg*-connected subgraphs)
   (d) Bridges (as a combination of terminal and initial spans)
2. Sharing
   (a) Definition: *can•share*(α, **x**, **y**, G_0) true iff there exists a sequence of protection graphs $G_0, \ldots, G_n$ such that $G_0 \vdash^* G_n$ using only take, grant, create, remove rules and in G_n, there is an edge from **x** to **y** labeled α
   (b) Theorem: *can•share*(r, **x**, **y**, G_0) iff there is an edge from **x** to **y** labeled r in G_0, or all of the following hold:
      i. there is a vertex $\mathbf{y}'$ with an edge from $\mathbf{y}'$ to **y** labeled r;
      ii. there is a subject $\mathbf{y}''$ which terminally spans to $\mathbf{y}'$, or $\mathbf{y}'' = \mathbf{y}'$;
      iii. there is a subject $\mathbf{x}'$ which initially spans to **x**, or $\mathbf{x}' = \mathbf{x}$; and
      iv. there is a sequence of islands $I_1, \ldots, I_n$ connected by bridges for which $\mathbf{x}' \in I_1$ and $\mathbf{y}' \in I_n$.
3. Model Interpretation
   (a) ACM very general, broadly applicable; Take-Grant more specific, can model fewer situations
   (b) Example: shared buffer managed by trusted third party
4. Stealing
   (a) Definition: *can•steal*(α, **x**, **y**, G_0) true iff there exists a sequence of protection graphs $G_0, \ldots, G_n$ for which the following hold simultaneously:
      i. there is an edge from **x** and **y** labeled α in G_n;
      ii. there is a sequence of rule applications ρ_1 such that $G_{i-1} \vdash G_i$ using ρ_i; and
      iii. for all vertices **v** and **w** in G_{i-1}, $1 \le i < n$, if there is an edge from **v** to **y** labeled α, then ρ_i is not of the form "**v** grants (α to **y**) to **w**".
   (b) Theorem: *can•steal*(α, **x**, **y**, G_0) iff there is an edge from **x** to **y** labeled α in G_0, or all of the following hold:
      i. there is no edge from **x** and **y** labeled α in G_0;
      ii. there exists a subject $\mathbf{x}'$ such that $\mathbf{x}' = \mathbf{x}$ or $\mathbf{x}'$ initially spans to **x**;
      iii. there exists a vertex **s** with an edge labeled α to **y** in G_0; and
      iv. *can•share*(t, $\mathbf{x}'$, **s**, G_0) holds.
5. Conspiracy
   (a) What is of interest?
   (b) Access, deletion sets
   (c) Conspiracy graph
   (d) Number of conspirators