18734 Recitation

- English -> Logic -> REDUCE language
Project

- Reminder for finalizing teams and deciding on a project
A covered entity may disclose an individual’s protected health information (phi) to law-enforcement officials for the purpose of identifying an individual if the individual made a statement admitting participation in a violent crime that the covered entity believes may have caused serious physical harm to the victim.

send(p1, p2, m): p1 sends message m to p2.
tagged(m, q, t, u): m is a message containing information with attributes t about q with purpose u.
inrole(p2, law-enforcement-official): p2 has the role ‘law-enforcement-official’.
attr_in(t, phi): t contains ‘protected health information’.
purp_in(u, id-criminal): purpose u is identifying a criminal.
state(q,m’): q states m’.
is-admission-of-crime(m’): m’ is an admission of crime.
believes-crime-caused-serious-harm(p1, q, m’): p1 believes q may have caused serious harm.
A covered entity may disclose an individual’s protected health information (phi) to law-enforcement officials for the purpose of identifying an individual if the individual made a statement admitting participation in a violent crime that the covered entity believes may have caused serious physical harm to the victim.

∀p₁, p₂, m, u, q, t.
( send(p₁, p₂, m)
  ∧ tagged(m, q, t, u)
  ∧ attr_in(t, phi))
  ⊃
    inrole(p₁, covered-entity) ∧ inrole(p₂, law-enforcement-official)
    ∧ (purp_in(u, id-criminal))
    ∧ ∃m′.∃state(q,m′) ∧ is-admission-of-crime(m′)
    ∧ believes-crime-caused-serious-harm(p₁, q, m′)
A covered health care provider providing emergency health care in response to a medical emergency, other than such emergency on the premises of the covered health care provider, may disclose protected health information to a law enforcement official if such disclosure appears necessary to alert law enforcement to:

(A) The commission and nature of a crime;
(B) The location of such crime or of the victim(s) of such crime; and
(C) The identity, description, and location of the perpetrator of such crime

\[
\begin{align*}
&\text{send}(p_1, p_2, m) \quad \text{tagged}(m, q, t, u) \quad \text{attr\_in}(t, \phi) \\
&\text{inrole}(p_2, \langle \text{roles} \rangle) \text{: Two roles to be used are ``health-care-provider'' and ``law-enforcement-official''} \\
&\text{purp\_in}(u, \langle \text{purpose} \rangle) \text{: One purpose is ``alert''} \\
&\text{providing-emergency-healthcare}(p_1, q) \text{: p}_1 \text{ is providing emergency healthcare to q.} \\
&\text{appears-necessary}(p_1, p_2, q, t, u) \text{: p}_1 \text{ thinks it is necessary to alert of crime-commission-location-victims-perpetrator to p}_2 \text{ with message about q with attribute t and purpose u.}
\end{align*}
\]
Answer?
∀ p1, p2, m, u, q, t.
  (send(p1, p2, m)
   ∧ tagged(m, q, t, u)
   ∧ attr_in(t, phi))
  ⊃
  inrole(p1, health-care-provider)
  ∧ inrole(p2, law-enforcement-official)
  ∧ (purp_in(u, alert))
  ∧ providing-emergency-healthcare(p1, q)
  ∧ appears-necessary(p1, p2, q, t, u)
Policy Composition
Norms of transmission in privacy laws

**Positive norms,** $\varphi_i^+$: Transmission *may occur* if condition is satisfied.

- “A covered entity may disclose protected health information for treatment activities [...]” [HIPAA §164.506(c)(2)]

**Negative norms,** $\varphi_j^-$: Condition *must be satisfied* if transmission occurs.

- “A covered entity must obtain an authorization for any use or disclosure of psychotherapy notes.” [HIPAA §164.508(a)(2)]

A transmission is lawful if and only if it satisfies at least one of the law’s positive norms and all of the law’s negative norms.

\[
maysend(p_1, p_2, m) \triangleq \left( \bigvee \varphi_i^+ \right) \land \left( \bigwedge \varphi_j^- \right)
\]

\[
\mathcal{G} \left( \forall p_1, p_2, m. \ (\text{send}(p_1, p_2, m) \supset maysend(p_1, p_2, m)) \right).
\]
∀ p₁, p₂, m, u, q, t.
( send(p₁, p₂, m)
∧ tagged(m, q, t, u)
∧ attr_in(t, phi))
⇒

\[ \text{inrole}(p₁, \text{covered-entity}) \land \text{inrole}(p₂, \text{law-enforcement-official}) \]
\[ \land (\text{purp_in}(u, \text{id-criminal})) \]
\[ \land \exists m'. \diamondsuit \text{state}(q,m') \land \text{is-admission-of-crime}(m') \]
\[ \land \text{believes-crime-caused-serious-harm}(p₁, q, m') \]

∀ p₁, p₂, m, u, q, t.
( send(p₁, p₂, m)
∧ tagged(m, q, t, u)
∧ attr_in(t, phi))
⇒

\[ \text{inrole}(p₁, \text{health-care-provider}) \]
\[ \land \text{inrole}(p₂, \text{law-enforcement-official}) \]
\[ \land (\text{purp_in}(u, \text{alert})) \]
\[ \land \text{providing-emergency-healthcare}(p₁, q) \]
\[ \land \text{appears-necessary}(p₁, p₂, q, t, u) \]
∀ p1, p2, m, u, q, t.
    ( send(p1, p2, m)
    ∧ tagged(m, q, t, u)
    ∧ attr_in(t, phi))
    ⊃ ( inrole(p1, covered-entity) ∧ inrole(p2, law-enforcement-official)
        ∧ (purp_in(u, id-criminal))
        ∧ ∃ m'. ◻ state(q, m') ∧ is-admission-of-crime(m')
        ∧ believes-crime-caused-serious-harm(p1, q, m')
    )

∀ ( inrole(p1, health-care-provider)
    ∧ inrole(p2, law-enforcement-official)
    ∧ (purp_in(u, alert))
    ∧ providing-emergency-healthcare(p1, q)
    ∧ appears-necessary(p1, p2, q, t, u) )
A covered entity may disclose protected health information to a coroner or medical examiner for the purpose of identifying a deceased person, determining a cause of death, or other duties as authorized by law.

\[
\text{send}(p_1, p_2, m) \quad \text{tagged}(m, q, t, u) \quad \text{attr_in}(t, \phi) \\
\text{inrole}(p_2, <\text{roles}>): \text{Two roles to be used are } \text{``covered-entity'', } \text{``coroner'' and } \text{``medical-examiner''} \\
\text{purp_in}(u, <\text{purpose}>): \text{One purpose is } \text{``identification}(q)\text{'', } \text{``determine-cause-of-death}(q)\text{''} \\
\text{is-authorized-by-law}(p_2, u): p_2 \text{ is authorized by law to carry out activities for purpose } u. \\
\text{belongrole}(q, \text{deceased}) \text{ [subjective predicate]: q has the role } \text{``deceased''} \]
Answer?
∀ p1, p2, m, u, q, t.
  (send(p1, p2, m)
  ∧ tagged(m, q, t, u)
  ∧ attr_in(t, phi))
  ⊃
    inrole(p1, covered-entity)
    ∧ ( (inrole(p2, coroner)
         ∧ inrole(p2, medical-examiner)
         )
    ∧ belongstorole(q, deceased)
    ∧ ( purp_in(u, identication(q))
        ∧( purp_in(u, determining-cause-of-death(q))
            ∨ authorized-by-law(p2, u)
        )
    )
Prefix Notation

- Infix: 3+4, Prefix +3 4, Postfix: 3 4 +
- REDUCE understands prefix notation

<table>
<thead>
<tr>
<th>infix</th>
<th>prefix(ish)</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a) and (b)</td>
<td>and (a) (b)</td>
</tr>
<tr>
<td>(a) or (b)</td>
<td>or (a) (b)</td>
</tr>
<tr>
<td>(a) imp (b)</td>
<td>imp (a) (b)</td>
</tr>
<tr>
<td>(a) plus (b)</td>
<td>plus (a) (b)</td>
</tr>
<tr>
<td>$\forall x, y. c(x, y) \supset B(x, y)$</td>
<td>all $[x] [y] (c(x, y)) (B(x, y))$</td>
</tr>
<tr>
<td>$\exists x, y. c(x, y) \land b(x, y)$</td>
<td>ex $[x] [y] (c(x, y)) (b(x, y))$</td>
</tr>
<tr>
<td>predicate-name(arg1, ...)</td>
<td>(predicate-name arg1 ...)</td>
</tr>
</tbody>
</table>
∀p1, p2, m, u, q, t.
( send(p1, p2, m)
 ∧ tagged(m, q, t, u)
 ∧ attr_in(t, phi))
 ⊃
    inrole(p1, covered-entity) ∧ inrole(p2, law-enforcement-official)
 ∧ (purp_in(u, id-criminal))
 ∧ ∃ m’. state(q,m’) ∧ is-admission-of-crime(m’)
 ∧ believes-crime-caused-serious-harm(p1, q, m’)
Answer?
all p1, p2, m, u, q, t.
  ( and
    (send(p1, p2, m))
    (tagged(m, q, t, u))
    (attr_in(t, phi)))
  ( and
    (inrole(p1, covered-entity))
    (inrole(p2, law-enforcement-official))
    (purp_in(u, id-criminal))
    (ex m'
      ( state(q,m'))
      ( and
        (is-admission-of-crime(m'))
        (believes-crime-caused-serious-harm(p1, q, m'))))))