your partners in safety & security...

Review www.onstar.com/publicsafety for the most up to date training materials.
Project Beacon

Started in 1996
• Offered on Cadillac models
• Dealer Installed
• About 1,000 subscribers by year end
• 9 calls per day

Factory installed began in 2000
• On Cadillac models
• About 630,000 subscribers by year end
• Over 5,000 calls per day

In 2005 began OnStar Monthly Vehicle Diagnostics Emails (OVD)
Expansion

Opened in China in 2009
• About 250,000 subscribers

Deployed Injury Severity Prediction (ISP)
• In 2010
• Determines the probability of a severe injury
• Based on the data from the vehicle

In 2011 rolled out mobile applications
• Allows the subscriber to connect to their vehicle
• Available for a broad range of vehicles (>90 M)
• Extends OnStar services outside GM family of vehicles
• Professional installation at consumer electronics stores
• Features accelerometer, GPS, OnStar services, Bluetooth, embedded cell phone
6 million+ global subscribers
2011

Over 43 million calls
• About 118,000 calls per day
• Around 2 calls per second

47 million OVD Emails

Over 7 million mobile app interactions

Total Interactions
• Over 97 million
• Over 270,000 per day
• Around 4 interactions per second
Technical Stuff

ESRI Mapping

Oracle Virtual Private Database
• Restrict access to personal information

Real Application Clusters (RAC)
• Provides failover and high availability

Oracle Service Oriented Architecture
• Front end application
• Load balancer between available servers
Technical Stuff

Oracle Goldengate
• Replication for real time data access

Oracle Spatial
• Geography based reporting and analytics

I/O Stats for one 24 hour period
• Total Logical Reads – 8 billion
• Total Physical Reads – 550 million
• Total Physical Writes – 4.8 million
2000+ Advisors
160+ Emergency advisors
80+ Stolen Vehicle advisors
HOW ONSTAR WORKS

GPS satellites orbit earth at 12,000 miles continuously streaming navigational data...

Upon OnStar button press or automatically in a crash, vehicle data is sent via wireless connection...

The OnStar receiver calculates data from at least 3 of those satellites...

Cellular transmission connects Subscriber to one of our Call Centers...
HOW ONSTAR WORKS

Trained Advisors work in special teams (Emergency Services, Stolen Vehicle Assistance, Crisis Assist, etc.) to better handle subscriber requests...

In an emergency, Advisor contacts Public Safety with location, crash data and injury status for emergency responders.

OnStar Call Centers answer a call for assistance every second of every day — 24/7/365...

Cellular transmission connects Subscriber to one of our Call Centers...
a day in the life of OnStar...
how OnStar helps... emergency services
Emergency Services by the numbers...

- **2,500** monthly automatic crash responses
- **5,600** monthly emergency services
- **7,000** monthly Good Samaritan calls

...as of December, 2011
HOW ONSTAR HELPS:
With a *human* connection...

- **Live Advisors**
  - Able to assess the situation
  - Specifically trained for emergency calls

- **Extensive Training**
  - General OnStar training (4 wks)
  - Non emergency assignment (3 months)
  - Emergency training including APCO (6 wks)
  - ALL Emergency Advisors are EMD certified
  - Stolen Vehicle Assistance training (4 wks)
  - Ongoing education
HOW ONSTAR HELPS:
At the push of a button...

- **Personal in-vehicle emergencies**
  - Similar to 9-1-1 Calls
  - Understanding of medical problems
  - Knowing routes to hospitals & service

- **Good Samaritan calls**
  - Vehicle crashes
  - Road hazards
  - Criminal/suspicious activity
  - Amber Alert information
HOW ONSTAR HELPS:
With *advanced* tools & training...

- **Sophisticated support**
  - Data / Voice link to vehicle
  - GPS location / Aerial imagery
  - Priority access to Public Safety
  - Real-time info (weather, Amber Alerts)
  - Bilingual Advisors / Language Line support
  - TTY
  - Command Center
  - Poison Control
  - Suicide Prevention Hotline
  - Emergency Medical Dispatch
when every second counts...

you can count on OnStar.

automatic crash response
Comprehensive, Continuous Safety: Protection Before, During, and After Vehicle Collisions

Available Crash Avoidance & Driver Assistance Technologies
- StabiliTrak
- Rear Video Monitor
- Lane Departure Warning
- Side Blind Zone Alert
- Adaptive Cruise Control
- Anti-Lock Braking System
- Daytime Running Lights
- Hands-Free Calling
- Vehicle Diagnostics

Systems Help Absorb Energy from Impact

Post-Crash Occupant Protection
- Automatic Crash Response
- Automatic High-Voltage Shutoff
- Automatic Fuel Sender Shutoff
- Automatic Door Unlock
- Automatic Flashers

Air bag inflation can cause severe injury or death to anyone too close to the bag when it deploys. Be sure every occupant is properly restrained.
TIME OF ALERT: 20:04:39

AUTOMATIC CRASH RESPONSE STATUS

- **Air Bag Status**: Airbag Deployed
- **Maximum Reported Delta V**: 28 mph from the left
- **Direction of Impact**: Left Side (30°)
- **Multiple Impacts**: No
- **Rollover**: No

INJURY SEVERITY PREDICTION

- **HIGH**
  - Advisor Crash Input: [Details not visible]

VEHICLE INFORMATION

- **Owner's Name**: Patty Smith
- **Make**: Chevrolet
- **Model**: Malibu Hybrid
- **Manuf. Year**: 2009
- **Color**: Imperial Blue
- **License Plate**: AKL3890
- **Emergency Contact**: Jim Smith
- **Emergency Contact Phone Number**: 313-555-0001

PSAP LOCATION

- **District of Columbia**: Primary Emergency No.: TRANSMIT

LOCATION

- **Georgetown Pike**
  - Latitude: 38° 53' 9" N
- **Ridge Dr**
  - Longitude: 77° 02' 51" W

Secondary emergency no. is (202) 555-5556. This value is plotted from the latitude 38.2172 and the longitude -81.6883.
Crash Notification Events

Analysis using Oracle Spatial

- Where are the higher volume areas
- How far from home do ACR events occur
  - Used to be thought of as occurring within 5 miles from home
  - OnStar events exceed a certain collision threshold or airbag deployment
  - On average these events occur 86 miles from the garaged address
Finding Location and Distance

Analysis using Oracle Spatial

```sql
SELECT /*+ ordered use_nl(uss,mdl) */
    mdl.aacn_case_sak,
    mdl.rds_case_sak,
    mdl.case_xsak,
    mdl.TIMESTAMP,
    mdl.rds_account_sak,
    mdl.rds_vehicle_sak,
    mdl.service_event_xsak1,
    mdl.lat,
    mdl.lng,
    uss.state inc_state
FROM   mdl,
        reds3.us_states uss
WHERE   sdo_anyinteract (
    uss.geom,
    SDO_GEOMETRY (2001,
    8307,
    sdo_point_type (mdl.lng, mdl.lat, NULL),
    NULL,
    NULL)
) = 'TRUE'
UNION ALL

……..

SELECT
    /*+ ordered use_nl(usc,st) */
    DISTINCT st.aacn_case_sak,
    st.rds_case_sak,
    st.case_xsak,
    st.TIMESTAMP,
    st.rds_account_sak,
    st.rds_vehicle_sak,
    st.service_event_xsak1,
    st.lat,
    st.lng,
    st.inc_state,
    usc.NAME inc_county
FROM   st, reds3.us_county usc
WHERE   sdo_anyinteract (usc.geom,
    SDO_GEOMETRY (2001,
    8307,
    sdo_point_type (TO_NUMBER (st.lng),
    TO_NUMBER (st.lat),
    NULL),
    NULL,
    NULL)
) = 'TRUE'
UNION ALL
```

……..
Finding Location and Distance
Analysis using Oracle Spatial

ROUND ( (sdo_geom.sdo_distance ( SDO_GCDR.GEOCODE_AS_GEOMETRY ( 'ODF_NA_Q210', SDO_KEYWORDARRAY ( addr.address_line1, addr.city || ' ' || addr.state || ' ' || addr.zip_code ), addr.country ), SDO_GEOMETRY (2001, 8307, sdo_point_type (addr.lng, addr.lat, NULL), NULL, NULL), 0.005 ) * 0.0006214), 2) dist_from_home_miles
Injury Severity Prediction

Data Points (in order of importance) include:

- Delta V
- Principal Direction of Force
- Seatbelt use
- Age
- Multiple events (impacts)
- Vehicle type
Injury Severity

Research Activity

Use Oracle Spatial to find all events that occur in a specific geographic area.

Identify counties and roadways to match up Police reports.
Injury Severity

Analysis using Oracle Spatial

mdl
AS (SELECT
  kvp9.aacn_case_sak,
  kvp9.rds_case_sak,
  kvp9.case_xsak,
  kvp9.TIMESTAMP,
  kvp9.rds_account_sak,
  kvp9.rds_vehicle_sak,
  kvp9.service_event_xsak1,
  TO_NUMBER (kvp9.lat) lat,
  TO_NUMBER (kvp9.lng) lng
FROM   kvp9
WHERE kvp9.lat BETWEEN 41.454273
AND 47.792508
AND kvp9.lng BETWEEN -92.324258
AND -82.378677),

md AS (SELECT
  /*+ ordered use_nl(usc,st) */
  DISTINCT st.aacn_case_sak,
  st.rds_case_sak,
  st.case_xsak,
  st.TIMESTAMP,
  st.rds_account_sak,
  st.rds_vehicle_sak,
  st.service_event_xsak1,
  st.lat,
  st.lng,
  st.inc_state,
  usc.NAME inc_county
FROM   st, reds3.us_county usc
WHERE   sdo_anyinteract (usc.geom,
  SDO_GEOMETRY (2001, 8307,
  sdo_point_type (TO_NUMBER (st.lng),
  TO_NUMBER (st.lat),
  NULL),
  NULL, NULL)
) = 'TRUE'
AND st.inc_state = 'MI'),
An example of the mechanics of the calculation is shown in the chart below.

### Injury Severity

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Factor</td>
<td>Model Coefficient</td>
<td>Variable input from Onexvar</td>
</tr>
<tr>
<td>2</td>
<td>Intercept</td>
<td>-13.0327</td>
<td>n/a</td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Delta-v (mph)</td>
<td>3.5991</td>
<td>0</td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>IMPACT DIRECTION</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>FRONT [1=“YES”]</td>
<td>0.9690</td>
<td>1</td>
</tr>
<tr>
<td>8</td>
<td>LEFT [1=“YES”]</td>
<td>2.7897</td>
<td>0</td>
</tr>
<tr>
<td>9</td>
<td>RIGHT [1=“YES”]</td>
<td>2.0008</td>
<td>0</td>
</tr>
<tr>
<td>10</td>
<td>Rear = C [base case]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>MULTIPLE EVENTS</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>MULTIPLE [1=“YES”]</td>
<td>0.3825</td>
<td>0</td>
</tr>
<tr>
<td>14</td>
<td>SINGLE = C [base case]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>BELT USE</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>USED [1=“YES”]</td>
<td>-1.4703</td>
<td>1</td>
</tr>
<tr>
<td>18</td>
<td>NOT USED/UNK = C [base case]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>OCCUPANT</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>YES [1=“YES”]</td>
<td>0.9877</td>
<td>1</td>
</tr>
<tr>
<td>22</td>
<td>NO = C [base case]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>23</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>GENDER</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>FEMALE [1=“YES”]</td>
<td>-0.4568</td>
<td>1</td>
</tr>
<tr>
<td>26</td>
<td>MALE = C [base case]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>27</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>28</td>
<td>VEHICLE TYPE</td>
<td></td>
<td></td>
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<tr>
<td>29</td>
<td>UTILITY [1=“YES”]</td>
<td>-0.2057</td>
<td>1</td>
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<tr>
<td>30</td>
<td>PICKUP [1=“YES”]</td>
<td>0.1412</td>
<td>0</td>
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<tr>
<td>31</td>
<td>VAN [1=“YES”]</td>
<td>-1.1485</td>
<td>0</td>
</tr>
<tr>
<td>32</td>
<td>CAR = C [base case]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>33</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>AIRBAG</td>
<td></td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>DEPLOYED [1=“YES”]</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>36</td>
<td>NOT DEPLOYED/UNKNOWN = C</td>
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<td></td>
</tr>
<tr>
<td>37</td>
<td></td>
<td></td>
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<td>41</td>
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<td>42</td>
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<td>43</td>
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<td></td>
</tr>
<tr>
<td>44</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*The probability of ISS 5+ is 0.2641 or 26%*
Injury Severity Prediction

<table>
<thead>
<tr>
<th>Crash</th>
<th>Probability?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delta V, Mph</td>
<td>24% HIGH</td>
</tr>
<tr>
<td>Impact Direction</td>
<td>Front</td>
</tr>
<tr>
<td>Multiple Events</td>
<td>No</td>
</tr>
<tr>
<td>Seatbelt Use</td>
<td>No</td>
</tr>
<tr>
<td>Age (over 55)</td>
<td>Unk</td>
</tr>
<tr>
<td>Gender</td>
<td>Unk</td>
</tr>
<tr>
<td>Vehicle Type</td>
<td>Car</td>
</tr>
</tbody>
</table>
## Injury Severity Prediction

### Crash

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delta V, Mph</td>
<td>35</td>
</tr>
<tr>
<td>Impact Direction</td>
<td>Front</td>
</tr>
<tr>
<td>Multiple Events</td>
<td>No</td>
</tr>
<tr>
<td>Seatbelt Use</td>
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<td>Unk</td>
</tr>
<tr>
<td>Gender</td>
<td>Unk</td>
</tr>
<tr>
<td>Vehicle Type</td>
<td>Car</td>
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</tbody>
</table>

### Probability?

7%
## Injury Severity Prediction

### Crash

<table>
<thead>
<tr>
<th>Feature</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delta V, Mph</td>
<td>35</td>
</tr>
<tr>
<td>Impact Direction</td>
<td>Front</td>
</tr>
<tr>
<td>Multiple Events</td>
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<td>Age (over 55)</td>
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</tr>
<tr>
<td>Gender</td>
<td>Unk</td>
</tr>
<tr>
<td>Vehicle Type</td>
<td>Car</td>
</tr>
</tbody>
</table>

### Probability?

- **38%**
- **HIGH**
when every second counts...

you can count on OnStar.

crisis assist
HOW ONSTAR HELPS:
During a crisis...

Central point of contact, assistance & information for subscribers...

Emergency Services plus:
- Evacuation routes
- Connection to loved ones
- Real-time hotel reservations
- Food, water & medical supply sites
- Targeted crisis messaging
- Hospital directions
- Fuel availability
- Special needs assistance
- Utility up-time information
Helping people during a crisis:

Real Time Assessment of traffic conditions with Oracle Spatial

GPS Based Speed (mph)

- >= 60 GREEN
- 50 < 40 BLUE
- 40 < 50 PURPLE
- 30 < 40 ORANGE
- 20 < 30 YELLOW
- < 20 RED
Helping people during a crisis:

Near real time assessment of incoming calls from disaster areas (counties) to conduct situational qualitative analysis

Crisis team listens to calls to get a ground view of what is happening and what subscribers are requesting

Listening to the quality of service being provided by the Advisors.
Helping people during a crisis:

<table>
<thead>
<tr>
<th>Inc State</th>
<th>Inc County</th>
<th>Case Number</th>
<th>Case Date</th>
<th>Longitude</th>
<th>Latitude</th>
<th>Call Type</th>
<th>STID</th>
<th>Advisor Name</th>
<th>Advisor Team</th>
<th>Call Rating</th>
<th>Reason for Call</th>
</tr>
</thead>
<tbody>
<tr>
<td>NC</td>
<td>Beaufort</td>
<td>#</td>
<td>Aug 28, 2011 11:45:24 AM</td>
<td>-77.00721</td>
<td>35.51368</td>
<td>OnStar Button</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
<td>#</td>
</tr>
<tr>
<td>NC</td>
<td>Carteret</td>
<td>#</td>
<td>Aug 28, 2011 11:58:34 AM</td>
<td>-76.82190</td>
<td>34.73202</td>
<td>Emergency Button</td>
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<td>#</td>
<td>#</td>
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<tr>
<td>NC</td>
<td>Carteret</td>
<td>#</td>
<td>Aug 28, 2011 11:52:21 AM</td>
<td>-76.80954</td>
<td>34.73419</td>
<td>Emergency Button</td>
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<td>#</td>
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<tr>
<td>NC</td>
<td>Columbus</td>
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<td>-78.38591</td>
<td>34.27780</td>
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<td>#</td>
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<td>#</td>
<td>#</td>
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<tr>
<td>NC</td>
<td>Craven</td>
<td>#</td>
<td>Aug 28, 2011 11:29:45 AM</td>
<td>-77.15516</td>
<td>35.08246</td>
<td>OnStar Button</td>
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<td>#</td>
<td>#</td>
<td>#</td>
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<tr>
<td>NC</td>
<td>Duplin</td>
<td>#</td>
<td>Aug 28, 2011 11:12:39 AM</td>
<td>-78.13303</td>
<td>34.98738</td>
<td>OnStar Button</td>
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<td>#</td>
<td>#</td>
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<tr>
<td>NC</td>
<td>Halifax</td>
<td>#</td>
<td>Aug 28, 2011 11:19:56 AM</td>
<td>-77.67260</td>
<td>34.67320</td>
<td>OnStar Button</td>
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<tr>
<td>NC</td>
<td>Lenoir</td>
<td>#</td>
<td>Aug 28, 2011 11:17:53 AM</td>
<td>-77.53861</td>
<td>35.29716</td>
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<td>#</td>
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<td>#</td>
<td>#</td>
</tr>
<tr>
<td>NC</td>
<td>Lenoir</td>
<td>#</td>
<td>Aug 28, 2011 11:21:26 AM</td>
<td>-77.53568</td>
<td>35.29660</td>
<td>OnStar Button</td>
<td>#</td>
<td>#</td>
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<td>#</td>
<td>#</td>
</tr>
<tr>
<td>NC</td>
<td>Nash</td>
<td>#</td>
<td>Aug 28, 2011 11:04:02 AM</td>
<td>-77.80683</td>
<td>36.09453</td>
<td>OnStar Button</td>
<td>#</td>
<td>#</td>
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<td>#</td>
<td>#</td>
</tr>
<tr>
<td>NC</td>
<td>Nash</td>
<td>#</td>
<td>Aug 28, 2011 11:13:27 AM</td>
<td>-77.80801</td>
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<tr>
<td>NC</td>
<td>Nash</td>
<td>#</td>
<td>Aug 28, 2011 11:19:12 AM</td>
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<tr>
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<td>Nash</td>
<td>#</td>
<td>Aug 28, 2011 11:22:44 AM</td>
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Helping people during a crisis:

Louisiana Roadways on a Normal Day in 2008
Helping people during a crisis:

Louisiana Roadways one Day Before Hurricane Gustav After Call for Evacuation
Helping people during a crisis:

Analysis of subscriber activity during a crisis

• What kinds of calls
  • Routes
  • Points of Interest
    • Gas stations
    • Lodging

• How far do they travel or do they stay put
  • Different for cat 2 through cat 5 hurricanes
  • Regional differences

• Establish call center staffing levels for different kinds of crisis
CALLS FROM MEXICO

Using Spatial as exclusion to create KML file
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