Interface Beyond the Enterprise: Systems Engineering in an era of Global Technical Means

Robert Brose, Science & Technology Transition Manager

Briefing to SERC
November 2012
Overview

• Our ‘traditional’ engineering environment
• Interface drivers
• ‘Closed’ systems
• The new Global Technical Means
• Implications for ‘knowledge’ systems
A note on speaker perspective

• Not a systems engineer
  – …but have been responsible for guiding engineers
  – …and have worked in a commercial IT engineering company

• Social scientist by formal training
  – See technology success and adoption as highly dependant on the human context within which it is employed
  – See ‘norms’ within S&T communities as potential source of inertia thwarting change

• My ‘system’ is *the world*
Observations on the traditional Intelligence Community (IC) engineering environment vs. commercial environments

<table>
<thead>
<tr>
<th></th>
<th>Commercial</th>
<th>IC</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customers</td>
<td>Known + unknown – enterprise goal is grow</td>
<td>Known – goal is satisfy</td>
</tr>
<tr>
<td>Requirements</td>
<td>Known + generated – seek new demand</td>
<td>Known – {ceiling on resources}</td>
</tr>
<tr>
<td>Customer to developer interaction</td>
<td>Varies – detached to direct – developers can drive expectations</td>
<td>Often extremely close – immediate feedback on fail – often highly informed ‘users’</td>
</tr>
<tr>
<td>Design cycle</td>
<td>Months / Year</td>
<td>Years / Decades</td>
</tr>
<tr>
<td>Adversary?</td>
<td>Competitors, hackers, fraud, yes…</td>
<td>Yes</td>
</tr>
</tbody>
</table>
Resulting IC interfaces are...

• Usually –
  – Planned, documented, tested, refined, validated, revised on a schedule, etc.

• Sometimes –
  – Ad-hoc, temporary, expedient
    • But still between ‘known’ systems
Historic interface drivers

- Laws (constitution, legislation, FAR, FCC, etc.)
- Specifications/standards (military, IC, contractual)
- Developers (known)
- Users (known)
- Environment (anticipated)
- Applications (intended)

Essentially, a closed system...
Closed systems - example

SE View of Breached Area
Slaughter Beach, DE
GEO: 38.52.73N, 75.16.66W (DMS)

31 OCT 2012
1258Z

Breached Area

UNCLASSIFIED

CIVIL AIR PATROL
Closed systems - example

SE View of Breached Area
Slaughter Beach, DE
GEO: 38.52.73N, 75.16.66W (DMS)

Known 4-space {time/location}
Known sensors
FAA-constrained aircraft
Known operators

UNCLASSIFIED
An Era of Global Technical Means (GTM)

Jonathan Harris and Sep Kamvar’s We Feel Fine scans the blogosphere for posts containing the phrases “I feel” and “I am feeling” to construct an ever-changing portrait of the landscape of human emotion. Since 2005, over 12 million feelings have been collected, with more than 10,000 new feelings added every day.

City of Laredo
Laredo, Texas

<table>
<thead>
<tr>
<th>International Bridge # 1</th>
<th>International Bridge # 1</th>
<th>International Bridge # 2</th>
<th>International Bridge # 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laredo Side</td>
<td>Mexico Side</td>
<td>Laredo Side</td>
<td>Mexico Side</td>
</tr>
</tbody>
</table>

Puentes de Las Americas Bridge I
Juarez-Lincoln Bridge II
Colombia Bridge III
World Trade Bridge IV

UNCLASSIFIED

Open Source Center

Nuclear explosion in northwest Pakistan - website

Pakistan television channel Geo News website on 2 November

Nuclear explosion in the Feroz Ghundi area of Hangu. Police say casualties are feared in this explosion. The exact number of casualties is not yet known.
Challenges ‘interfacing’ with GTM:

• Laws [compliance of external entities unknown]
• Specifications/standards [vary and dynamic]
• Developers [may be unknown]
• [Other] users [unknown]
• Environment (still may be anticipated)
• Applications [unintended]
Challenges ‘interfacing’ with GTM:

- Laws [compliance of external entities unknown]
- Specifications/standards [vary and dynamic]
- Developers [may be unknown]
- [Other] users [unknown]
- Environment (still may be anticipated)
- Applications [unintended]

**Implication:** require knowledge systems with adaptable, resilient, and rapidly reconfigurable interfaces
Challenges ‘interfacing’ with GTM:

• What can systems engineering offer to

  – Our interfaces with the knowledge of the world?

  – Our internal processes to move and interpret data?

  – Our means for communicating to customers in a timely and relevant manner?
• Thank you