The Good, The Bad, and The Ugly of Interoperability Metrics

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DEFINITIONS

• Interoperability usually defined at the 30,000ft level
  ✓ the ability of systems...to provide data...and services to ... other systems...to enable them to operate effectively together
  ✓ The ability of two systems to exchange information and to mutually use that information

• Interoperability is not an “absolute”
  ✓ The degree of interoperability should be defined when referring to specific cases
  ✓ The probability of successful interoperation of subscribers in a network under specified conditions for a given mission time

What do these mean at ground level?
CONTEXT

INTEROPERABILITY METRICS:

• Quantify “suitability” for inclusion in GIG/NCES/JC2
  ✓ GIG/NCES/JC2 Implementation details remain fluid
  ✓ Legacy/heritage/deployed systems retain important role

• Encompass diverse requirements
  ✓ Interoperability, functionality, security, usability, …
  ✓ Technical, Operational, System requirements

• Define a calculus for an Interoperability Quotient (IQ)
THE GOOD

INTEROPERABILITY METRICS:

• Embolden acquisition commands to make technical decisions
  ✓ Mitigates push-back from “emotional” stake-holders

• Quantify a program’s degree of interoperability
  ✓ Provides repeatable & defendable discriminators

• Focus design/development on interoperability
  ✓ Not a bolt-on-later capability

• Force disciplined engineering for life-cycle support
  ✓ Development, integration, deployment, support
THE BAD

INTEROPERABILITY METRICS:

• Limit flexibility

  ✓ Legacy/deployed systems impose constraints

• Limit innovation

  ✓ “Better” may be less important than “consistent” or “common” or “integrated” or “sustainable” or ...

• Slow technology insertion

  ✓ Impedance mismatch between new and old technology must be addressed
**THE UGLY**

**INTEROPERABILITY:**

- Defies actionable definition
  - Does it apply to applications or interfaces?
  - How far into an application does interoperability apply?

- Leads to significant software complexity
  - Backward compatibility is mandated

- Facilitates propagation of viruses
  - Boundary-less global network is prime breeding ground for destructive effect of network-borne viruses

- Combination of complexity and boundary-less environment may lead to a “Perfect Storm”
  - Seemingly unrelated events cascade into a sequence of unexpected actions that are perfect – in the worse sense – leading to meltdown
so what’s my approach to addressing the broad range of interoperability issues?
Design IQ to combine Technical, Operational, and System Views
Interoperability tests for the System View

- Taxonomy
  - ✓ External Interfaces
  - ✓ Internal Context
“System View” IQ – 10 External Interface Tests

1. **Interface security – inbound** (validation, access control)
2. **Interface security – outbound** (digital signature, encryption options)
3. **Data integrity – low level** (syntactic & semantic validation)
4. **Data integrity – high level** (semantic cast/loss, precision cast/loss)
5. **Interface flexibility** (data formats, transport protocols)
6. **Interface bandwidth** (manage/control bandwidth use)
7. **Interface registration & version control** (register information on interface, provide version control)
8. **Interface management** (flow control, health status, error conditions)
9. **Interface performance** (support operational data rates, support multiple connections, degrade gracefully under load)
10. **Interface documentation** (clear & complete documentation)
“System View” IQ – 10 Internal Context Tests

1. **Security** (access control tied to user profile)
2. **Data processing integrity** (compliant business logic)
3. **Data presentation** (dynamic updates, customizable, UI compliant)
4. **User help, prompts, process controls** (on-line context-sensitive help, user prompts & error/status alerts, activity status, training scenarios)
5. **Web enabled** (browser, web services, PDA access)
6. **Sysadmin** (logging, monitoring, trouble-shooting tools)
7. **Collaboration** (support for collab sharing/viewing/annotation)
8. **Upgrade & version control** (upgrade without loss of data, compatibility between versions on LAN/WAN)
9. **Reliability/Robustness** (self-protecting from data loss/contamination, survivable from catastrophic failure, resilient to network failure)
10. **Special processing/performance** (MLS, RT, smart “down-sampling”)
Sample IQ Assessment

![IQ Assessment Chart]

- **Perfect Score**
- **Best Practices**
- **Sample Results**

Test 1
Test 2
Test 3
Test 4
Test 5
Test 6
Test 7
Test 8
Test 9
Any Questions?
Interoperability and the Quantum Effect

• Quantum Physics

✓ Act of observing affects what is being observed
✓ Act of observing sometimes creates what is being observed

• Quantum Computing (new definition)

✓ Act of test & evaluation affects the occurrence of problems
✓ Act of test & evaluation creates the occurrence of problems

• Conclusion

✓ Computing Systems work properly until being observed (e.g., tested or used)
✓ Reduction of observations effectively and efficiently reduces problems and saves money (by eliminating T&E labs)