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VIRT: Maximum Bang-for-the-Buck in IT

Hayes-Roth, F

Hayes-Roth, F. (2012) VIRT: Maximum Bang-for-the-Buck in IT. Presentation to NRAC Panel on "Lightening the Information Load," July 25, San Jose. The paper here provides a concise set of 25 factual statements showing why VIRT provides the biggest known IT-based improvement to decision-making and execution outcomes. A supporting document available here shows global rates of growth in IT technologies that help document the assumed evolutionary context.

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VIRT¹: Maximum Bang-for-the Buck in IT

Rick Hayes-Roth, Professor, Information Sciences, NPS
Presentation to NRAC, "Lightening the information load"
July 25, 2012

Dispensing with viewgraphs, here's the condensed talk:

1. Exponential rates for data, storage, and processing power.
2. Gating factors in descending order: human thinking, mobile bandwidth, hypothesis synthesis and validation for unpredicted activities and patterns.
3. Vast amounts of "relevant information" have no information value.
4. To optimize a system, the basic strategy is to assure the most expensive components are working on the highest value items only they can handle.
5. Hence, humans should work on high-value bits.
6. Not all high-value bits can be identified, but many can, and many low-value bits can also be identified.
7. Computers should filter out identified low-value bits and forward high-value bits to appropriate humans.
8. Bits that don't reduce human uncertainty are low value.
9. Bits that challenge human assumptions, especially those underlying operational plans, have high-value.
10. Plans rest on assumptions, and negations of those assumptions that would change selected COAs define high-value events.
11. Each operator has "conditions of interest" (COIs) corresponding to the events that warrant reconsideration of planned actions.
12. The COIs are operator-specific, context-dependent, temporal and spatial descriptions of high-value events.
13. COI monitoring is an ideal function for computers.
14. COIs provide a framework for optimizing the sensors, processing, and communication for entire networks.
15. Using COIs to find high-value bits reduces bit flows by orders of magnitude (e.g., 99.999% reductions in some cases).

¹ VIRT = "Valued Information at the Right Time"

16. COIs depend on domain-specific descriptions (“ontologies”) and operators.
17. Every COI that can be delegated and monitored provides measurable ROI.
18. COIs can be implemented incrementally with increasing productivity.
19. Implementation of information management through incremental COI implementation provides a Pareto-optimal R&D management strategy.
20. COIs are routinely monitored in financial markets, air traffic control, and other arenas where rapid response to high-value bits has recognized value.
21. Considerable progress has been accomplished on some generic ontologies (the rich semantic track, Maritime Information Exchange Model, NIEM-M).
22. The value of VIRT for USMC operations has been demonstrated analytically.
23. The DOD continues to be afflicted by vague, grandiose approaches to information management that have no incremental credible strategy.
24. If you can demonstrate a better ROI than VIRT offers, go get it.
25. If you can’t demonstrate a better ROI than VIRT offers, get busy on VIRT COIs.