



Engineering, Operations & Technology
Boeing Test & Evaluation

Test & Eval

Test as We Fight

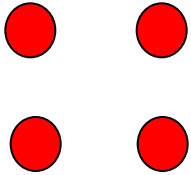
Dennis O'Donoghue
Vice President, Boeing Test & Evaluation

NDIA T&E Conference
March 13, 2012

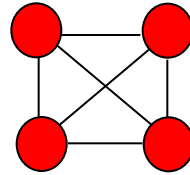
Patterns of Complexity

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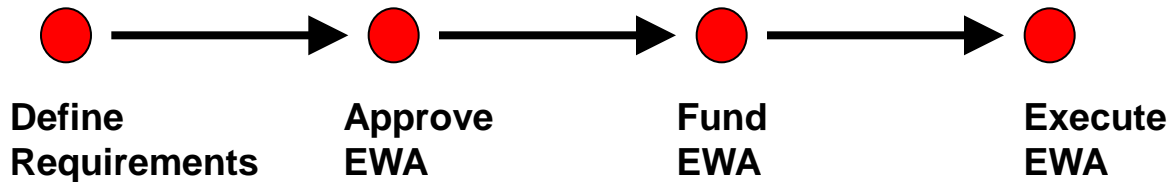
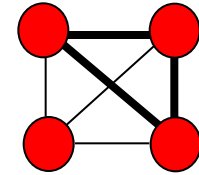
N=4



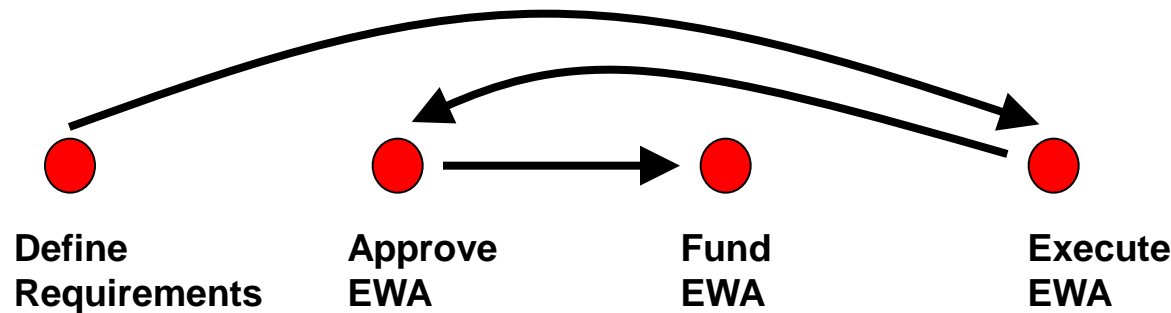
L=6



P=64



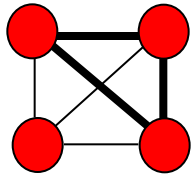
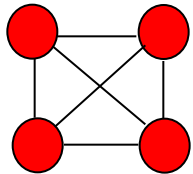
Documented Process



Emergent Process

Patterns of Complexity

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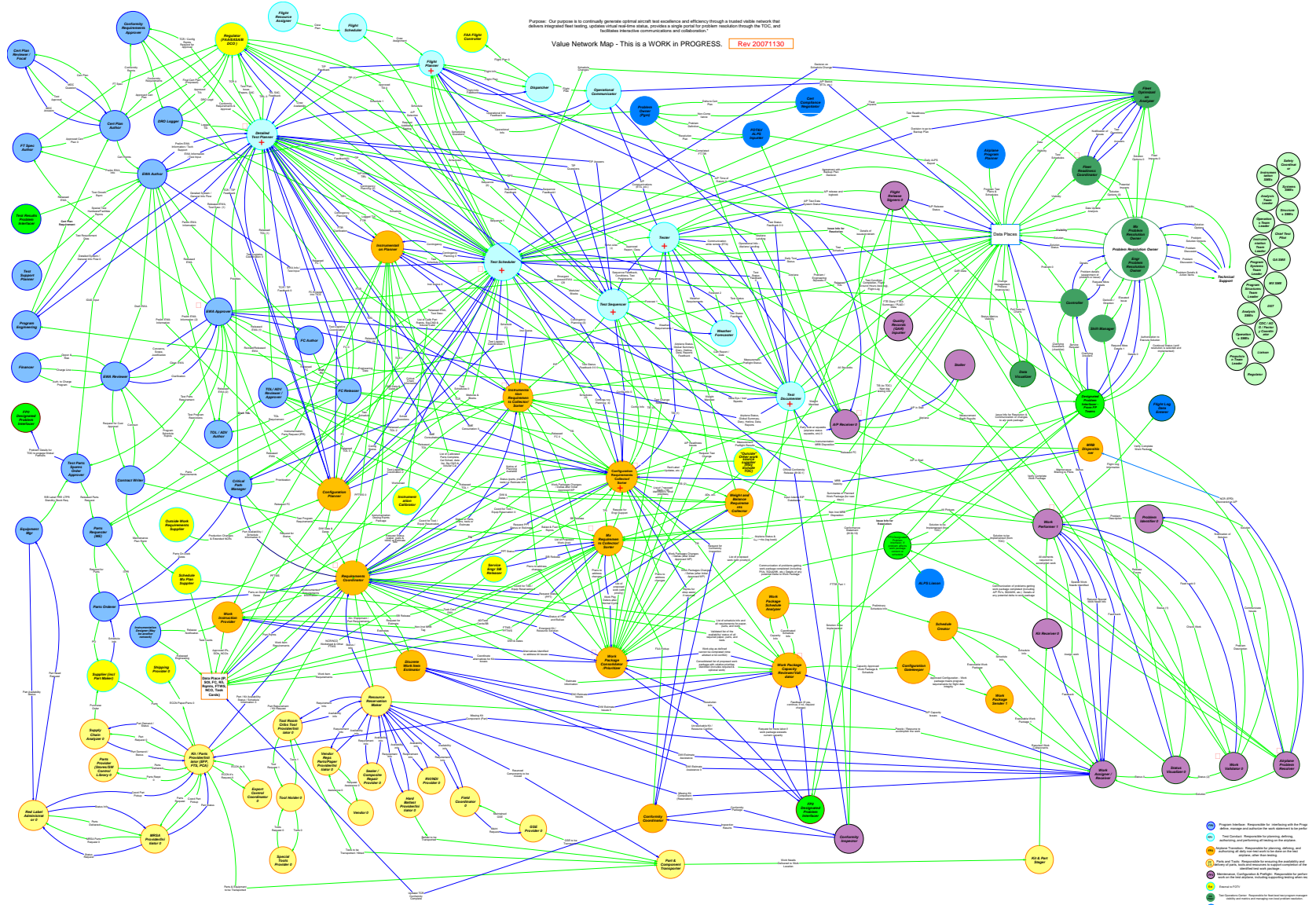
Nodes	Links	Possible Patterns
N=4	L=6	P=64
N=10	L=45	P=3.5 Trillion
N=12	L=66	P=4,700 Quadrillion

$$L = \frac{N(N-1)}{2}$$

$$P = 2^L$$

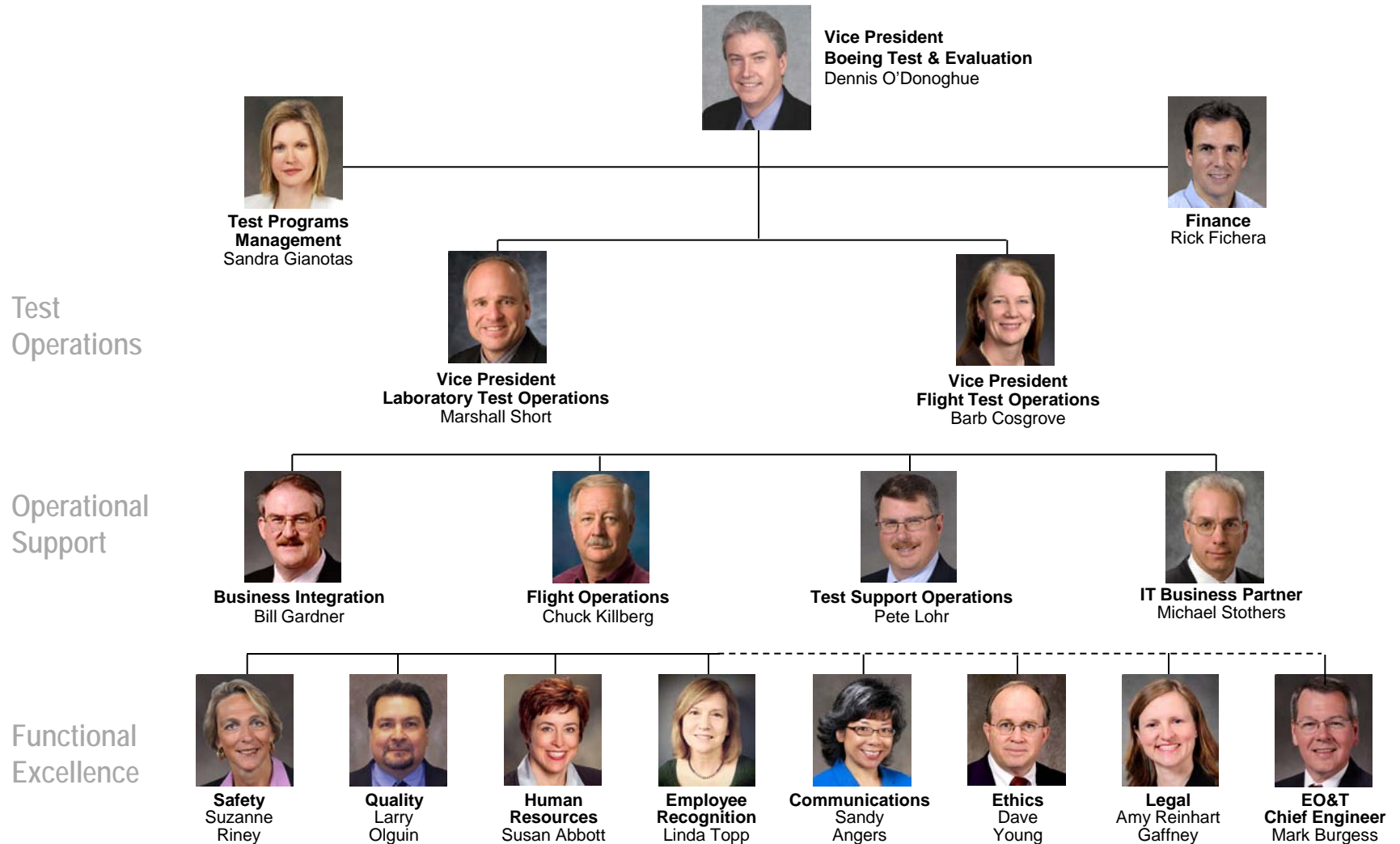
Flight Test Operations Network

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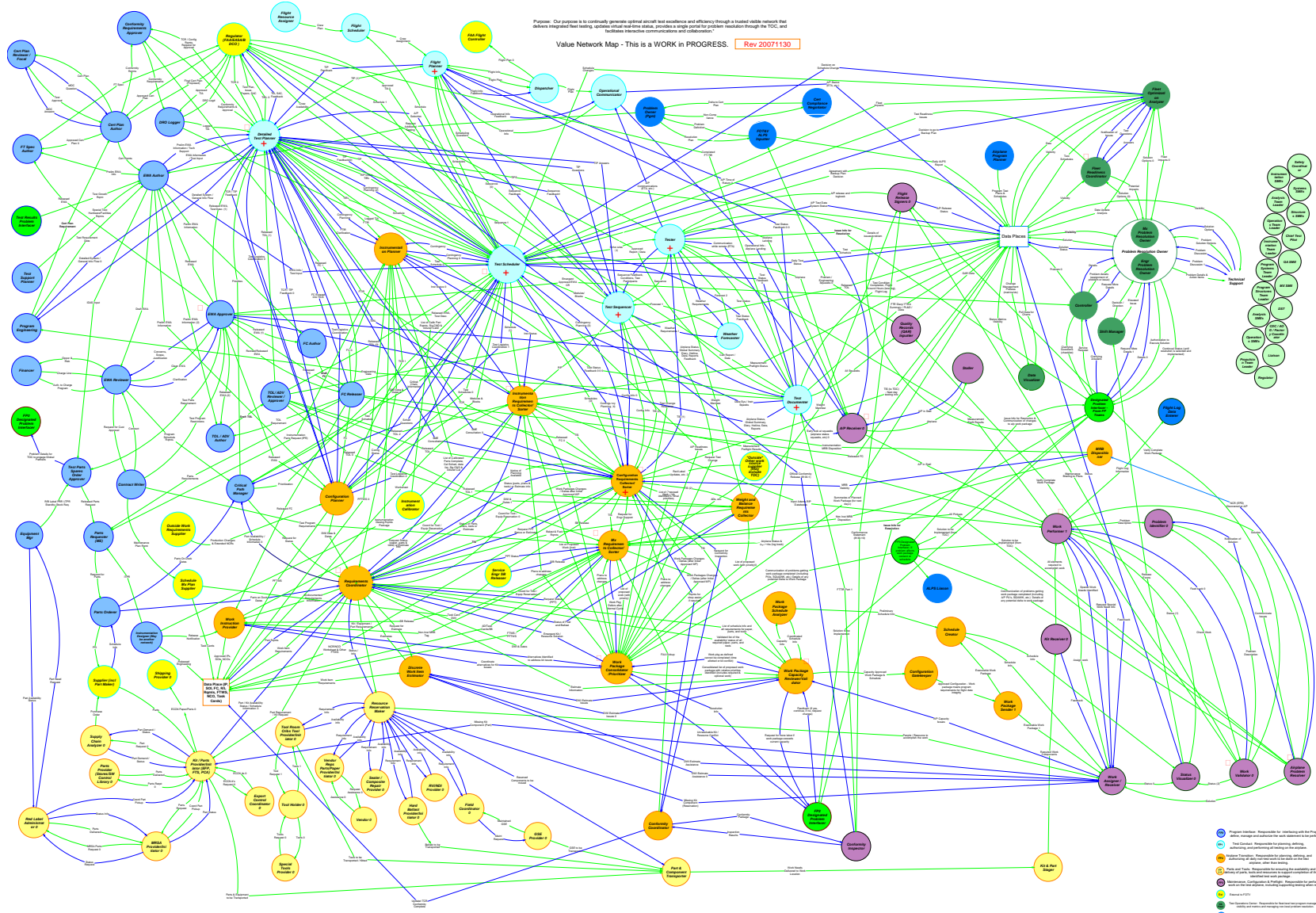
BT&E Organization – The Visible Structure

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Flight Test Operations Network

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The Changing Face of Warfare in the 21st Century

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“...And just like their allies in al Qaeda, this new Taliban is more network than Army, more a community of interest than corporate structure. For the U.S. military that I had spent my life in, this was not an easy insight to come by.....It was over the course of years and with considerable frustration that we came to understand how the emerging networks of Islamist insurgents are fundamentally different from any enemy we have ever faced. In bitter bloody fights....it became clear to me that to defeat a networked enemy we had to become a network ourselves.”

- General Stanley McChrystal

“It takes a Network”; Foreign Policy, March/April 2011

What Does It Mean For T&E?

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- **The paradigm has shifted!**
- **Validation of the weapon system itself is no long sufficient**
- **Validation of the weapon system as a node in a network of weapon systems will be tantamount**
- **Understanding (and modeling) of the behavior of the network will be key to success in the networked battle-space of the future**
- **The new paradigm will require a shift in thinking, away from specification-based testing to.....**

“Test As We Fight”

Test as We Fight

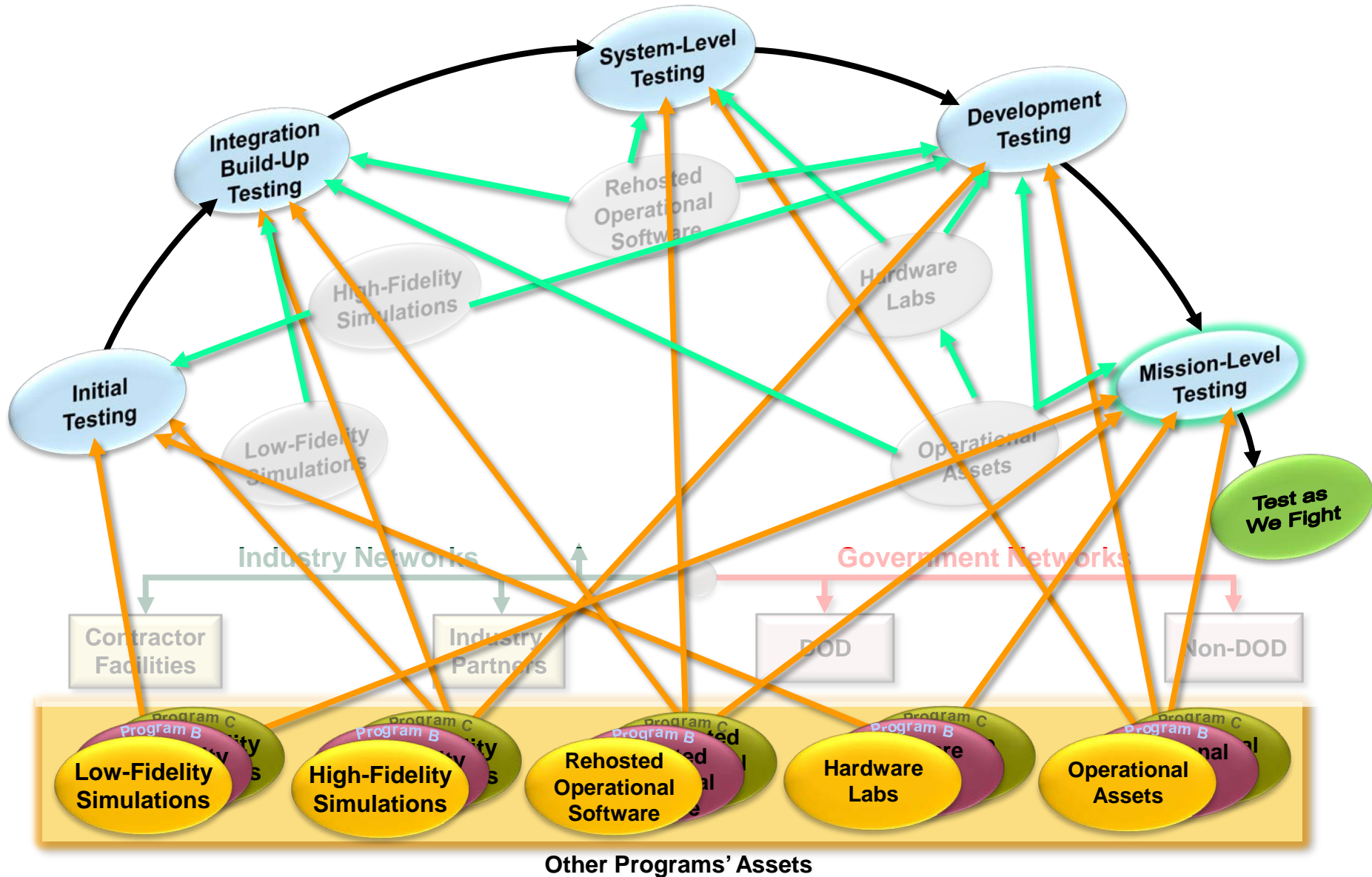
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To improve test as we fight:

- **Create a relevant complex test environment.**
 - Stimulate network under test to drive emergent behavior
 - Understanding of the fidelity of hardware, emulation, modeling and simulation
 - Pedigree of assets across the network available throughout test life cycle
- **Ensure the availability of critical assets across programs.**
 - Labs and simulations
 - Integrated networks
- **Keep a mission-level focus across the product test life cycle.**
 - Mission threads
 - Training testers to mission
- **Change the test culture to meet complexity of the SOS test.**
 - Influence test-as-we-fight requirements that shape acquisition

Test as We Fight

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It Takes a Network

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“Over time it became increasingly clear..... that our enemy was a constellation of fighters organized not by rank but on the basis of relationships and acquaintances, reputation and fame.....All of this allowed for flexibility and an impressive ability to grow.....The enemy did not convene promotion boards; the network is self-forming....After achieving some tactical success, a [young Iraqi] would market himself, make connections, gain followers, and suddenly a new node in the network would be created and absorbed. The network energy grew.”

- General Stanley McChrystal

“It takes a Network”; Foreign Policy, March/April 2011

The Leadership Challenge

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“...As we learned to build an effective network, we also learned that leading that network—a diverse collection of organizations, personalities, and cultures—is a daunting challenge in itself. That struggle remains a vital, untold chapter of the history of a global conflict that is still underway.”

- General Stanley McChrystal

“It takes a Network”; Foreign Policy, March/April 2011

