

Mosaic Warfare

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Asymmetric Advantages Eroding



Chinese J-31 Stealth Fighter



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Russian PAK-FA (T-50) Stealth Fighter



© 2011 Alex Beltyukov

Russian SS-N-26 Cruise Missile



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North Korean Musudan IRBM



© 2010 EPA

Chinese KJ-2000



© 2009 Zhenguan Studio

•Adversaries have had 25+ years after Desert Storm to analyze U.S. playbook and develop competing weapon systems

Iranian Fateh-110 SRBM

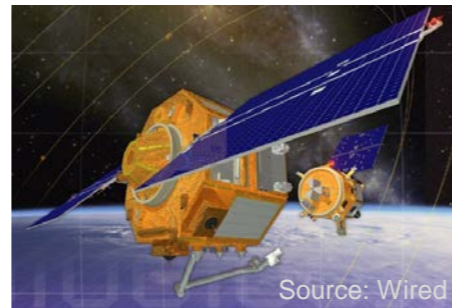


Source: M-ATF



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Chinese PL-15 Missile



Source: Wired

Chinese Space Robotics



Source: UMNICK

Russian S-400 IADS

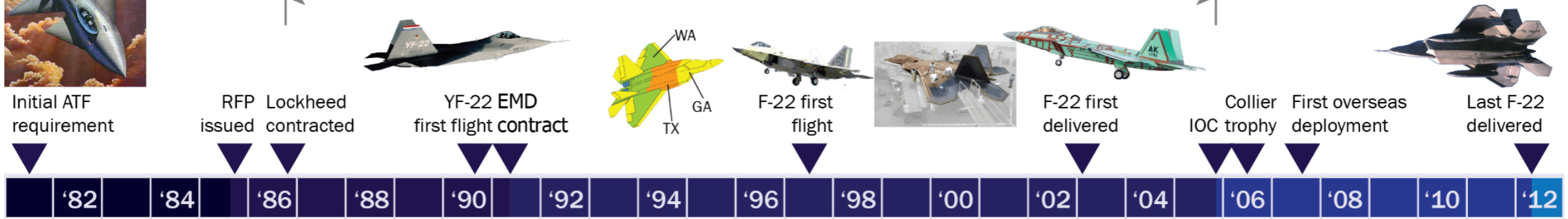
IRBM: Intermediate Range Ballistic Missile
SRBM: Short-Range Ballistic Missile



A modern complication: a slow reaction



19.1 years from contract to IOC



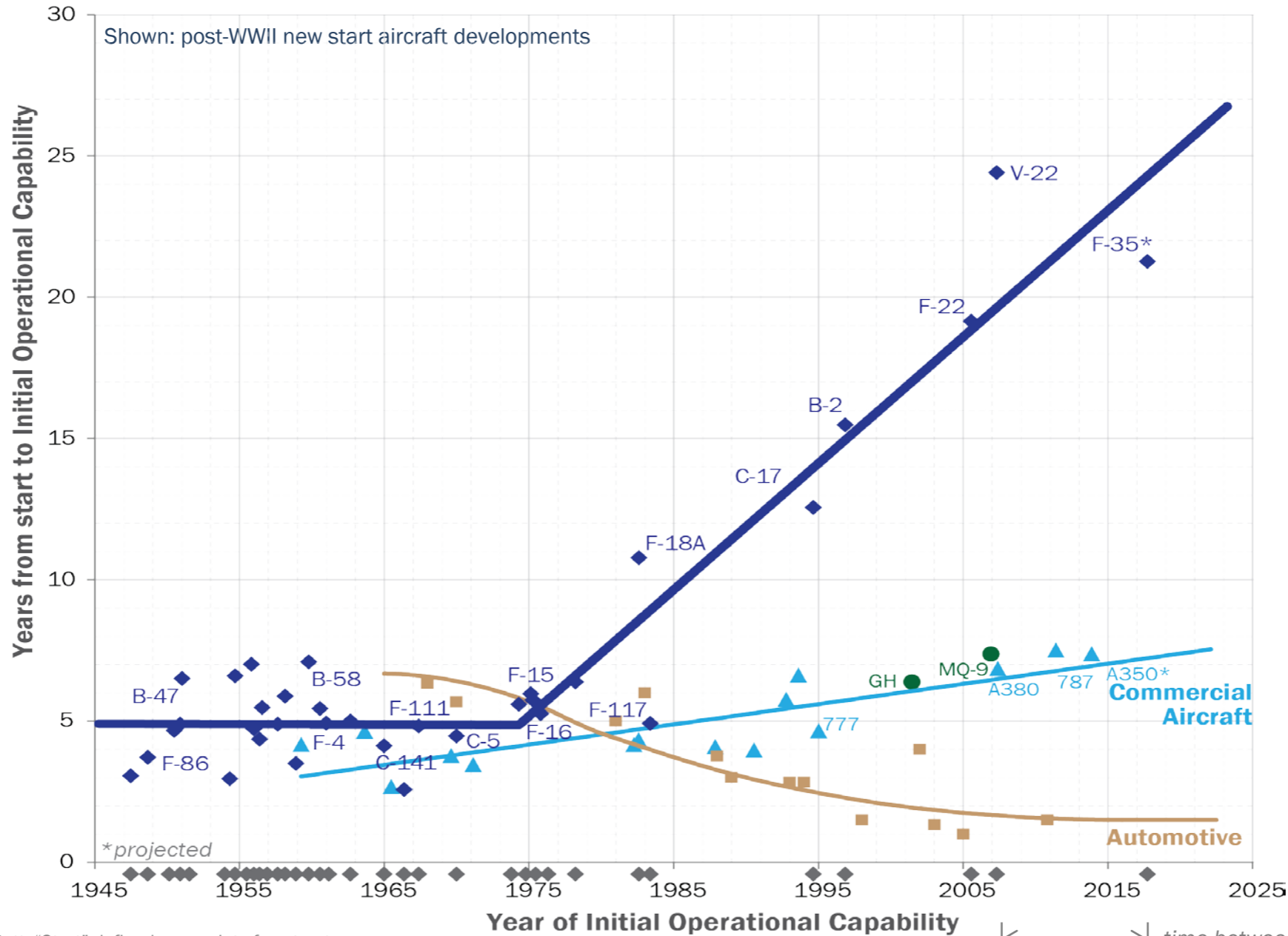
6 threat generations



Time to field exquisite DoD systems untenable, but there is hope



Time-to-Market

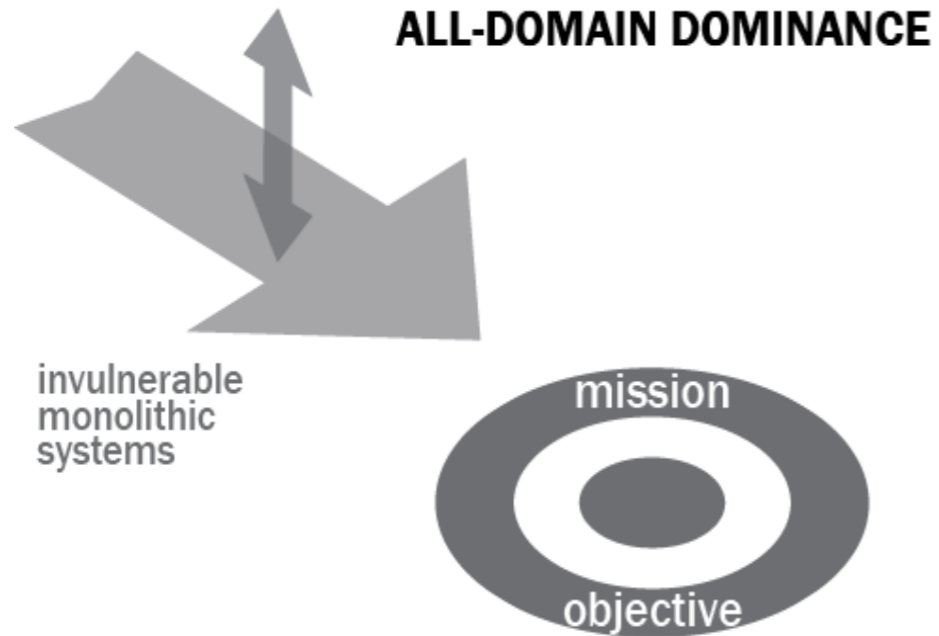


It's not simply complexity or software content driving increased time-to-market

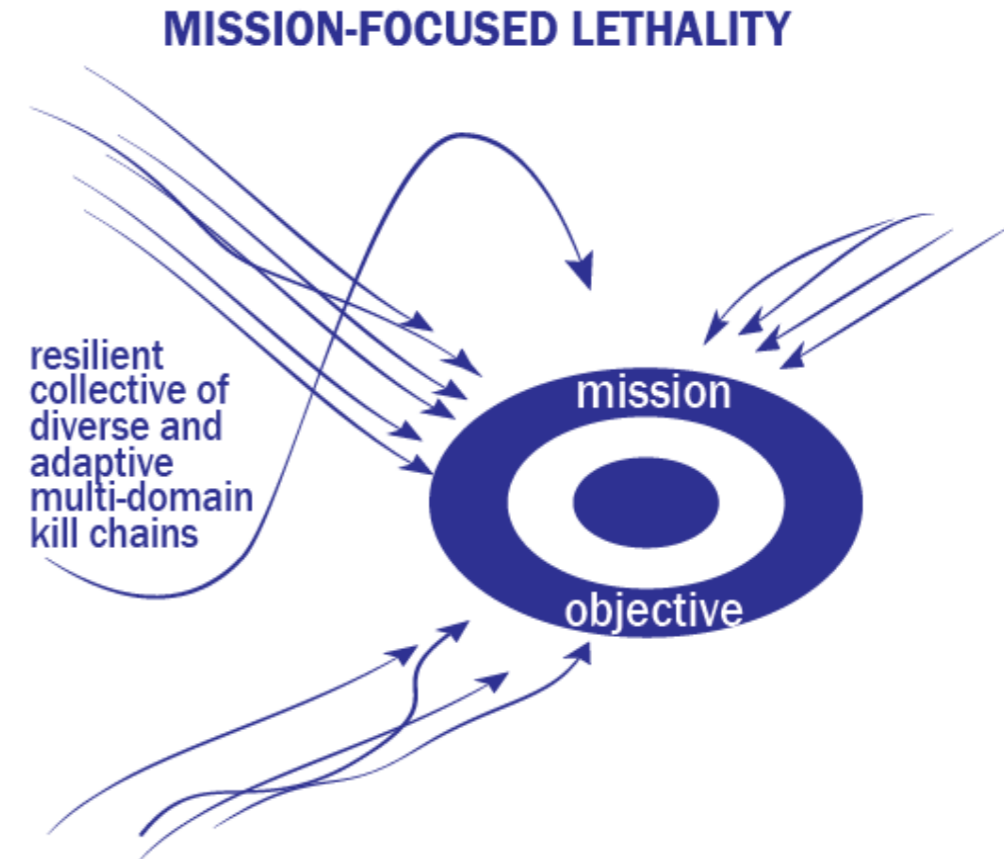
Sources: DARPA/TTO 2012 TTM study. D. Patt. "Start" defined as receipt of contract.



How we win – pivot to lethality



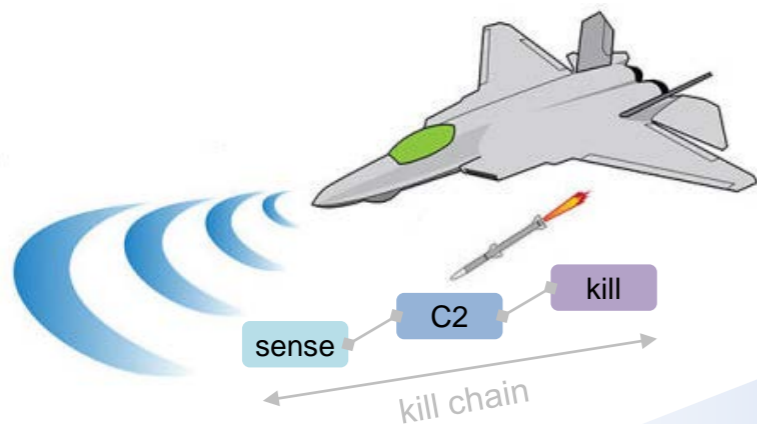
- cannot expect to continue to cover down with invulnerable monolithic systems
- incremental improvement on current paradigm is untenable



- lethality through diversity of options
- impose cost/penalty for any adversary action
- adversary left without good options – doesn't play



The promise and payoff of distributed, disaggregated SoS



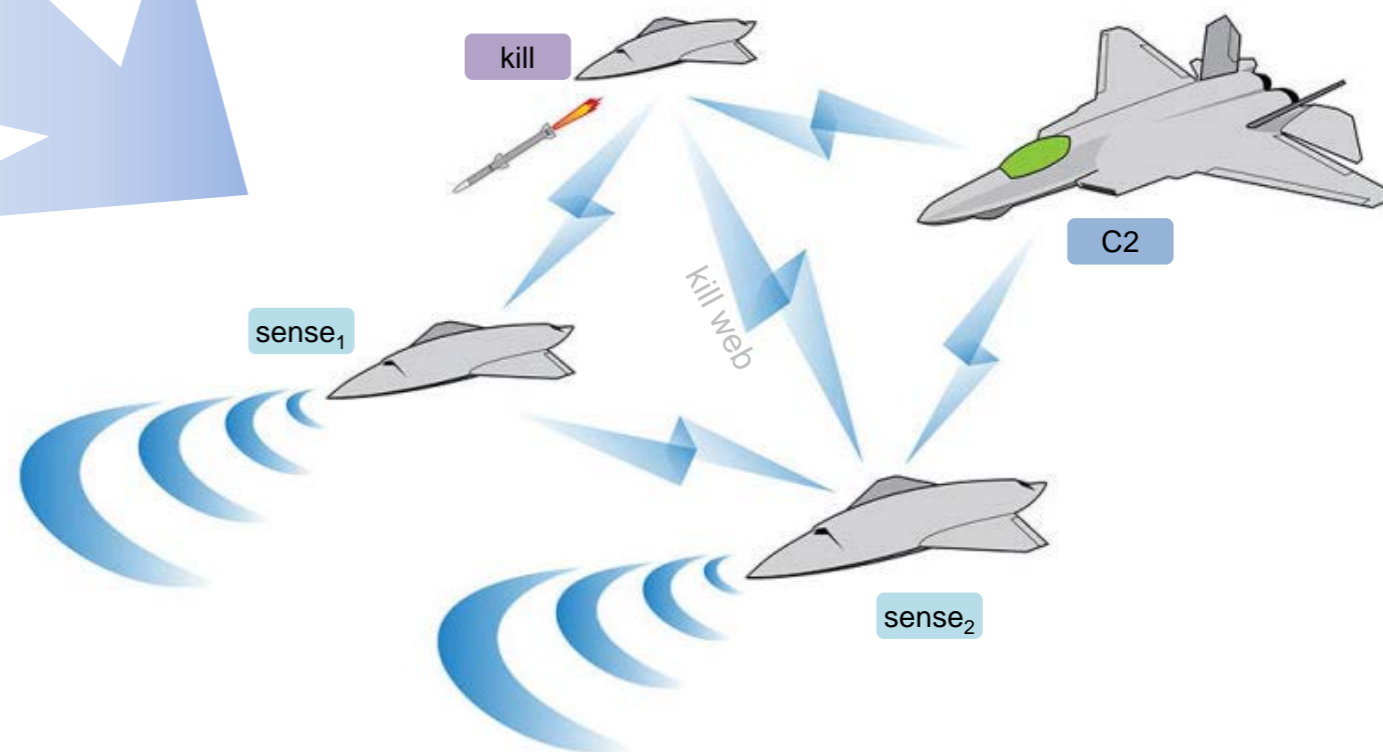
Limitations:

Vulnerable to evolving adversary kill-chains
Difficult to upgrade

first principles
see first • shoot first • win
take action with minimal risk
be resilient and adaptable (OODA)

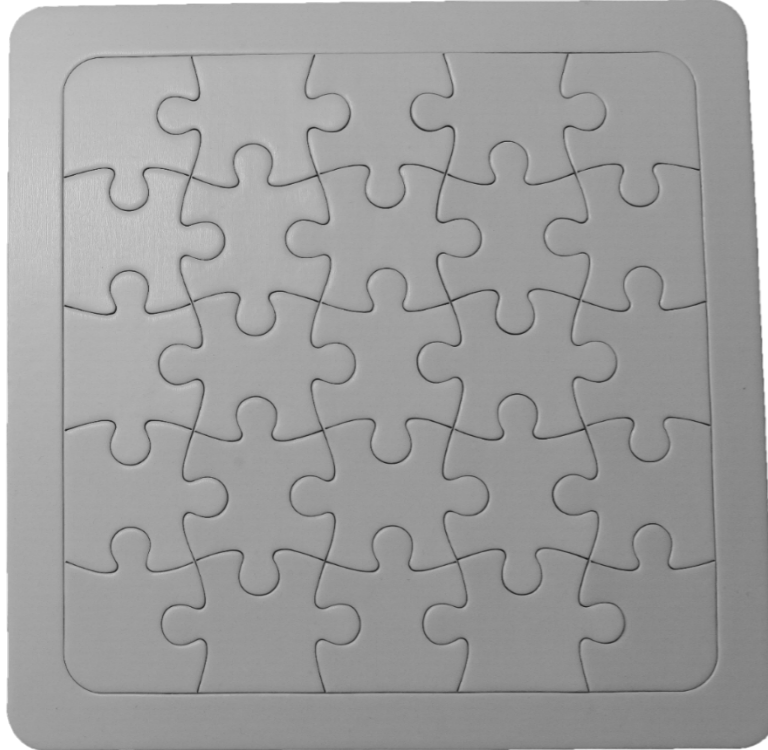
Advantages:

See first, shoot first via distribution
Heterogenous
Adaptable
Spreads risk
Can break adversary kill chain





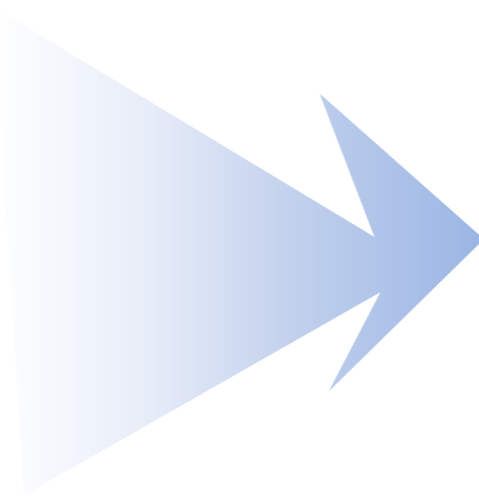
Distributed systems must be Mosaic to win



© Kyoshino

pieces, interfaces painstakingly engineered
can only be assembled in one way

creates a distributed monolith
retains legacy vulnerabilities, introduces new set



© Dotti Stone

pieces, interfaces engineered for interoperability
can be assembled in many ways

creates an adaptable, resilient, distributed system
retains, improves legacy capability, mitigates vulnerabilities

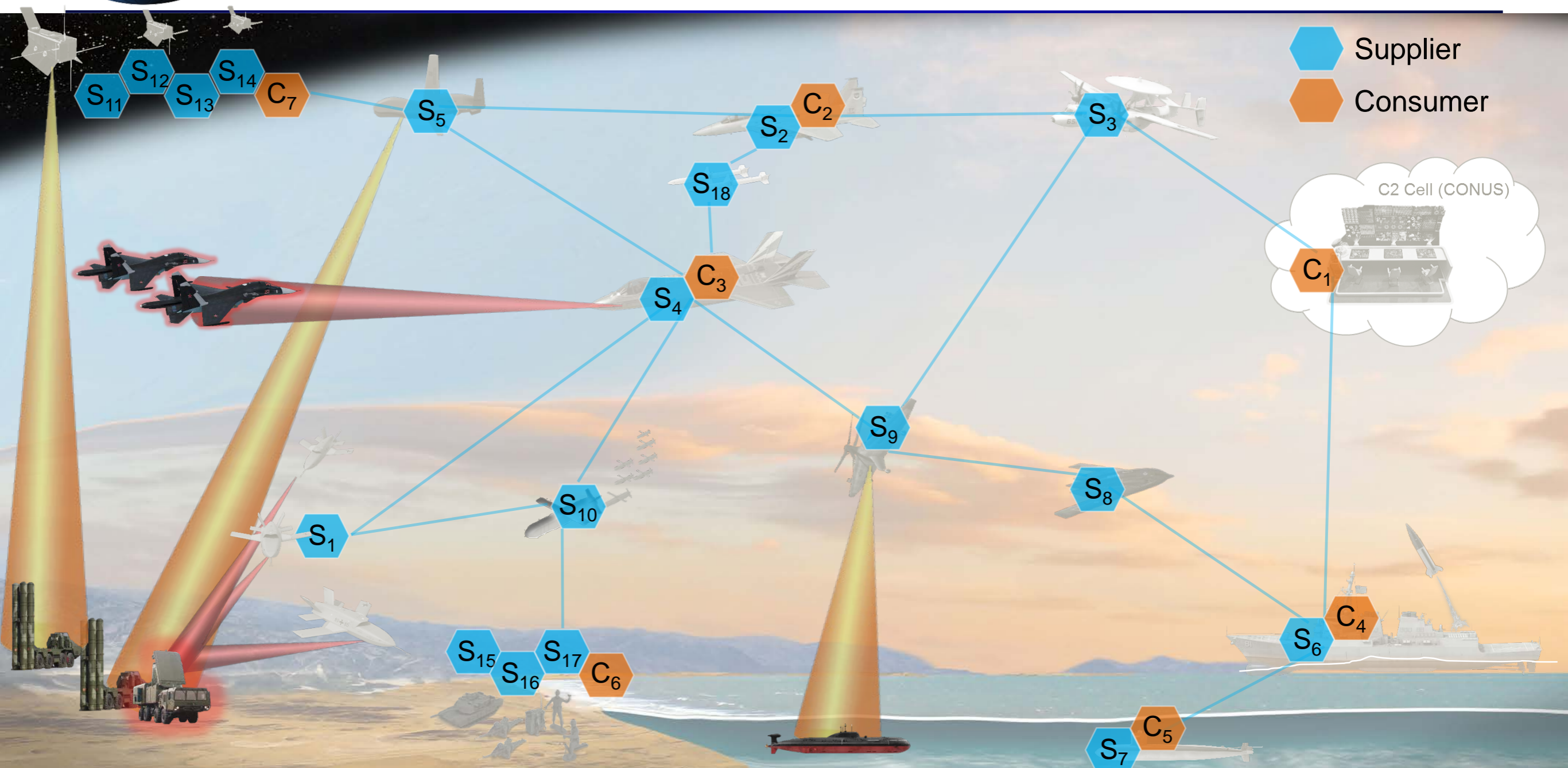


How do we make "joint multi-domain battle" fast and adaptive?

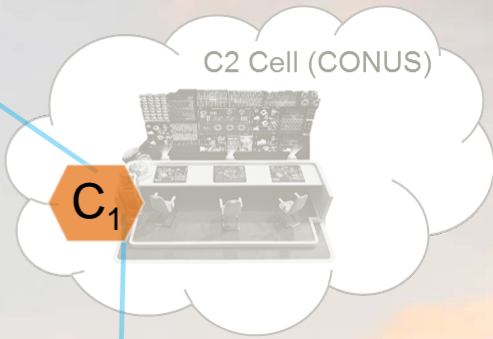




Mosaic Warfare = joint multi-domain lethality at speed



 Supplier
 Consumer

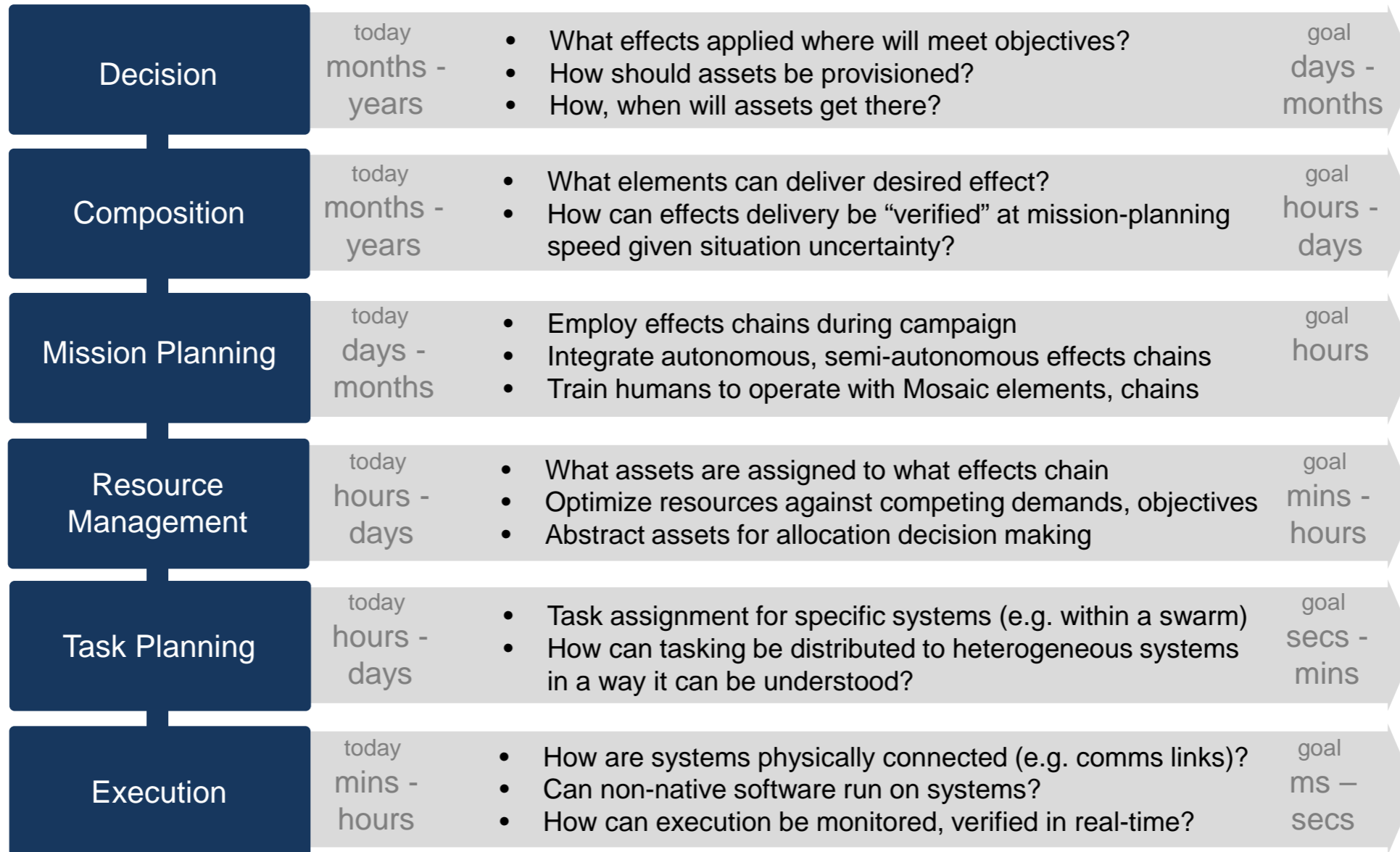




Mosaic technologies must address the entire combat lifecycle

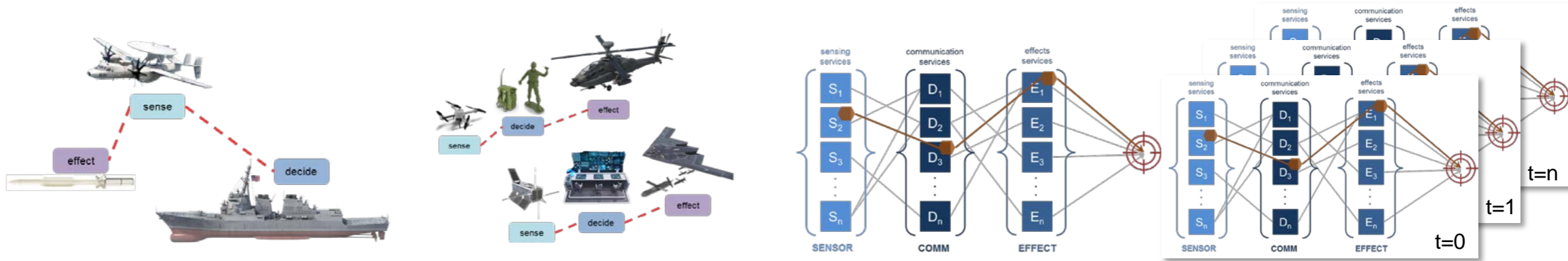


the Mosaic "Stack"





The Pathway to Mosaic Warfare



	Distributed Kill Chain	System-of-Systems	Adaptive Kill Web	Mosaic Warfare
Example	NIFC-CA	SoSITE	TBD	TBD
Description	Manual integration of existing systems	Systems prepped for multiple battle configurations	Semi-automated ability to select a pre-defined effects web prior to mission	Ability to compose new effects webs at campaign time
Benefits	<ul style="list-style-type: none"> • Extends effective range • Increases engagement opportunity 	<ul style="list-style-type: none"> • Enables faster integration and more diverse kill chains 	<ul style="list-style-type: none"> • Allows pre-mission adaptation • More lethal, imposes complexity on adversary 	<ul style="list-style-type: none"> • Adaptable to dynamic threat and environment • Scaling to many simultaneous engagements
Challenges	<ul style="list-style-type: none"> • Static • Long to build • Difficult to operate and scale 	<ul style="list-style-type: none"> • Each architecture static • Limited ability to adapt • Cannot add new capabilities on the fly • Difficult to operate and scale 	<ul style="list-style-type: none"> • Static “playbook” • Limited number of kill chains • May not scale well 	<ul style="list-style-type: none"> • Scaling limited by human decision makers

