



Mission Thread Workshop (MTW): Preparation and Execution

Software Engineering Institute
Carnegie Mellon University
Pittsburgh, PA 15213

Tim Morrow
Mike Gagliardi
Bill Wood

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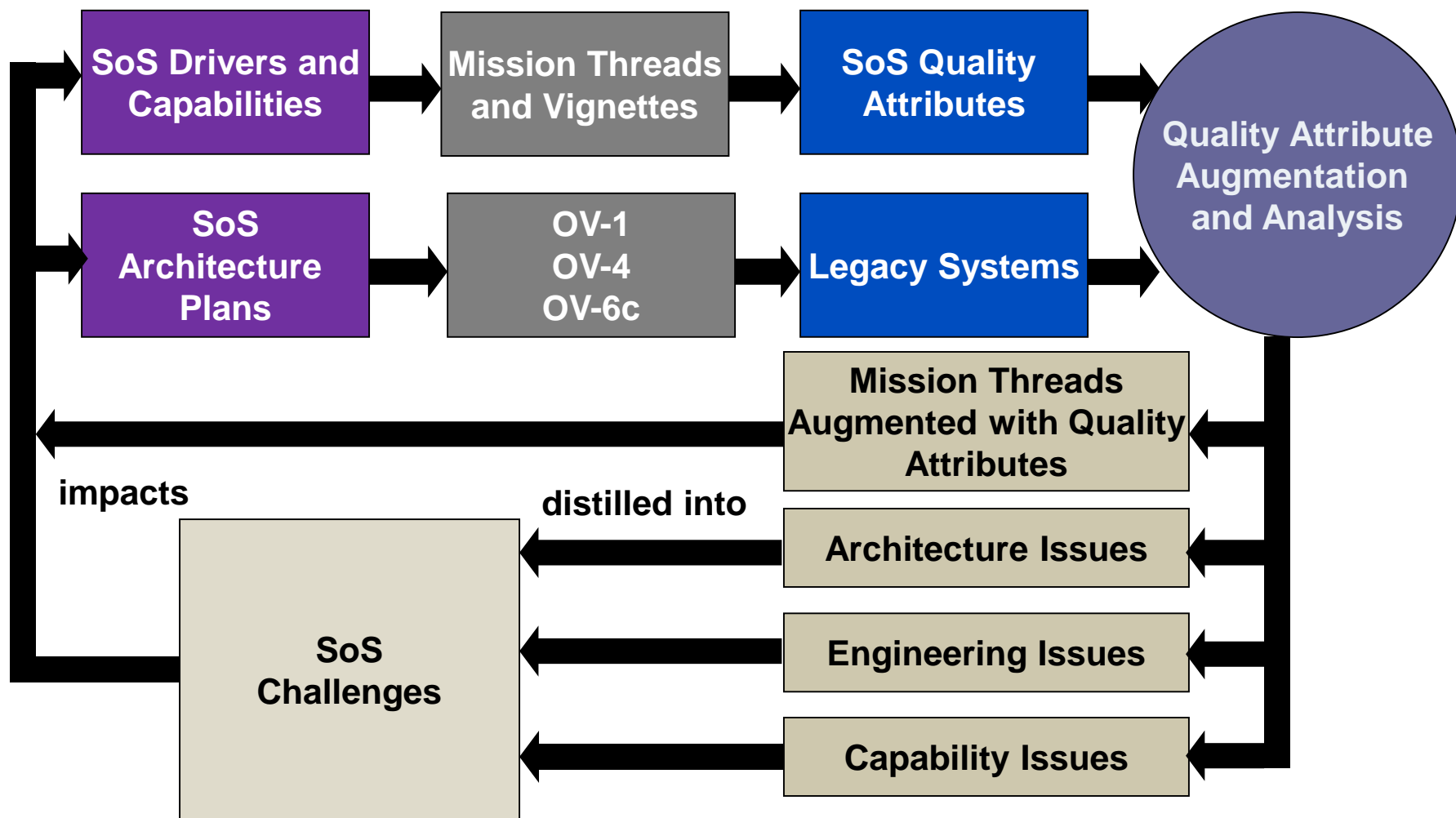


Outline

- MTW and our experience base
- Three phases for conducting an MTW
- How MTWs fit into system-of-systems (SoS) architecture development and analysis



Conceptual Flow of the MTW





Mission Thread Workshops – Experiences

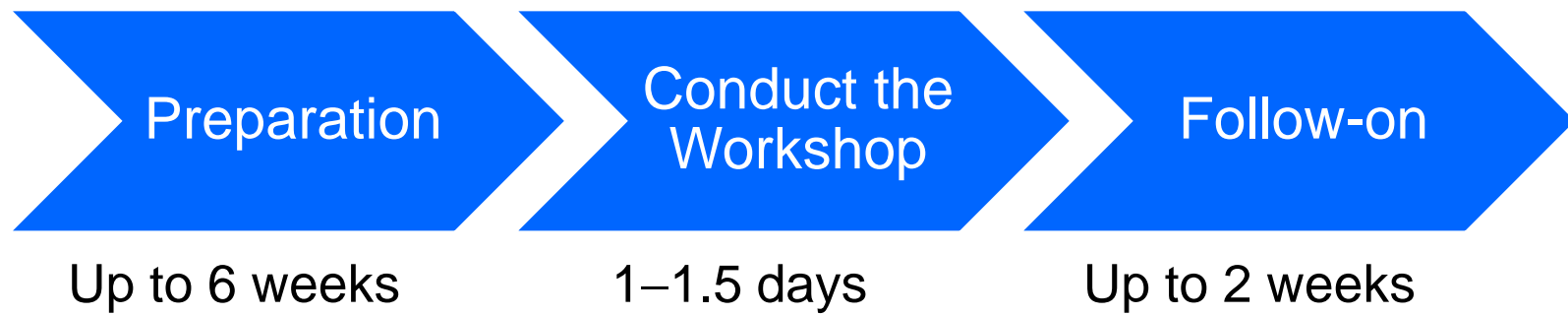
| Client | Description | MTWs | Vignettes | Mission Threads | Stakeholders |
|--------|------------------------------|------|-----------|-----------------|--------------|
| A | IRAD New Platform/Capability | 1 | 1 | 2 | 8 |
| B | New Naval Ship | 13 | 17 | 37 | >200 |
| C | Battle Command | 6 | 3 | 4 | >100 |
| D | Maritime Detection | 2 | 4 | 4 | 30 |
| E | NSF | 1 | 3 | 3 | 15 |
| F | Air Force Program | 1 | 1 | 1 | 10 |
| G | DHS | 2 | 2 | 3 | 23 |
| H | Other Govt Agency | 1 | 4 | 4 | 12 |

- Identifies SoS architecture gaps, overlaps, and challenges
- Identifies issues for constituent legacy systems and software architectures
- Overcomes organizational stovepipes and facilitates stakeholder communication





Three Phases of an MTW Engagement



MTW Timeline



Preparation Phase

- Review the MTW process
- Develop SoS mission and business drivers
- Develop SoS architecture plans
- Develop the vignettes, mission threads, and appropriate quality attributes
- Identify participating stakeholders
- Select MTW team
- Settle on logistics



SoS Mission and Business Drivers and Architecture Plans

Overview presentation of the SoS mission and business drivers

- 1–2 slides on the business drivers; more if agreed it's needed
- Identify business/programmatic context, high-level functional requirements, high-level constraints, high-level quality attributes, plan for development, and the program's goals and objectives

Overview presentation of the SoS architecture plans

- 1–2 slides on the vision for the architecture; more if agreed it's needed
- Identify legacy systems being considered, high-level constraints, high-level quality attributes, and the plan for development
- Visio/PowerPoint

Need to establish the scope of the mission thread analysis effort

- 70–80% functionality



Vignettes

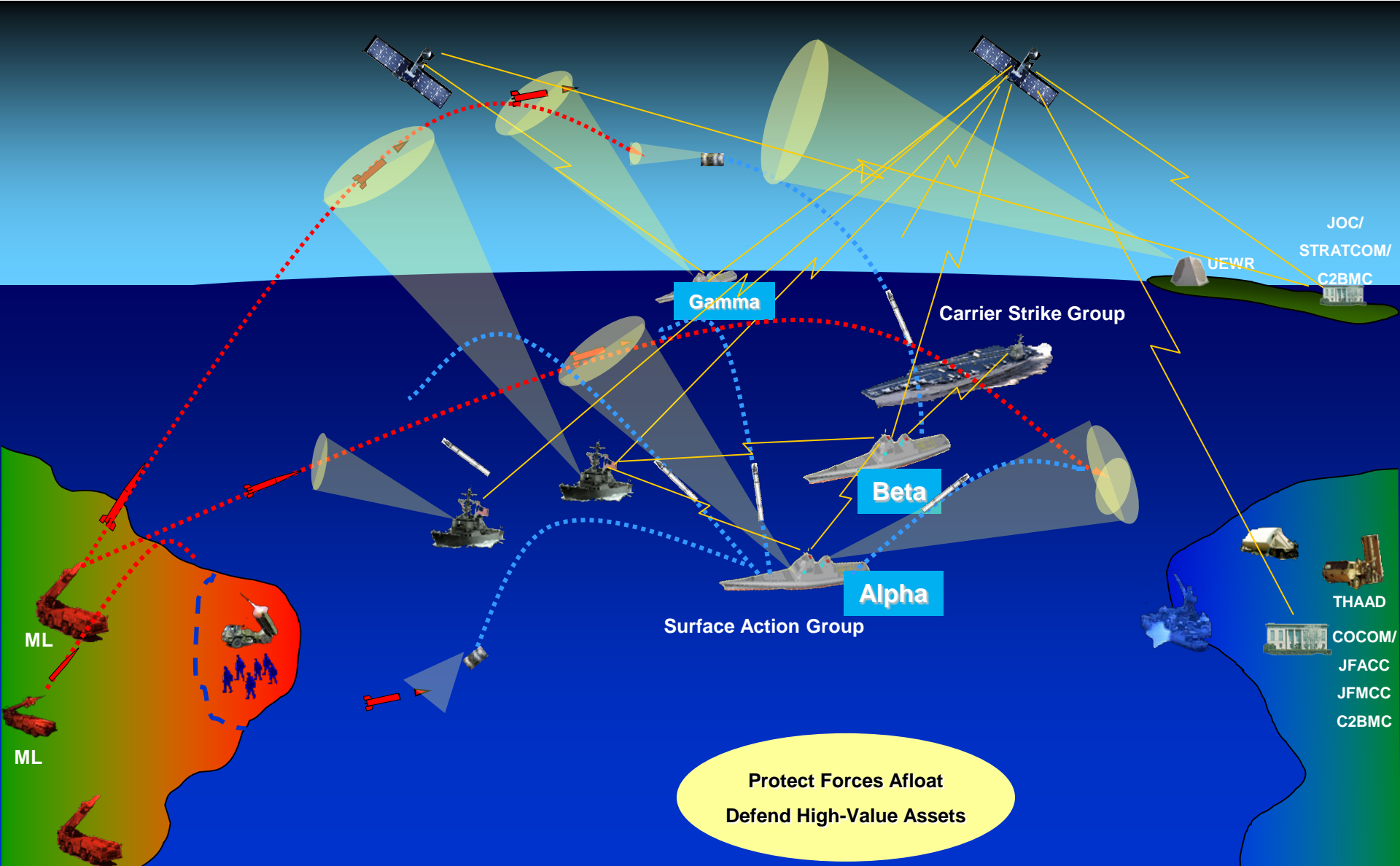
A vignette has two parts:

1. Vignette description
2. Graphical description of the vignette, such as an DoD OV-1 or context diagram.

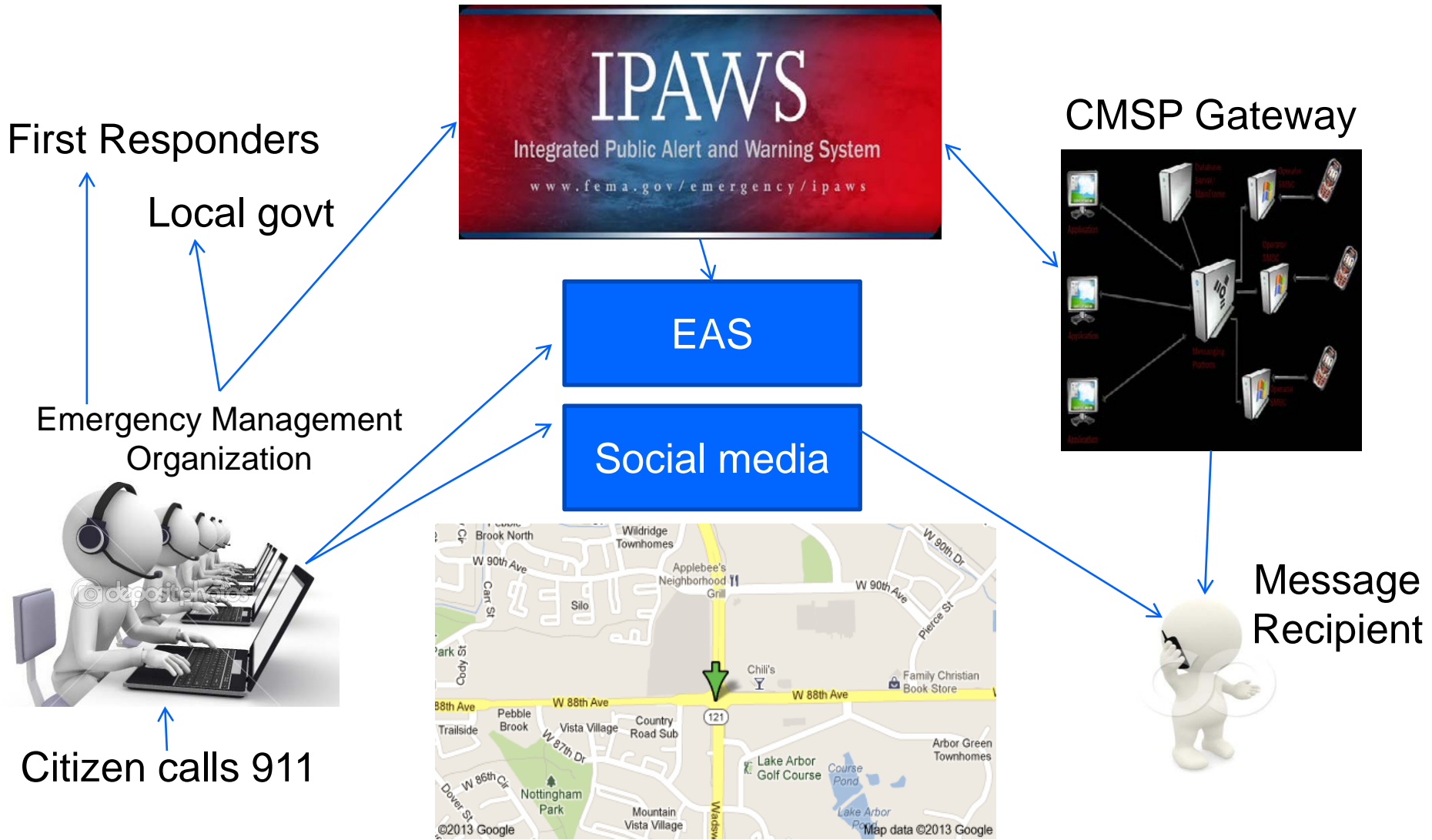
| Name of Vignette | Protect Fleet Assets Against Cruise Missile Attacks |
|--------------------------------|---|
| Vignette (summary description) | <p>Two ships (Alpha and Beta) are assigned to air defense to protect a fleet containing two high-value assets. A surveillance aircraft and four UAVs (two pairs) are assigned to the fleet and controlled by the ships. A pair of UAVs flying as a constellation can provide fire-control quality tracks directly to the two ships. A two-pronged attack on the fleet occurs:</p> <ul style="list-style-type: none">- five aircraft-launched missiles from the southeast- three minutes later, seven submarine-launched missiles from the southwest <p>The fleet is protected with no battle damage.</p> |
| Nodes/actors | Alpha and Beta ships, two high-value assets, surveillance aircraft, UAVs, missiles |
| Assumptions | Sea state is Level 1 Etc. |



Ballistic Missile Defense (BMD) OV-1 Example



Example of a Context Diagram for a Wireless Emergency Alerts Message



Mission Thread Snippet

| Step | Description | Engineering Considerations, Issues, Challenges |
|------|---|---|
| 1 | A large truck carrying pesticide goes through an intersection with a "RED" traffic light and is hit broadside by an SUV. Both vehicles burst into flames. | 1. |
| 2 | Several citizens in cars that were approaching the intersection stop and call 911 to report the accident. Others rush to assist the accident victims. | 1. 911 call center starts receiving calls but is quickly overwhelmed with the volume 2. Calls start rolling to neighboring 911 call centers 3. Begin initial assessment |
| 3 | Driver from SUV is pulled from vehicle and placed on a nearby lawn. | 1. Fire, police, EMS are dispatched to accident 2. No information provided to public yet. (should any be?) 3. A smoke plume begins drifting toward residential area. |



Quality Attributes

| Quality Attribute | Considerations |
|-------------------|----------------|
| Performance | |
| Security | |
| Usability | |
| Resilience | |
| | |





Wrap-up of Preparation Steps

Identify participating stakeholders

- Need to elicit architectural and engineering considerations for the mission threads
- Experience of stakeholders largely determines quality of the results

Select MTW team

- Consists of three or more people who fill the four MTW roles (lead, facilitator, scribe, and analyst)
- Experienced architects with good facilitation skills and related quality attribute knowledge

Logistics of the MTW

- Room, equipment



Conduct Workshop Phase

- Present the MTW
- Present the business and mission drivers
- Present the architectural plan
- Review the vignette
- Augment the mission thread
- Consider extensions to the mission thread
- Discuss overarching quality attribute considerations
- Analyze remaining mission threads



MTW Agenda

Day 1: XX XXX 2009

| | |
|-------------|---|
| 08:00–08:15 | Welcome/Introductions/Opening Remarks (name, SEI) |
| 08:15–08:30 | MTW Overview (SEI) |
| 08:30–08:45 | Business Drivers and Quality Attributes (name) |
| 08:45–09:00 | Architecture Plan (name) |
| 09:00–09:30 | Vignettes and OV-1 Descriptions (name) |
| 09:30–09:45 | Break |
| 09:45–12:00 | Augmentation of Mission Threads (SEI facilitated) |
| 12:00–13:00 | Lunch |
| 13:00–17:00 | Augmentation of Mission Threads (SEI facilitated) |

Day 2: XX XXX 2009

| | |
|-------------|---|
| 08:00–12:00 | Augmentation of Mission Threads (SEI facilitated) |
| 12:00–13:00 | Lunch |
| 13:00–16:30 | Augmentation of Mission Threads (SEI facilitated) |
| 16:30–17:00 | Summary/Wrap Up |





Follow-On Phase

- Scrub the augmented mission threads
- Reference each comment with a unique identifier
- Produce a group of challenges
- Develop a briefing to summarize the challenges
- Complete the Mission Thread Description Document



Augmented Mission Thread

| Step | Description | Engineering Considerations, Issues, Challenges |
|------|---|---|
| 1 | A large truck carrying pesticide goes through an intersection with a "RED" traffic light and is hit broadside by an SUV. Both vehicles burst into flames. | 1. |
| 2 | Several citizens in cars that were approaching the intersection stop and call 911 to report the accident. Others rush to assist the accident victims. | 1. 911 call center starts receiving calls but is quickly overwhelmed with the volume 2. Calls start rolling to neighboring 911 call centers 3. Begin initial assessment |
| 3 | Driver from SUV is pulled from vehicle and placed on a nearby lawn. | 1. Fire, police, EMS are dispatched to accident 2. No information provided to public yet. (should any be?) 3. A smoke plume begins drifting toward residential area |



Scrubbed, Augmented Mission Thread

| Step | Description | Engineering Considerations, Issues, Challenges |
|------|---|---|
| 1 | A large truck carrying pesticide goes through an intersection with a "RED" traffic light and is hit broadside by an SUV. Both vehicles burst into flames. | MT1-1-1. |
| 2 | Several citizens in cars that were approaching the intersection stop and call 911 to report the accident. Others rush to assist the accident victims. | MT1-2-1. 911 call center starts receiving calls but is quickly overwhelmed with the volume MT1-2-2. Calls start rolling to neighboring 911 call centers MT1-2-3. Begin initial assessment |
| 3 | Driver from SUV is pulled from vehicle and placed on a nearby lawn. | MT1-3-1. Fire, police, EMS are dispatched to accident MT1-3-2. No information provided to public yet MT1-3-3. A smoke plume begins drifting toward residential are. |



Challenge Area Grouping

Initial Grouping

| Category | Mission Thread Reference |
|------------------------------------|---|
| Alert severity levels | Assumptions, MT5-10-5 |
| 911 call center overload | MT2-4-1, MT2-4-2, MT4-4-3, MT4-5-4, MT5-9-1, MT5-9-2, MT5-9-14, MT5-10-6, MT5-10-10 |
| Public education – alert awareness | MT3-4-5, MT4-9-2, MT4-9-16, MT5-11-2, MT5-11-6, MT5-11-11 |
| Role of a communications manager | MT1-4-7, MT1-9-2, MT1-9-7, MT1-9-8, MT2-10-6, MT2-11-6, MT2-11-11 |
| Tool features | MT3-4-9, MT5-1-5, MT5-1-11 |
| Coordination and jurisdiction | MT2-4-11, MT2-5-1, MT4-6-2, MT4-9-5, MT4-11-1 |
| Future information inputs | MT3-5-3, MT3-9-6, MT3-9-13, MT3-9-16 |
| Operator training | MT2-9-3, MT2-9-6, MT2-9-16, MT2-10-6 |
| Mutual aid agreements/awareness | MT1-5-4, MT1-9-5, MT1-9-6, MT1-9-8, MT4-6-3, MT4-6-4 |
| Operators' procedures | MT2-4-2, MT2-6-2, MT3-9-1, MT3-9-16, MT4-4-6, MT4-4-10 |
| Scenario planning | MT1-9-1, MT1-9-9, MT1-9-10, MT3-3-2, MT3-3-9, MT3-3-11 |
| Public's expectations | MT1-4-12, MT1-9-2, MT1-9-16, MT1-11-2, MT1-11-6 |
| When to send an alert | MT1-4-3, MT2-6-2, MT2-6-3, MT2-6-4, MT3-9-7, MT4-2-4, MT4-3-5 |
| Communication channels | MT1-4-1, MT1-4-10, MT3-5-3, MT3-6-2, MT4-9-1, MT4-9-2, MT5-3-6 |
| Security | Sec-2, Sec-4, Sec-5 |

Challenge Areas

| Category | Mission Thread Reference |
|---|---|
| Alert severity levels/When to send an alert | Assumptions, MT5-10-5, MT1-4-3, MT2-6-2, MT2-6-3, MT2-6-4, MT3-9-7, MT4-2-4, MT4-3-5 |
| Tool features/Future information inputs | MT3-4-9, MT5-1-5, MT5-1-11, MT3-5-3, MT3-9-6, MT3-9-13, MT3-9-16 |
| Coordination and jurisdiction/Mutual aid agreements/Awareness | MT2-4-11, MT2-5-1, MT4-6-2, MT4-9-5, MT4-11-1, MT1-5-4, MT1-9-5, MT1-9-6, MT1-9-8, MT4-6-3, MT4-6-4 |
| Operators' procedures/Operator training | MT2-4-2, MT2-6-2, MT3-9-1, MT3-9-16, MT4-4-6, MT4-4-10, MT2-9-3, MT2-9-6, MT2-9-16, MT2-10-6 |
| Scenario planning/911 call center overload | MT1-9-1, MT1-9-9, MT1-9-10, MT3-3-2, MT3-3-9, MT3-3-11, MT2-4-1, MT2-4-2, MT4-4-3, MT4-5-4, MT5-9-1, MT5-9-2, MT5-9-14, MT5-10-6, MT5-10-10 |
| Public's expectations/Public education – alert awareness/Role of a communications manager | MT1-4-12, MT1-9-2, MT1-9-16, MT1-11-2, MT1-11-6, MT3-4-5, MT4-9-2, MT4-9-16, MT5-11-2, MT5-11-6, MT5-11-11, MT1-4-7, MT1-9-2, MT1-9-7, MT1-9-8, MT2-10-6, MT2-11-6, MT2-11-11 |
| Communication channels | MT1-4-1, MT1-4-10, MT3-5-3, MT3-6-2, MT4-9-1, MT4-9-2, MT5-3-6 |
| Security | Sec-2, Sec-4, Sec-5 |



Example of a Challenge

Challenge: What civil emergencies are worthy of a WEA message?

Category grouping: Operational procedures, governance

Supporting info

- MT5-10-5
- MT2-6-2, MT2-6-3, MT2-6-4
- MT4-3-5

Recommendations

- Continue to identify and develop civil emergency scenarios that can be discussed with first responders and partnering communities to develop a consistent approach for determining when to issue WEA messages.
- Continue to host meetings with NWS, FEMA, DHS, and the state to share information about when it is appropriate to send a WEA message.



Contents of the Mission Thread Description Document

Inputs

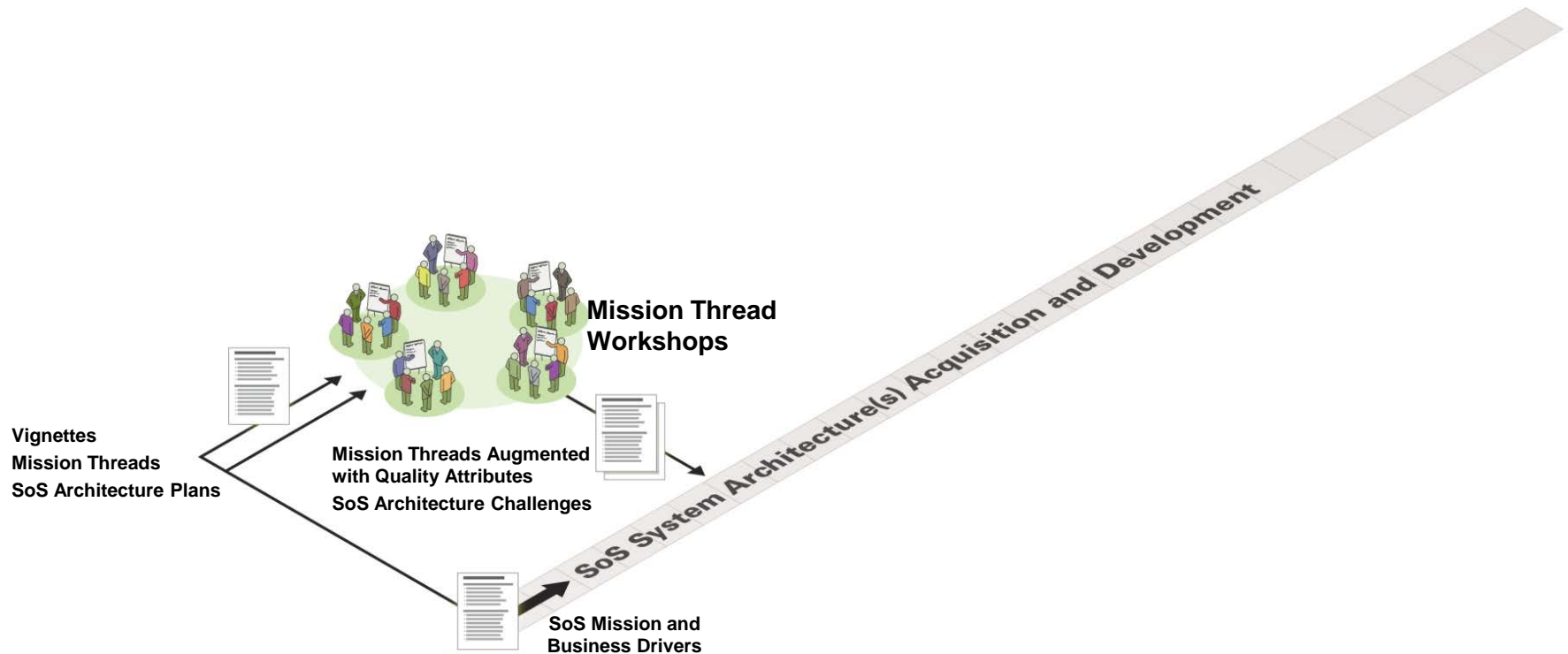
- Presentations
 - MTW process
 - Business and architecture drivers and plans
- Tailored vignette(s) and mission threads

Outputs

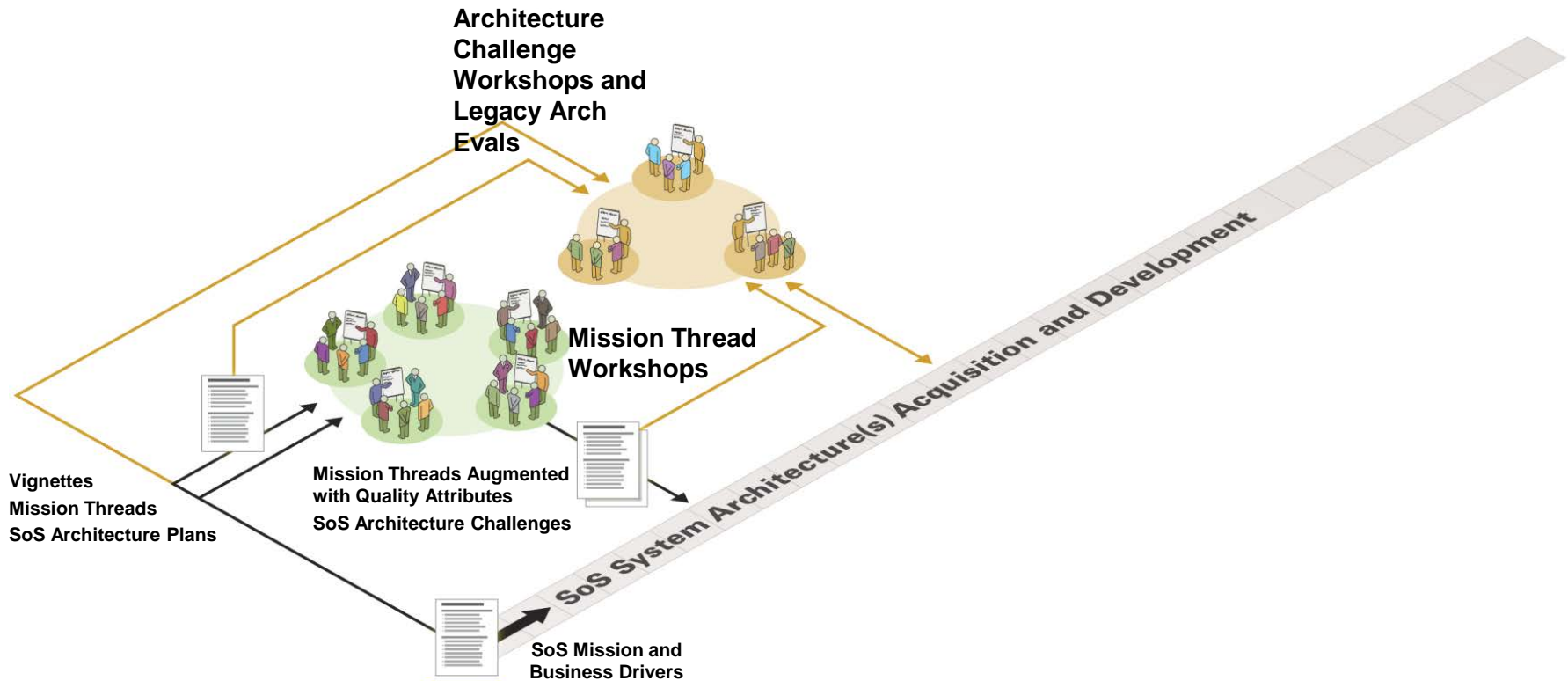
- Mission threads augmented with quality attributes
- Analysis methods
- Challenges



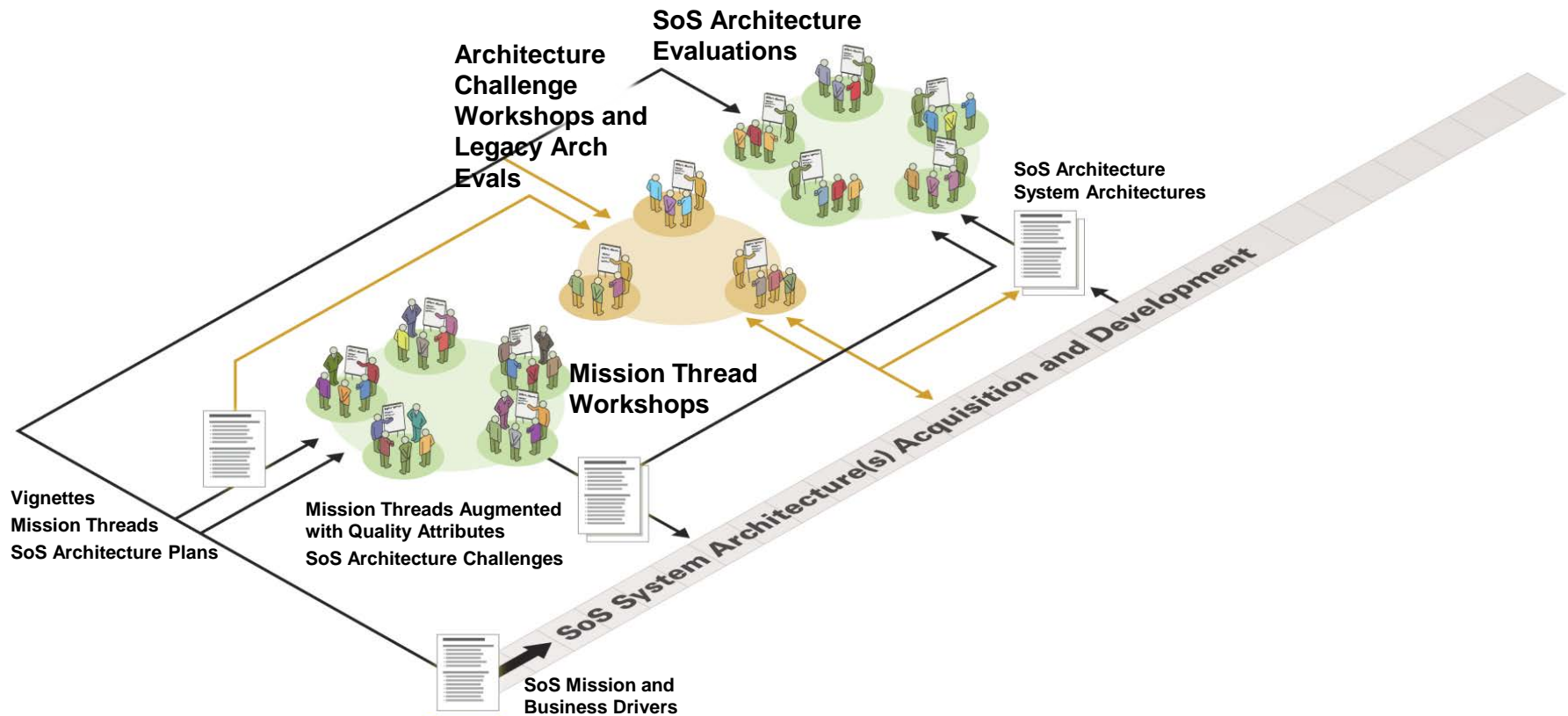
How MTWs Fit into SoS Architecture Development and Analysis



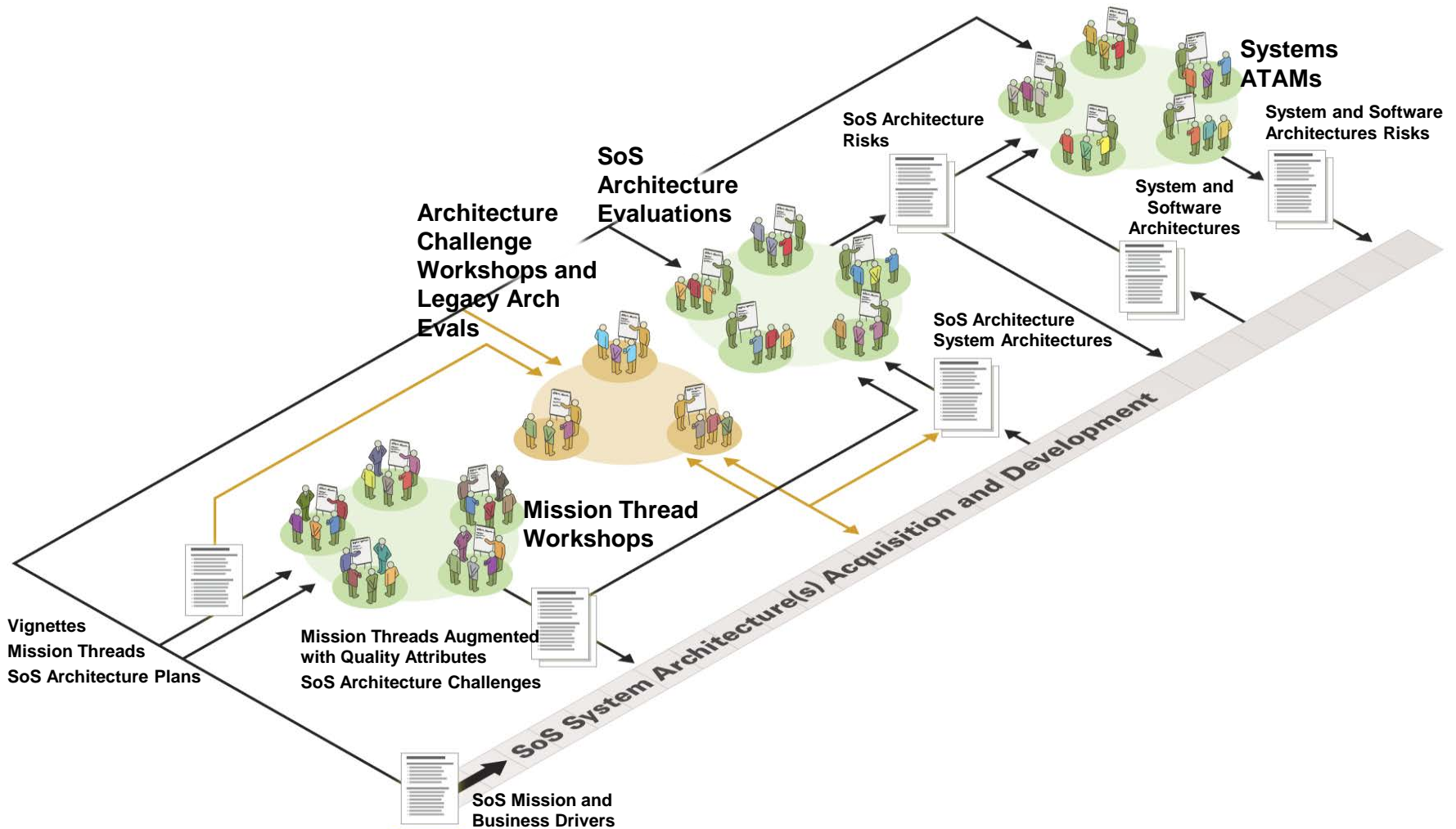
Overview



Overview



Overview

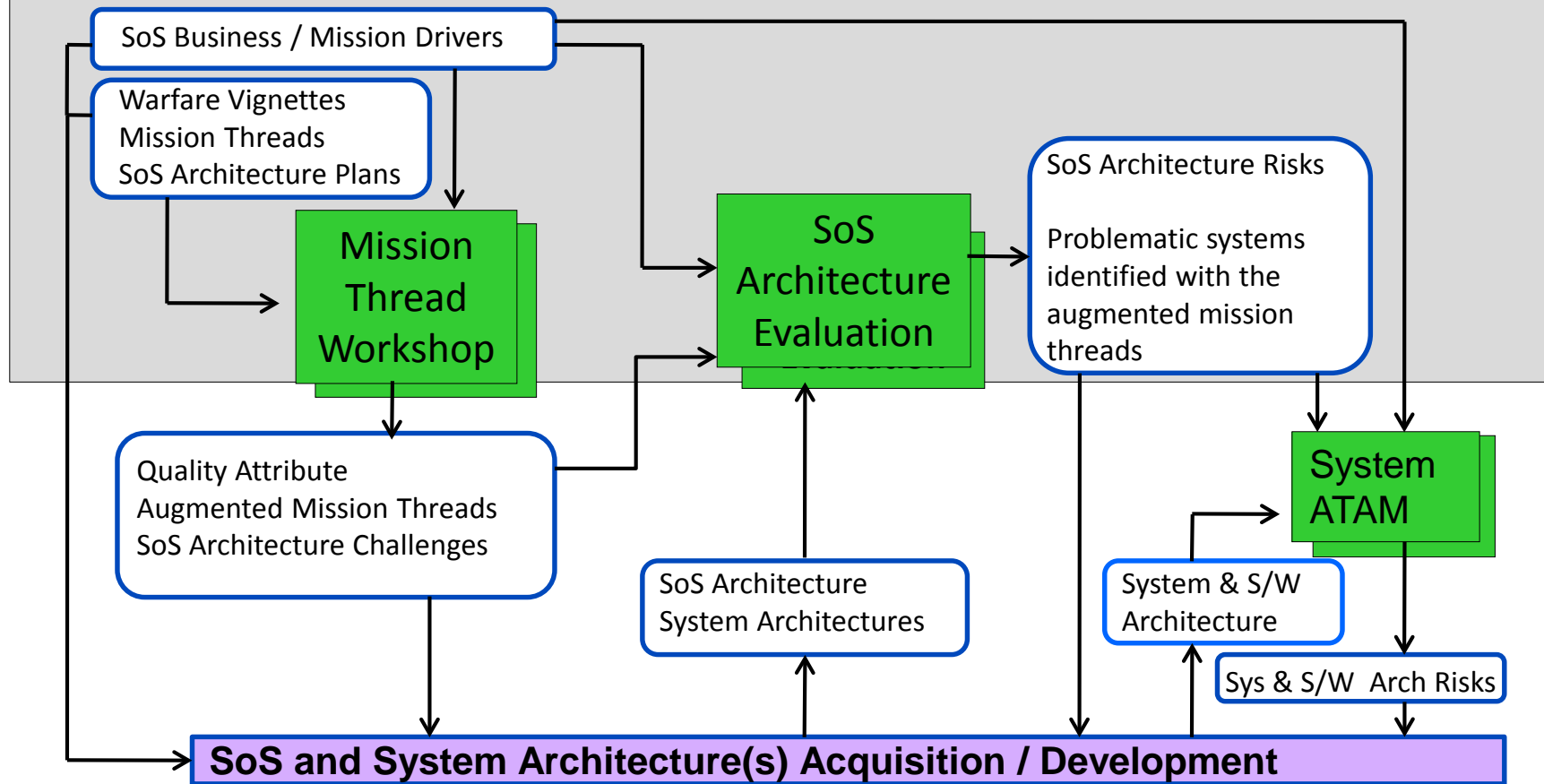


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SoS Architecture Quality Attribute Specification and Evaluation Approach

- Early elicitation of quality attribute considerations
- Early identification and addressing of architecture challenges
- Early identification and mitigation of architectural risks



Contact Information

Tim Morrow

Senior Member of the Technical Staff

Software Solutions Division

Email: tbm@sei.cmu.edu

Web

www.sei.cmu.edu/architecture

www.sei.cmu.edu/contact.cfm

U.S. Mail

Software Engineering Institute

Customer Relations

4500 Fifth Avenue

Pittsburgh, PA 15213-2612

USA

Customer Relations

Email: info@sei.cmu.edu

Telephone: +1 412-268-5800

SEI Phone: +1 412-268-5800

SEI Fax: +1 412-268-6257



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