ISG ZSM PoC Proposal: Agent-based Fault Management on Slicing Packet Networking

1 PoC Project Details

1.1 PoC Project

PoC Number:	21
PoC Project Name:	Agent-based fault management on Slicing Packet Networking (SPN)
PoC Project Host:	Huawei
Short Description:	This PoC Project will demonstrate the fault management including fault detection, analysis, resolution through multi-agent collaboration, the whole process of fault management not only within single-domain but also cross-domain. The PoC aims to demonstrate: 1) How agents collaborate within the ZSM framework, which supports agent capability registration and discovery, task assignment and collaboration. 2) Summarizing a human-readable fault resolution report, including the root cause, repair recommendations, and resolution status. 3) Trustworthiness focus - Visualization of the whole process including collaboration of multiple agents. The implementation of the solution of this PoC complies with the ZSM standards. The design architecture of the use case follows GS ZSM 002 (ZSM Framework) [1], and uses the multi-agent systems in GS ZSM 022 [2].

1.2 PoC Team Members

	Organisation name	ISG ZSM participant (yes/no)	Contact (Email)	PoC Point of Contact (*)	Role (**)	PoC Components
1	China Mobile	Yes	chenxin@gd.chinamobile.com zhangxiaofeng@gd.chinamobile.com liuxudong2@gd.chinamobile.com		Network Operator	-Use case definitions -Implementation of multi-agent coordination center, E2ES MD Agent
2	Huawei	Yes	yuan.xie@huawei.com; Guofei@huawei.com;	X	Network Supplier	-Design of the Functional Blocks -Implementation of the specific algorithms -Provide hardware and software on MD Agent
3	China Academy of Information and Communications Technology (CAICT)	Yes	majunfeng@caict.ac.cn liuzhiruo@caict.ac.cn		Research Institute	- Use case definitions -Business model definitions

All PoC Team members listed above declare that the information in this proposal is conformant to their plans at this date and commit to inform ETSI timely in case of changes in the PoC Team, scope or timeline.

1.3 PoC Project Scope

1.3.1 PoC Topics

PoC topics identified in this clause need to be taken for the PoC topic List identified by ISG ZSM and publicly available in the ZSM WIKI. PoC teams addressing these topics commit to submit the expected contributions in a timely manner.

PoC Topic Code	PoC Topic Description	Related WI	Expected Contribution	Target Date
Topic 5 Agent-based Autonomy	Agent-based Cross Domain fault management	ZSM-022	Use case definitions, story line description, reference Architecture for this PoC. Design of functional blocks. Development and provision of business model definitions and the model of algorithms. Processing procedures (including agent capability registration and discovery, agent team formation, task assignment and collaboration.).	Sep 2026

1.3.2 Other topics in scope

Further topics can be found below for which the PoC plans to provide input/feedback to the ISG ZSM.

PoC Topic Description	Related WI	Expected Contribution	Target Date

1.4 PoC Project Milestones

PoC Milestone	Milestone description	Target Date	Additional Info
P.S	PoC Proposal submission	Jun 2026	Official PoC proposal submission.
P.D	PoC Demo	Sep 2026 (ZSM#36)	Demonstrate how the E2E SMD agent and MD agents collaborate within the ZSM framework, to solve issues and potential risks on SPN.
P.PU	Contribution on lessons learned from Demo	Oct 2026	Collect feedback about Demo and lessons learned about the PoC, and to make improvements.
P.R1	PoC Report completed	Dec 2026	Final draft of the PoC report.
P.R2	PoC Report feedback considered	Dec 2026	Feedback of the PoC report considered.
P.E	PoC Project End	Dec 2026	

NOTE: Milestones need to be entered in chronological order.

1.5 PoC Demonstration Plan

This PoC will be initiated in ZSM#35 in June 2026. There should be a discussion and collection of suggestions on this. The plan is to present 1 Demo, which is in the ZSM#36 meeting in September 2026. The target of the completion date for the PoC is December 2026. We will look for further opportunities to give presentations at meetings related to the topic of Network Autonomous, e.g. AN-MSDO, etc.

Huawei, as a network supplier, will provide computing hardware, network equipment and corresponding software for the Domain Agent implementation. China Mobile Guangdong, as an operator, will provide computing hardware, network equipment and corresponding software for the E2ES MD Agent implementation and multi-agent coordination mechanism. The PoC demo will be presented in the form of video clips.

2 PoC Technical Details

2.1 PoC Overview

2.1.1 Use case description

This PoC will demonstrate how multiple agents collaborate within the ZSM framework, which supports agent capability registration and discovery, agent team formation, task assignment and collaboration. The scenario focuses on the escalation of a fault detected in one MD, leading to the formation of a cross-domain investigation team of agents led by the E2E SMD agent to resolve the issue.

The actors for this use case include Transport MD agent (MD Agent in figure 1) which can detect faults, perform analysis for demarcation and localization by leveraging network status information, and execute self-remediation that can be repaired within their respective domain, while the E2ES MD agent (E2E Agent in figure 1) which coordinates activities across multiple MDs and forms teams for complex, cross-domain issue resolutions.

The first step is the MD agent detects a fault or potential risk based on its continuously monitoring of network and environment status. It initiates fault analysis and determines that the root cause originates within its own domain. In some cases, for example, single unidirectional link failure, it performs automated diagnostics, and self-repaired locally, and reports to the E2E agent aims for traceability and explainability. In other cases, for example, fibre attenuation nearing end-of-life (EOL) levels. The MD agent identifies these resolutions require on-site repair or E2E Agent's instruction, it reports the E2E Agent with the fault details and repair recommendations. The E2E agent then authorizes MD agent to execute repair actions or reports these recommendations to guide on-site engineers in accurately resolving the fault.

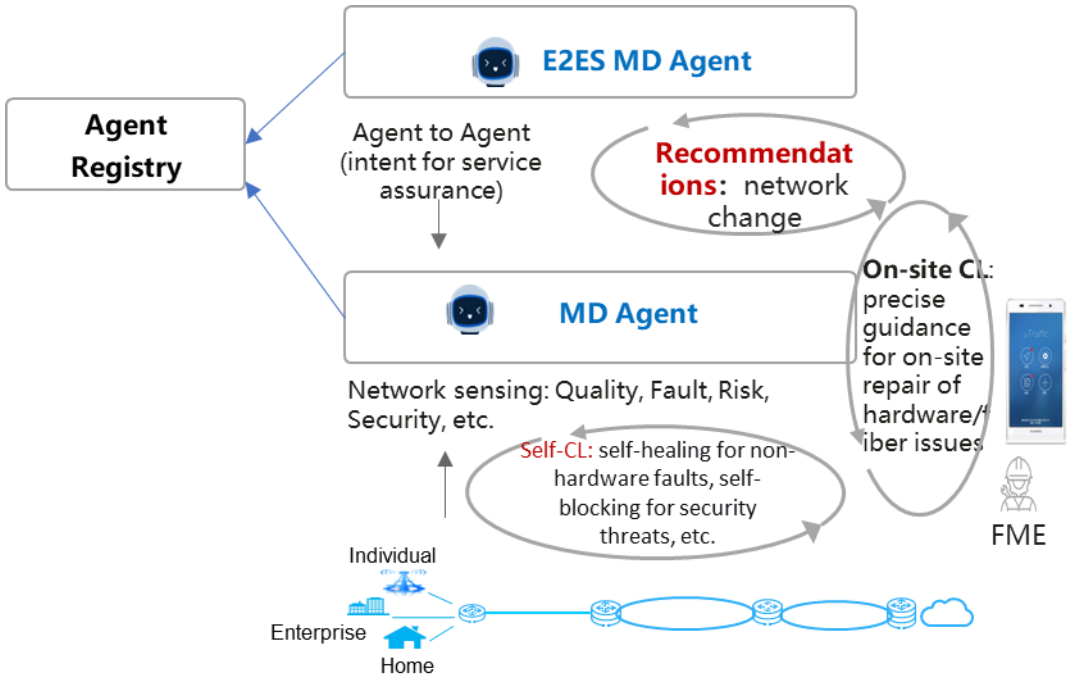

Figure 1 Agents collaboration for SPN fault management

2.1.2 PoC scope

This PoC demonstrates how multiple agents collaborate within the ZSM framework.

The detailed use case is as follows:

1) Capability Registration: The MD agent registers/publishes capabilities to the Agent Registry. This MD agent can be discovered by the E2ES MD agent since the E2ES MD agent subscribes Agent Discovery Service.

2) Fault Detection by one MD agent: The fault agent of a MD, aware of the network degradation affecting its domain. After analysing the root cause, the agent determines that the root can be self-repaired or the decision-making needed to be escalated.

3) Capability Discovery and Escalation: The agent from the MD that has the fault queries the Agent Discovery Service to discover agents capable of handling cross-domain issues. It then identifies a E2ES MD agent (E2E agent) as having the necessary coordination and investigation capabilities. The MD agent escalates the task to the E2ES MD agent, providing detailed fault description and repair recommendations.

4) The E2ES MD cross-domain agent receives the escalation task with several repair recommendations (e.g., requires network expansion). It authorizes MD agent to execute repair actions.

2.2 PoC Architecture

This PoC will use the Multi-Agent Systems (MAS) defined in GS ZSM-022 [2]. Figure 1 illustrates the architecture of the ZSM framework, focusing on the integration of agents across multiple management domains (MDs) and the role of cross-domain communication. It highlights how agents operate within individual domains and collaborate across domains to achieve end-to-end service automation. The figure also highlights the use of “Agent Registry”, where agents can register their capabilities. This registry facilitates capability discovery by enabling agents to identify and interact with neighbouring agents, allowing for efficient collaboration across domains.

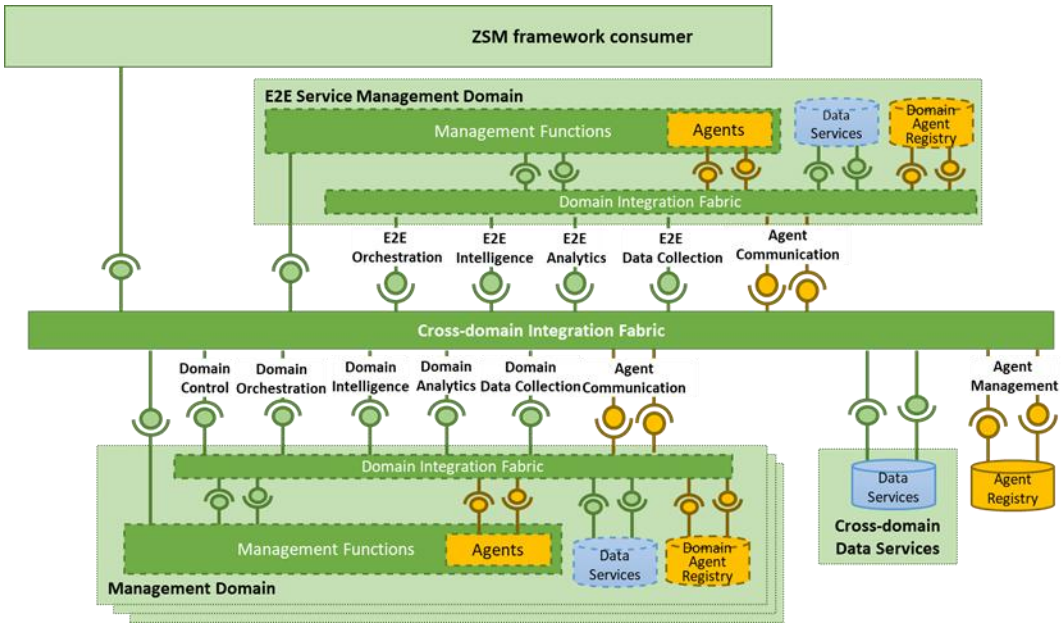

Figure 2 Agents in the ZSM Framework

2.3 Additional information

The references used throughout this document are listed below.

[1] ETSI GS ZSM 002: "Zero-touch Network and Service Management (ZSM); Reference Architecture".

[2] ETSI GR ZSM 022: "Zero-touch Network and Service Management (ZSM); Architectural Enhancements for Agent-based Network and Service Management".