

June 22-24

2010

SANTA ANITA
★ 15TH ICCRTS ★
THE EVOLUTION OF C2
WHERE HAVE WE BEEN? ★ WHERE ARE WE GOING?
2010

A Lightweight C2 Service Invocation Method Based on HTTP Proxy

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Outline

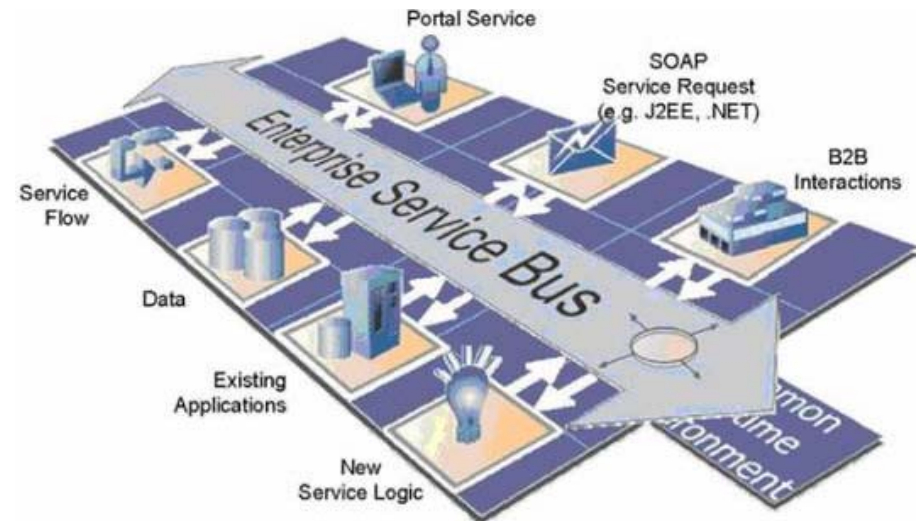
- ◆ **Background & Motivation**
- ◆ **Service-Oriented C2 Software Architecture**
- ◆ **Our Proposed Method**
- ◆ **Experiments**



Background & Motivation

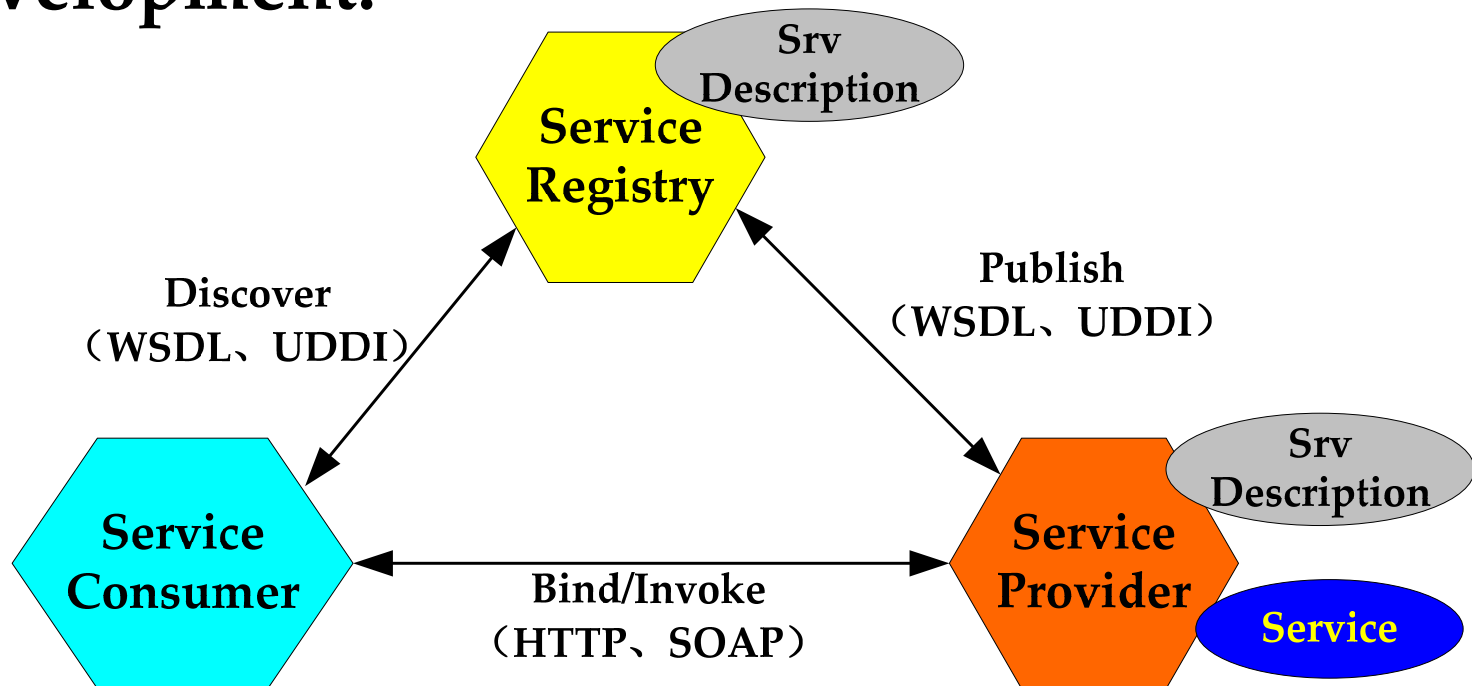
Background & Motivation

- ❖ **SOA (Service-Oriented Architecture)** is an architectural approach and methodology that builds on the concept of **services**.



Background & Motivation

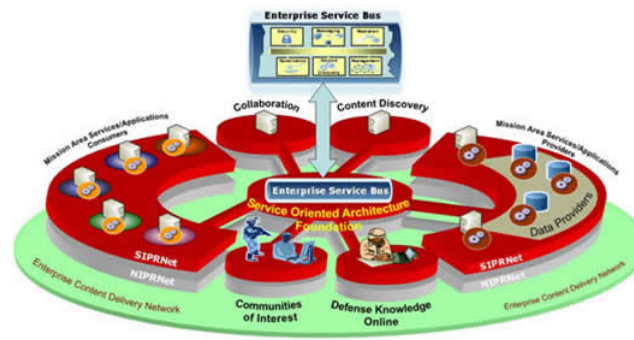
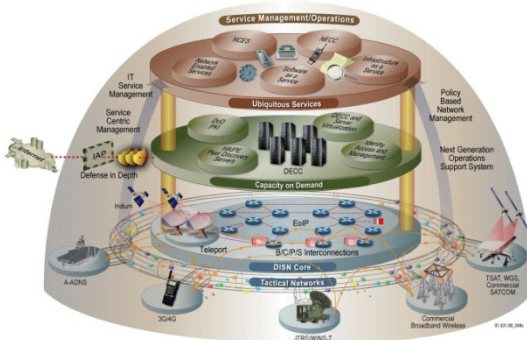
- ❖ **Web services** (SOAP, WSDL, UDDI, ...) are a set of open standards that will lead to widespread adoption of SOAs and serve as the basis for a new generation of service oriented development.



Background & Motivation

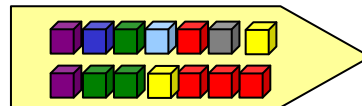
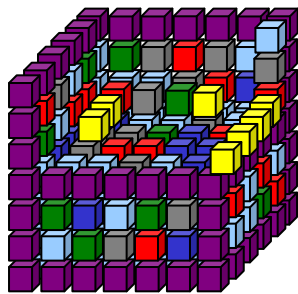
❖ **SOA** and **Web Services** technologies have been increasingly applied to military fields.

- GIG/NCES
- FORCENET, FCS, JBI
- *Command and Control domain: NECC*
- ...

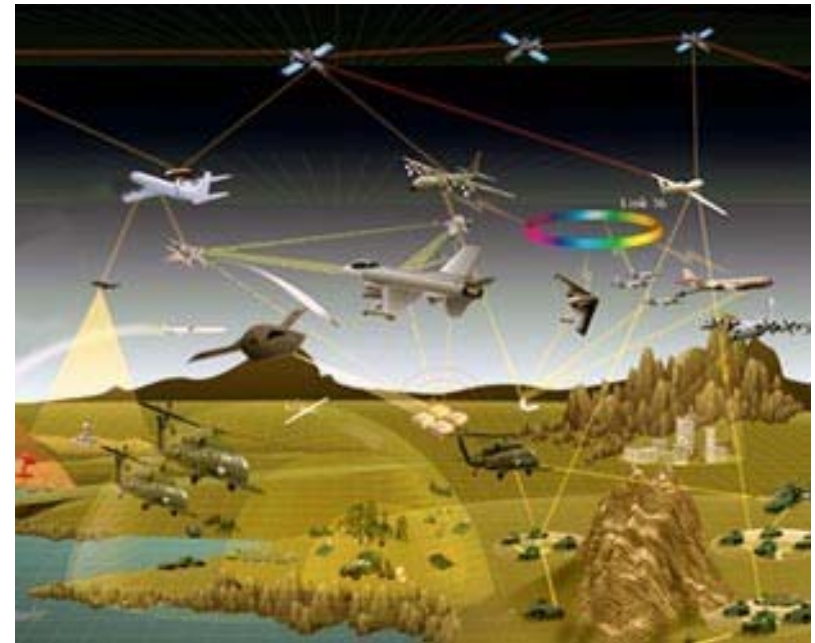


Background & Motivation

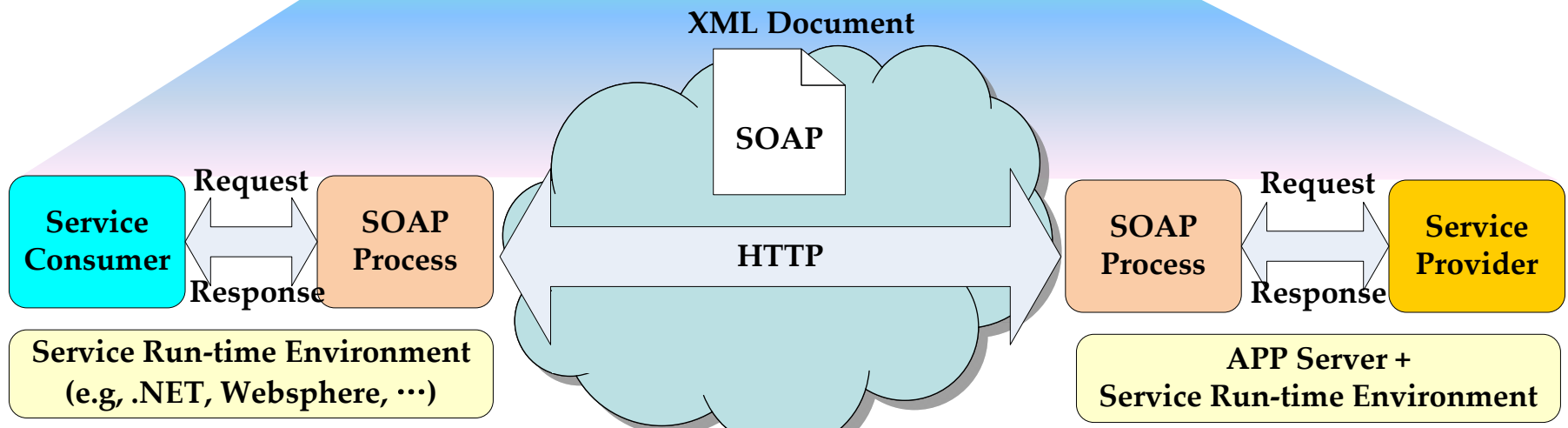
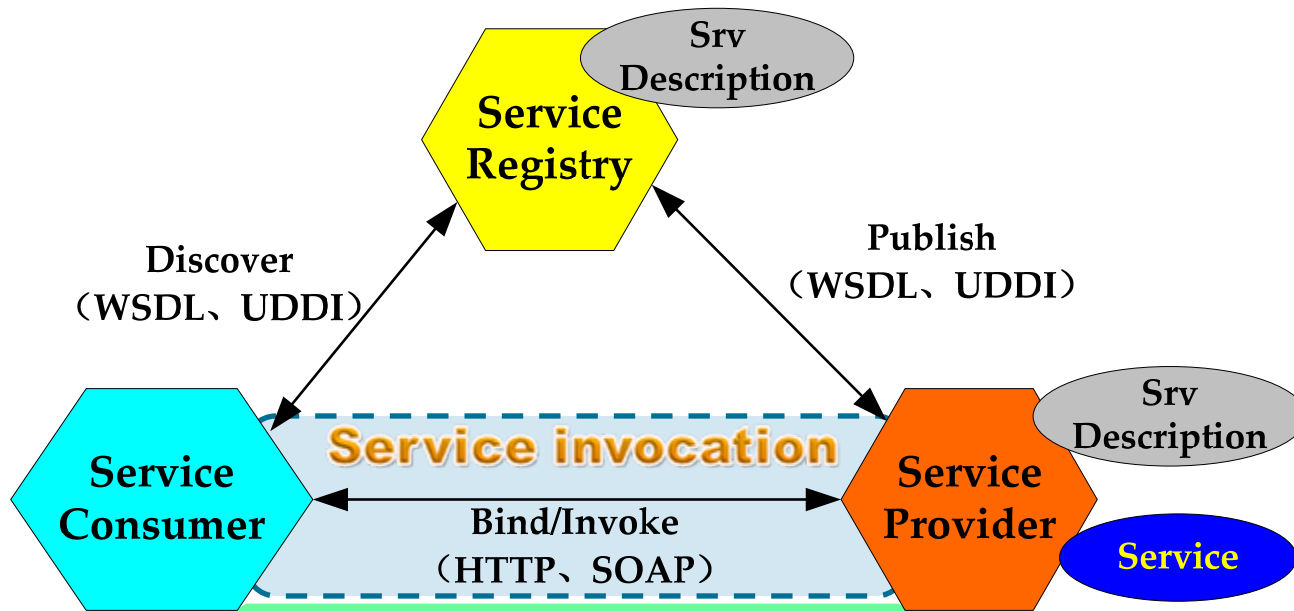
- ❖ In service-oriented C2 systems, software and capability of C2 systems often are wrapped **web services** (or other style services) so as to implement C2 function and information exchanging through service invocation.



C2 Capabilities as web services

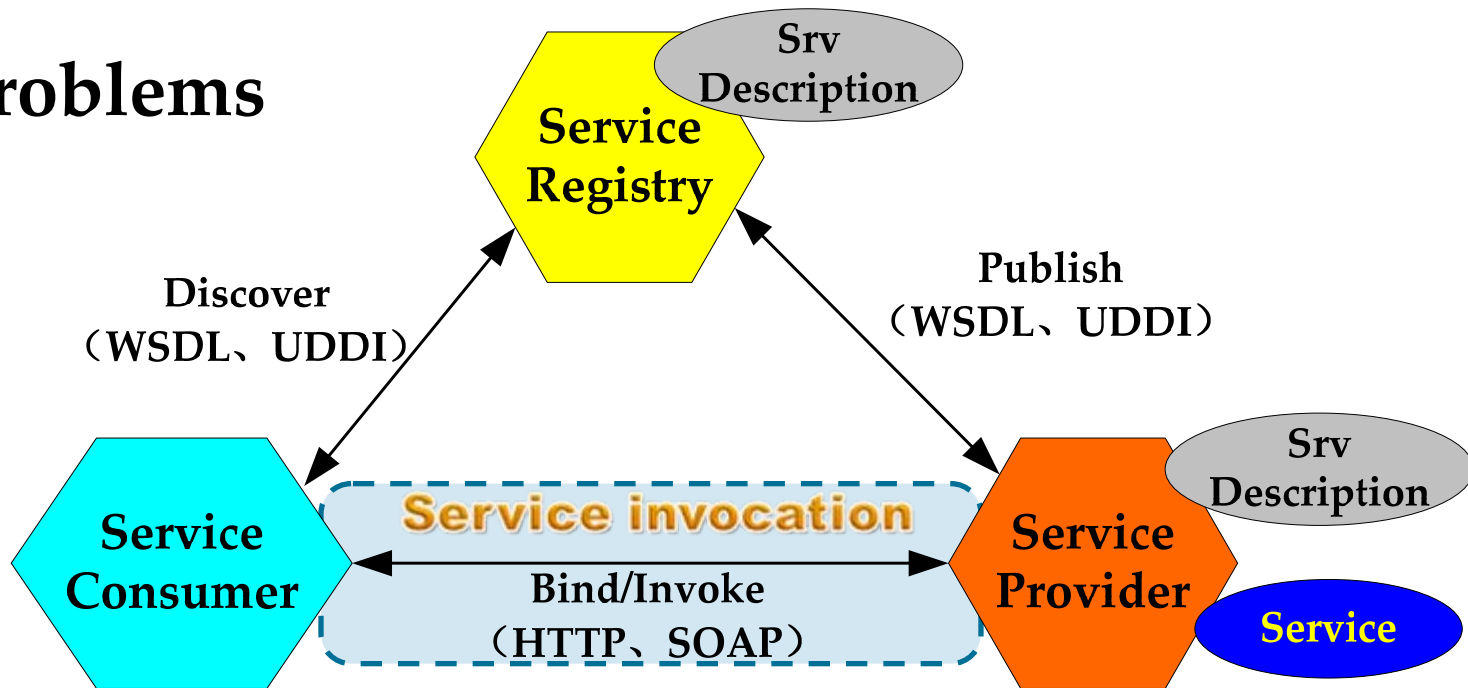


Background & Motivation



Background & Motivation

❖ Problems



- ◆ unauthorized access
 - ◆ interpolated
 - ◆ intercepted
- SOAP**
- ◆ XML efficiency
 - ◆ security of HTTP

Background & Motivation

❖ Our work

- Proposed a service-oriented C2 software architecture
- Proposed a lightweight service invocation method based on HTTP proxy



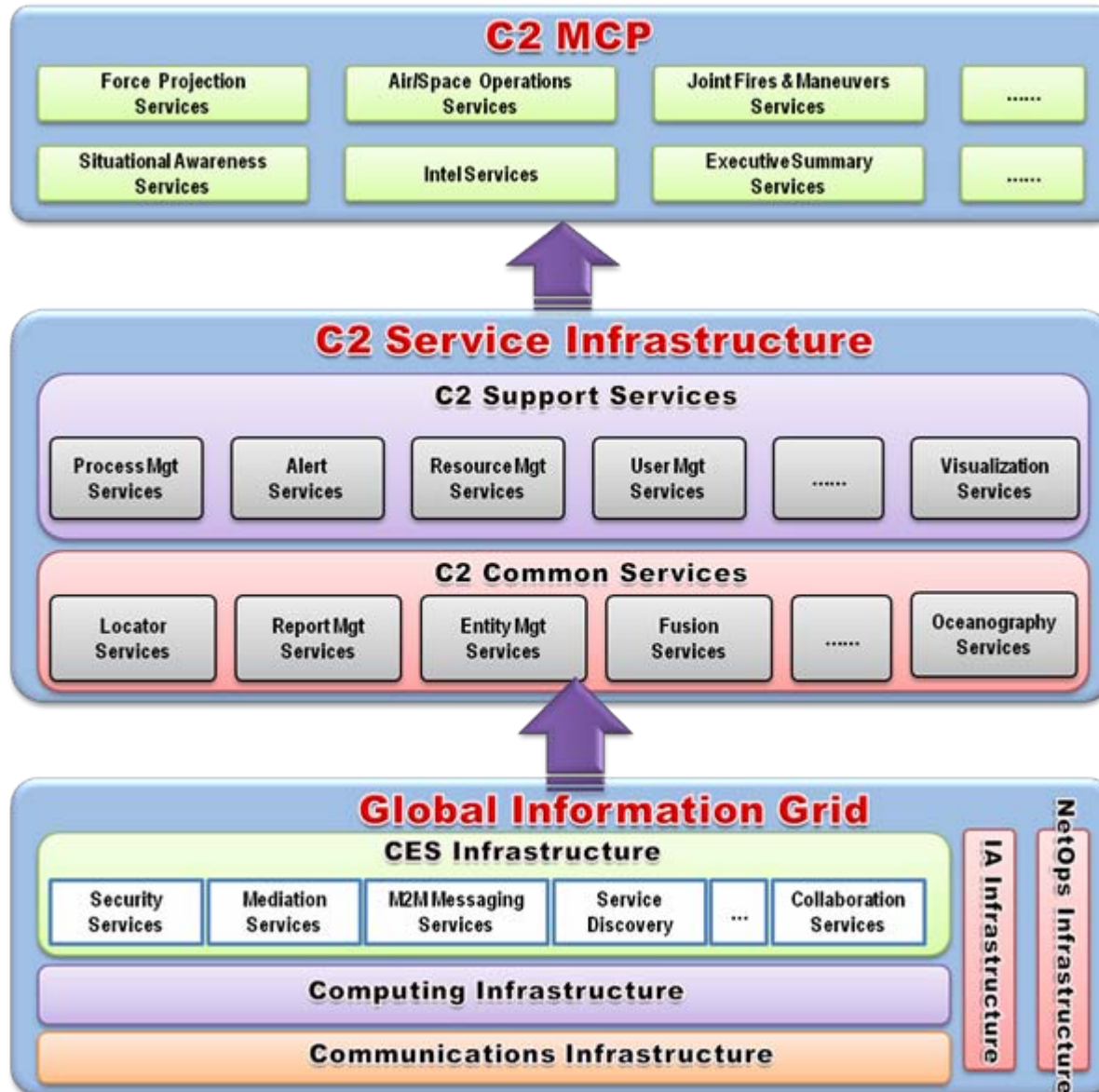
Service-Oriented C2 Software Architecture

Service-Oriented C2 Software Architecture

❖ Service-Oriented C2 Software Architecture (SO-C2SA)

- "service" as the granularity of the C2 software architecture
- unified description mechanism
- summarize elements of domain software and the correlation between the elements
- achieve service combination and orchestration based on process approach
- the mission capability packages (MCP) for the carrier of service capability

Service-Oriented C2 Software Architecture

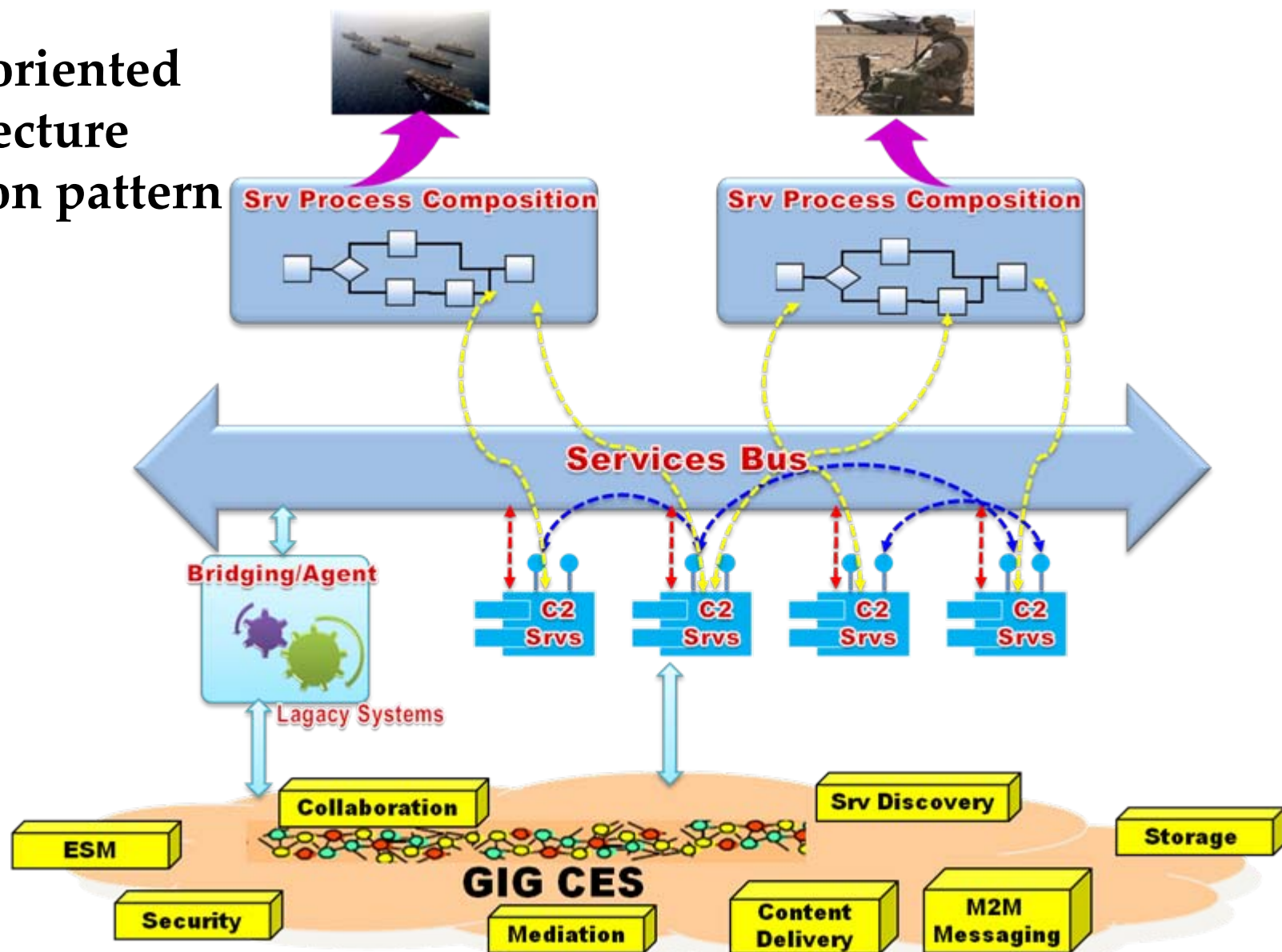


Service-Oriented C2 Software Architecture

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Mission-oriented C2 architecture application pattern



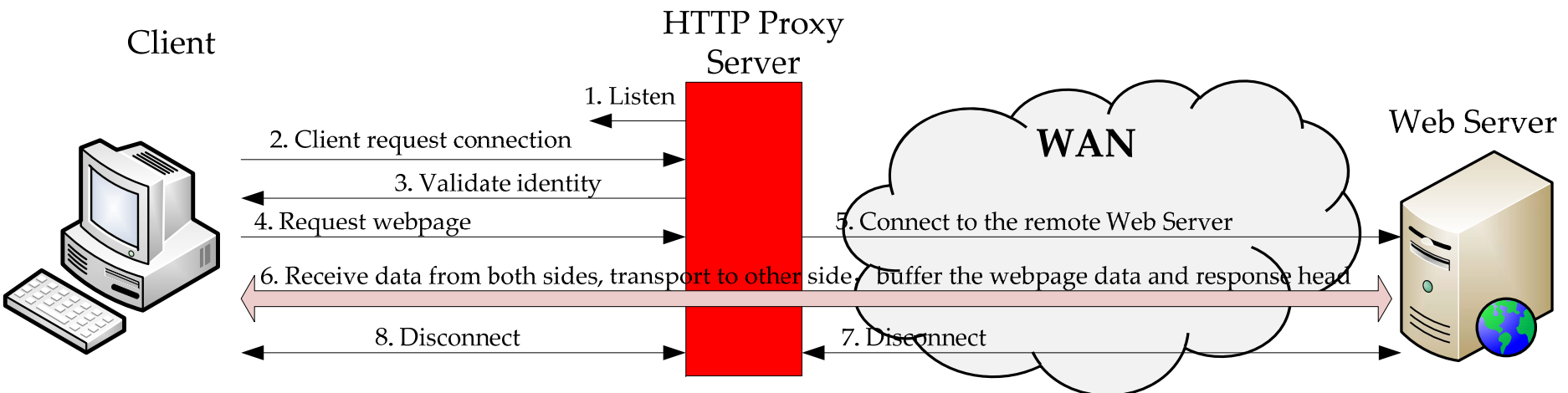


Our Proposed Method

Our Proposed Method

❖ Our basic idea

- based on the principle of **HTTP proxy**
- In HTTP proxy, as an application-level gateway, the proxy server plays the role of the bridge between the client and the server.



Our Proposed Method

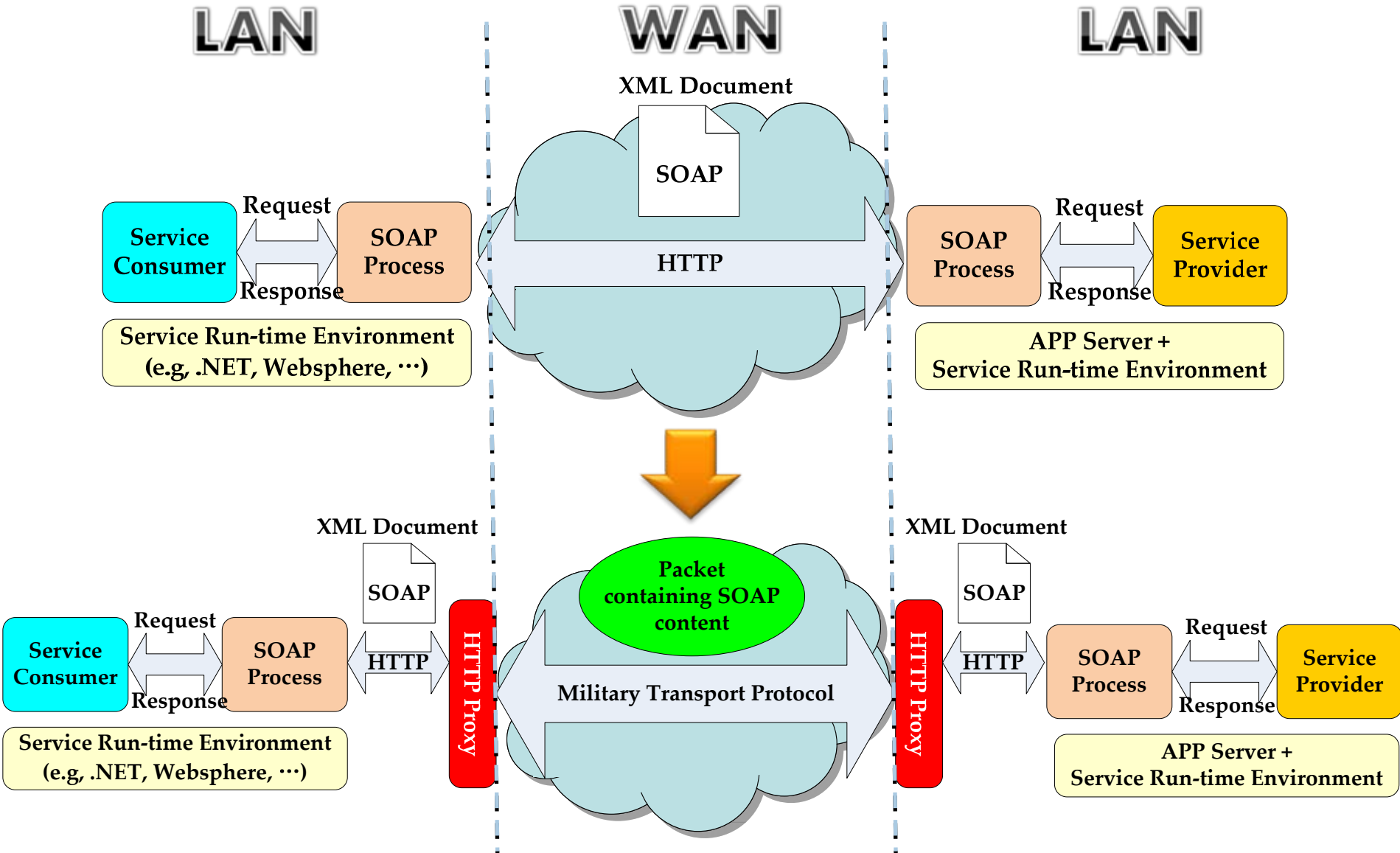
- ❖ Our basic idea --- **Prerequisite**
 - **LAN environment is secure**, and allowed to use some open or standard transport protocols such as HTTP
 - use military transport protocols for messaging in **WAN environment**.

Our Proposed Method

❖ Our basic idea

- in LAN, standard Web Services are used to messaging, i.e., SOAP via HTTP
- deploy HTTP proxy software at the boundary of the LAN to intercept HTTP packets
- The SOAP message in the HTTP packets is delivered in the WAN via the military transport protocol
- At the receiver end, the same HTTP proxy is used to convert and restore standard invocation way (i.e., SOAP via HTTP) in LAN

Our Proposed Method

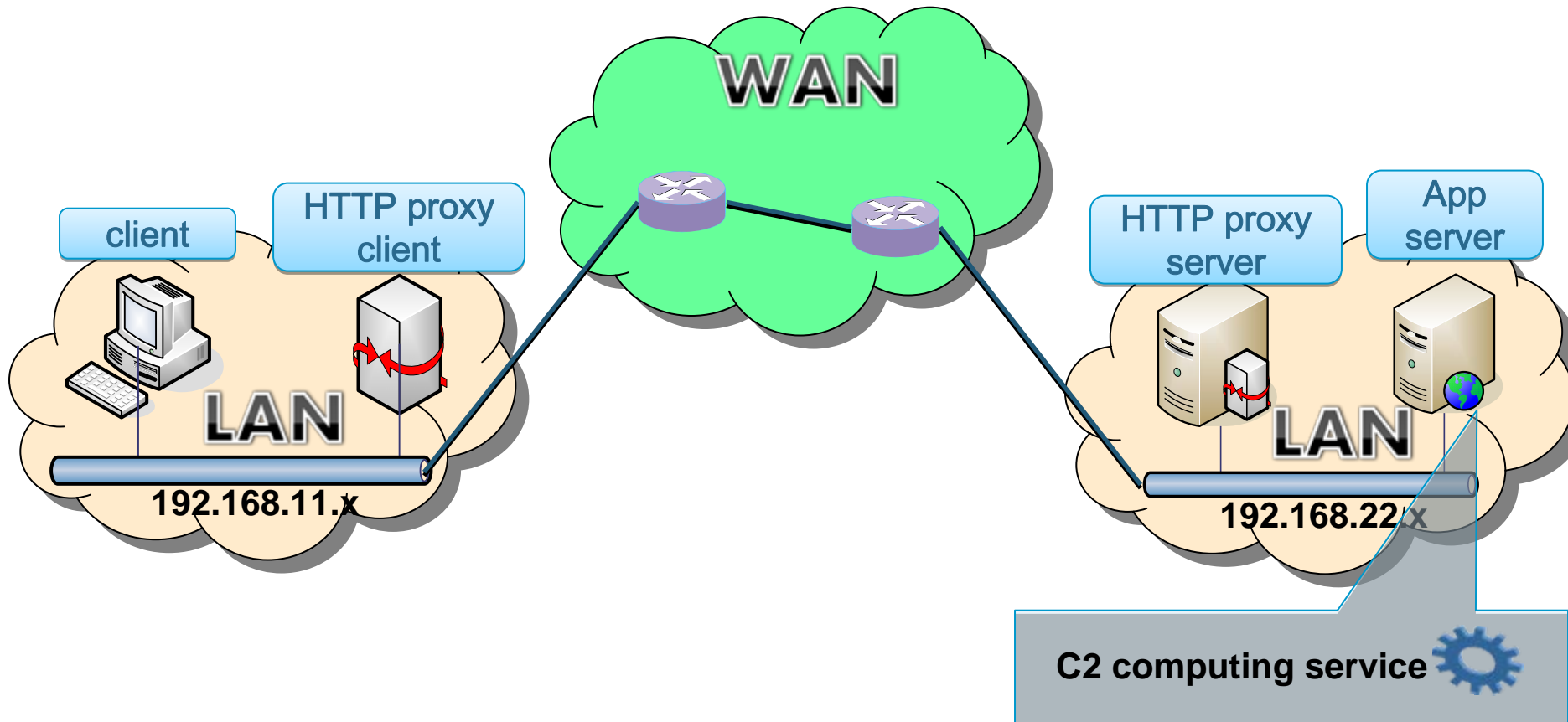




Experiments

Experiments

❖ Experiments environment

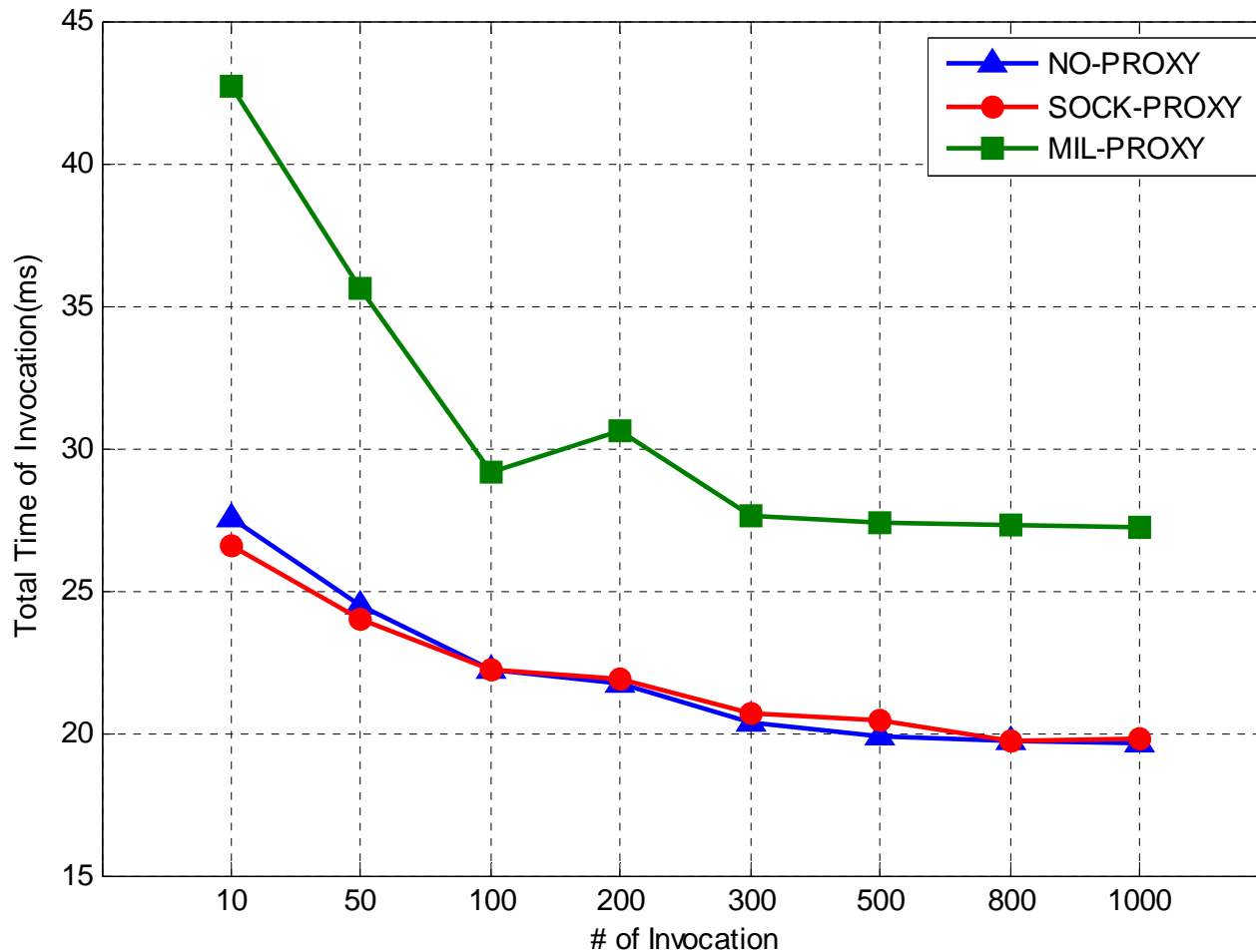


❖ Compared methods

- C2 service invocation not using HTTP proxy
(NO_PROXY)
- Based on HTTP proxy, messaging between two HTTP proxies is implemented by using Socket
(SOCK_PROXY)
- Based on HTTP proxy, messaging between two HTTP proxies is implemented by using military transport protocol
(MIL_PROXY)

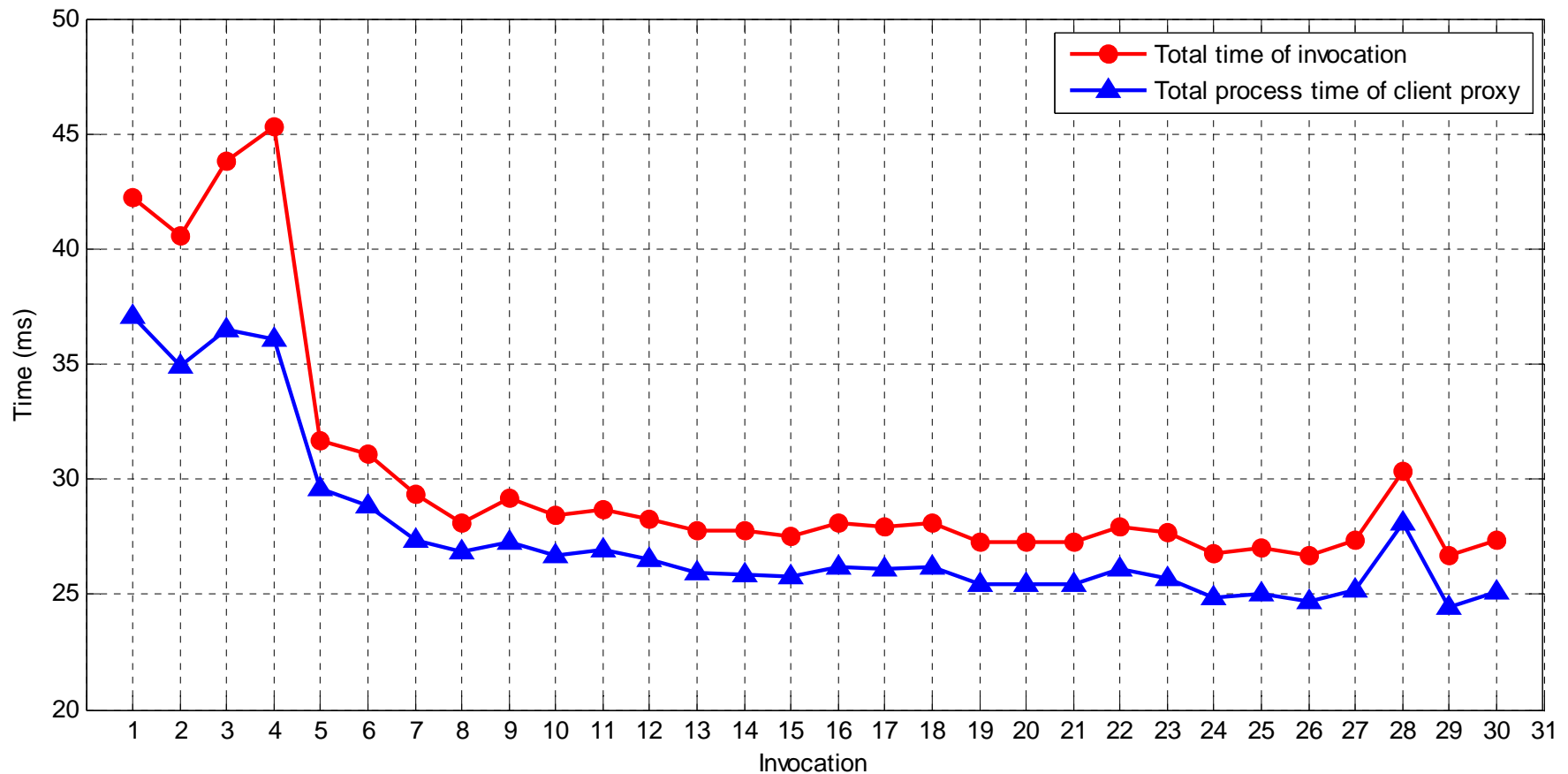
Experiments

❖ Experiment 1: the total time of invocation



Experiments

❖ Experiment 2: the time in MIL_PROXY mode



Experiments

❖ Experiment 3: the quantity of data

		NO_PROXY	SOCK_PROXY	MIL_PROXY
Client	The size of request packet (1st)	407	407	474
	The size of request packet (2nd)	305	305	352
APP Server	The size of request packet (1st)	25	25	66
	The size of request packet (2nd)	572	572	617

❖ Our proposed method

- Simple
- Effective
- Feasible
- Meet the security and real-time requirements in military environment

Thank You !