Functional Architecture of the NODS Fault Tolerance Framework

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Abstract

This paper presents the NODS fault tolerance framework. It encompasses the framework itself and a definition of fault tolerance level. Depending on the required fault tolerance level, different elements of the framework will be integrated to the target application. Two main kinds of architectures are identified and described. In the resulting architectures, fault tolerance of the framework itself is also provided.

Keywords: Fault Tolerance, Fault Tolerance Level, Customization, Functional Architecture

1 Introduction

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¹concern and aspect are interchangeable in this context.
2 Fault tolerance expression

\begin{itemize}
  \item $M_{ij} : b_i$
  \item $U_{ij} : b_i$
  \item $S_{ij} : b_i$
  \item $N_{ij} : b_i$
\end{itemize}

soulation  \hspace{1cm} ,

\begin{itemize}
  \item $\text{Def. 1} \quad F \not\in F_d \Rightarrow F_j \not\in F_j$
\end{itemize}

\hspace{1cm} \text{Def. 2} \quad F \not\in F_d \Rightarrow F_j \not\in F_j$

\hspace{1cm} \text{Def. 3} \quad F \not\in F_d \Rightarrow F_j \not\in F_j$

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3. Operational faults are ones which appear during the system life and are caused due to physical reason[7].

4. Users may be another system or a human being.
Definition 2  \( FT(S) = \{ < f, l > | d \}
\]
\( l \in \{ \text{nothing, signaling, unmasking, masking}\} \)
\( i, j \}
\( d \in \{ \text{nothing, unmasking, masking}\} \)
\( i \neq f_j \).

\[
FT(S) = \{ < \text{Byzantine, nothing} >, < \text{Value, nothing} >, < \text{Late timing, unmasking} >, < \text{Omission, masking} >, < \text{Crash, masking} > \}
\]

3  NODS fault tolerance framework architecture
3.1 Architecture for levels without replication

(a) Levels requiring only signaling form

- Sensor: Sensor
- Monitor: Monitor
- Notifier: Notifier

(b) Levels requiring at least one unmasking form

- Sensor: Sensor
- Monitor: Monitor
- Notifier: Notifier

one instance for each type of fault of concern

one instance for each type of fault of concern
3.2 Architecture for levels with repl cat on

Without making from viable ad antin fault

Sensor Monitor Notifier

diagnosisInfo() analyze() signalsFault() notifiesFault() recover()

3: 4

With: Sensord Monitor: Sensord Monitor: Sensord Monitor: Sensord Monitor:

• Sensor Monitor: Sensord Monitor: Sensord Monitor: Sensord Monitor:
- Notifier: Monitor

- Replication Framework & Binding objects: Replication Framework

- Fault tolerance level manage (FT Manager): Monitor

With making from value add antia fault Monitoring
3.3 Fault tolerance of elements in the NODS fault tolerance framework

- FT elements
- Notifier
- Monitor
- Sensor

FTL Manager

Replication Framework

FTL Manager

Replication Framework
3.4 Final framework architectures

(a) Masking crashes for added elements

(b) Masking all types of faults for added elements

Related work
5 Conclusion

We...
References


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