Problem 7

7.1. Suggestion for Improving Architecture Description

The evaluation on Nginx Architecture Description is based on “Question Framework for Architectural Description Quality Evaluation”[1]. The evaluation is scored for 10 where suggestion is provided with reasoning where there is a score gap and in case of perfect scores the reason for the score is explained in the Reason/Suggestion section.

| S.No | Criteria | Questions/ Metrics | Score(on 10) | Reason/ Suggestion |
| --- | --- | --- | --- | --- |
| 1 | Stakeholders | Are the stakeholders of the description defined and who are they? | 10 | The stakeholders are represented in the architecture diagram along with a detailed description of their routine tasks [2] |
| 2 | Purpose | Is the purpose of the description defined in relation to the stakeholders? | 10 | The description is provided in accordance with the stakeholders tasks. |
| 3 | Suitability for the stakeholders | Does the description provide the stakeholder with the desired knowledge?  Does the description answer/correspond to the objective of stakeholder?  Does the description relate to problem?  Is a practical reason for the information evident? Is the information presented from the stakeholders’ point of view? | 8 | The description provides knowledge, addresses the objectives and is presented in the point of view of the stakeholder. However, there is a gap in providing performance metrics, benchmarks, or comparison studies that demonstrate Nginx's capabilities in addressing concerns related to scalability, throughput, response times, or resource utilization. This data can help stakeholders assess the suitability of Nginx for their specific use cases. |
| 4 | Usage | Frequency of use: How frequently the description is used or referenced.  Number of users: The approximate number of personnel who will likely want or need to use the description. Variety of users: The variety of different functional areas or skill levels of personnel who will likely use the description. Impact of non-use: The level of adverse impact that is likely to occur if the description is not used properly | 7 | The description provides no clarity in addressing the concerns of the stakeholders, improving the efficiency, reducing the costs, enhancing the security, or simplifying their workflows. |

**Table 1** Evaluation question framework for the stakeholder and purpose orientation

| S.No | Criteria | Questions/ Metrics | Score(on 10) | Reason/ Suggestion |
| --- | --- | --- | --- | --- |
| 1 | Scope and focus | Scope: Is it defined what part of reality will be described (e.g. only primary processes)?  Aspects: Is it defined what aspects will be described?  The level of detail: Is it defined what level of detail will be described? | 8 | The clarity on scope of the description is vague. For example, the level of detail on the functionalities such as Load balancing, fault tolerance, performance scalability are abstract. |
| 2 | Currency of EA description | 1. Does the information reflect the current enterprise?  2. Were any changes made in the EA after the EA description has been produced?  3. Number and scope of architectural effects having projects carried out after the EA description have been produced 4. Number and scope of architecture changes made after EA description has been produced  5. Degree with which the current version of the description is up to date (Percentage, subjective evaluation)  6. How long is it since the previous updating of the description? | 10 | There are timely updates on documentation, release notes and change logs. The community engagement is active with prioritized considerations of insights and updates from the communities. |
| 3 | Currency of SA description | 1.Does the information reflect the system?  2. Have there been any changes in the system after the architecture description was produced?  3. How long is it from the previous updating? | 9 | The release notes and change logs provide detailed information about the changes made in the system, features added and performance enhancements. Version compatibility is maintained as a cross reference to the architecture description. The frequency of the update is in sync with the development process. However, the details of the performance and scalability testing or comparison with the previous versions after the changes were not presented in the release documents[3]. |
| 4 | Correctness of Information | Verification of information: Is the information included in the description verified?  Are there any incorrect arguments, or in-accurate or untrue reasoning? | 10 | The reasoning provided are cross-referenced with other relevant document sources, feedback of Nginx experts are obtained, as the project progresses, regular reviews and updates on the architecture description to reflect any changes, updates, or lessons learned from implementation and operational experiences are performed. |
| 5 | Correctness of EA | ‘‘Substantive’’ errors/deficiencies after the EA description has been released: Are there ‘‘substantive’’ errors/deficiencies? The number of ‘‘substantive’’ errors/deficiencies found (e.g. the number and type of change request applied to EA principles)? | 10 | The releases indicates substantive errors/deficiencies in the description[2] |
| 6 | Correctness of SA | Correctness for stakeholders: Does the description present correctly the needs and concerns of stakeholders?  Correctness of solution: Does the description define correctly an architecture that will meet stakeholder’s needs? | 10 | The description meets the criteria of correctness of the stakeholders and correctness of the solution[3]. |
| 7 | EA completeness | EA’s coverage of business areas: The degree to which EA description addresses needs of each business area (e.g. subjective evaluation score 1–10) | 9 | The EA description includes understanding the unique requirements, strategic goals and key performance indicators (KPIs). However, clarity on dependencies on technology infrastructure is quite ambiguous[2]. Clarity on this aspect would increase the quality of the description. |
| 8 | Sufficiency/ completeness | Description’s coverage of required viewpoints: The degree to which description addresses each required architectural viewpoint (e.g. subjective evaluation score 1–10). Sufficient amount of information: Is the all required information included in the description? Are all topics relating to stakeholder’s objectives and concerns covered, and only those topics?  Is information repeated only when needed?  Does the description contain irrelevant or superfluous elements?  Sufficient level of detail: Has each topic has just the detail that stakeholder needs? | 10 | The description addresses identifying the view points, mapping the architecture to the viewpoint, identifying the gaps, expanding the coverage, collaboration with stakeholders with iterative review and improvements. |
| 9 | Consistency | Are views presenting different viewpoints in the description consistent with each other? | 10 | The viewpoints, dependencies and information presented in the document are consistent with each other. |

**Table 2** Evaluation question framework for the content

| S.No | Criteria | Questions/ Metrics | Score(on 10) | Reason/ Suggestion |
| --- | --- | --- | --- | --- |
| 1 | Conformance to corporate standards | Does the presentation of the description conform to the corporate standards (if any) for such documents? | 10 | The description meets the criteria of general guidelines that are often considered when presenting architecture descriptions. |
| 2 | Intuitiveness of the presentation | Does the description have an intuitive structure for the stakeholder?  What is this intuitive structure? Does the description correspond to it? Is the recipient familiar with the structures used? | 9 | The description meets the criteria of Intuitiveness of the presentation except for the future roadmap which outlines the upcoming upgrades for the architecture. |
| 3 | Definition of the notation and structures | Does the description use a defined notation?  Is the notation/structure of the description explained?  Is stakeholder familiar with notation? | 8 | The Nginx architecture documentation typically uses a combination of text, diagrams, and sometimes code snippets to describe the architecture and its components.The familiarity of stakeholders with the notation used will vary depending on their background, experience, and level of familiarity with architectural documentation. Technical stakeholders, such as developers or system administrators, may have a higher likelihood of being familiar with the notations commonly used in architectural descriptions. However, it's important to consider the audience and ensure that the notation and structure of the description are explained clearly and comprehensively to accommodate stakeholders who may be less familiar with technical notations. |
| 4 | Clarity of the vocabulary and concepts | Are the terms and concepts used known by the stakeholder?  Are the terms used defined? Are the (new) concepts defined and explained?  Are the names of elements descriptive?  Are all of the description’s elements defined so that their meanings, roles, and mapping to the real world are all clear and not open to different interpretations? | 10 | The description meets the criteria of Clarity of the vocabulary and concepts. |
| 5 | Information complexity | Is there too much information included in the model?  The number of elements in the model. (Humans are only good at working with models that do not include more than 30 elements.)  The number of types of elements in the model.  The number of relations depicted in the model.  The number and types of concepts.  The number of architectural viewpoints. (Viewpoints reduce complexity). | 10 | There is very elaborate and necessary information with less than 30 elements included for this model. The types of elements and the relations depicted are less and have minimal viewpoints. |
| 6 | Visual complexity | Proximity: Are the related objects placed near to each other in a model?  Continuity: Are there any right angles positioned next to each other? (Right angles should not be positioned next to each other in a model.)  Closure: Are objects symmetric and regular? (This increases readability of models and reduces the perceived complexity.)  Similarity: Are similar objects presented in the similar way? Common fate: Are similar object presented to move or function a similar manner? (People have a tendency to perceive different objects that move or function in a similar manner as a unit.) | 10 | Objects placed near as needed in this model are clear enough to give a proper continuity throughout the flow[2]. |

**Table 3** Evaluation question framework for the presentation and visualization

| S.No | Criteria | Questions/ Metrics | Score(on 10) | Reason/ Suggestion |
| --- | --- | --- | --- | --- |
| 1 | Maintenance of documentation | Ownership:  Are the staffs responsible for the documentation clearly identified and supported?  Maintenance practice:  Is it known how the documentation will be maintained once it has been accepted?  Is the frequency of updating known?  Frequency of updates (number of updates/year or project). Needs for updates (number of architecture changes made in a year, in projects that require documentation update). Maintainability of documentation:  The relative ease or difficulty with which the documentation can be updated, including revision dates and distribution of new versions and the relative ease or difficulty with which the consistency between descriptions can be checked | 10 | The release notes and change logs have clear information about the ownership of the document. Frequency of update is maintained with versioning. The maintainability standard is high with respect to the documentation[3]. |
| 2 | Cost effectiveness | Costs: Time and resources needed to produce or update architecture documentation (required man-days).  Amount of documentation: Number of documents/models. Frequency of documentation updates: Updates/project or updates/year. Needs for updates (number of architecture changes made in (a year, in projects) that require documentation update | 10 | Very frequent releases in order to resolve issues from previous releases, bug fixes, and security updates. This also increases the frequency of documentation by the same amount. |
| 3 | Architectural framework and views | Architecture framework (for EA and for SA):  Is there existing architectural framework?  Is the framework accepted in organisation?  Is the framework used in the EA documentation work? Architectural views: Are the suitable architectural views chosen for the company or for the project?  Are the viewpoints well defined?  A Viewpoint name?  The stakeholders the viewpoint is aimed at?  The concerns the viewpoint addresses?  The language, modelling techniques, or analytical methods to be used in constructing a view based upon the viewpoint? | 10 | The viewpoints are clearly defined with appropriate names in a way stakeholder’s would understand and relate to the use case[3]. |
| 4 | Tools support | Support for organisation’s framework and viewpoints:  Do design tools support the framework and viewpoints that organisation has chosen to use? Do design tools support production of the deliverables required?  Suitability for Stakeholders: Is there ability to represent architecture descriptions (e.g. models and views) in a way meaningful to stakeholders (e.g. to non-technical stakeholders)? Repository for architecture documentation: Is there a repository for storage and dissemination of the captured information? | 10 | Nginx supports the organization's framework, viewpoints and organization's specific requirements and standards.  The centralized documentation repository of Nginx provides a single source of truth, version control, and access control mechanisms. It allows stakeholders to access and review the architecture documentation when needed and ensures the availability of up-to-date information. |

**Table 4** Evaluation question framework for the architecture documentation management

7.2. Suggestion for Improving Architecture

7.2.1 Performance Optimization

1. Architecture can be modified to utilize hardware resources efficiently, such as CPU and memory, by adjusting worker processes, worker connections, and other related settings.
2. Implement caching mechanisms to reduce the load on backend servers and improve response times for static content.
3. Fine-tune load balancing configurations to evenly distribute traffic and optimize resource utilization.
4. Utilize connection pooling to reuse connections and minimize the overhead of establishing new connections.

7.2.2 Security Enhancements

1. A WAF module or a dedicated WAF solution can be integrated to protect against common web application vulnerabilities and attacks.
2. DDoS protection mechanisms, such as rate limiting, request filtering, and IP whitelisting/blacklisting can be implemented to mitigate the impact of distributed denial-of-service attacks.

7.2.2 Monitoring and Logging

1. Monitoring tools can be integrated to track performance metrics, component’s health, and resource utilization in real-time. This enables proactive identification of potential issues and facilitates capacity planning.
2. Detailed logs can be generated to include access logs and error logs, for troubleshooting, security analysis, and auditing purposes. Centralizing and analyzing the logs using log management tools to gain insights into the system's behavior.

References

[1]N. Hämäläinen and J. Markkula, “Question framework for architectural description quality evaluation,” *Software Quality Journal*, vol. 17, no. 2, pp. 215–228, Jan. 2009, doi: <https://doi.org/10.1007/s11219-008-9068-1>.

[2]“Architecture Overview | NGINX Documentation,” *docs.nginx.com*. https://docs.nginx.com/nginx-management-suite/acm/about/architecture/

[3]“NGINX Management Suite | NGINX Documentation,” *docs.nginx.com*. https://docs.nginx.com/nginx-management-suite/.

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