

Design of a Manufacturing System

By

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A Manufacturing System

I. Requirement from user:

We need a completely orchestrated infrastructure that is highly reliable and easily deployable. We must ensure these sites are up and running as soon as possible.

We are expecting a design that includes the complete solution stack, from the infrastructure layer to the application layer.

The application that controls the depot has the following requirement: (Hint: These should be scalable)

- Client facing web layer
- Message queuing middle tier
- Database backend

This manufacturing system is capable of producing a launch ready ship in 72 hours. Larger ships are currently being designed. Any malfunction of the manufacturing systems is catastrophic, and will cost precious human lives.

II. Conceptual Design:

Based on the description above, I have the following requirements for the manufacturing system that I am designing:

- Highly reliable
- Easy deployable
- Up and running as soon as possible
- Able to build bigger ship later
- An application to support the manufacturing process with these elements
- Client facing web layer
- Message queuing middle tier
- Database backend

Design Requirements:

ID	Requirement
R001	Able to sustain 99.999% uptime.
R002	No single point of failure.
R003	Ensure data availability 100% of the time.
R004	RTO of 2 hours max.
R005	RPO 1 hour min.
R006	Use of Continuous Deployment for the application that is supporting the manufacturing system.
R007	Message queuing is to be used by the application that supports the manufacturing system.
R008	Use of single vendor for each type of equipment to avoid complexity and interoperability problem.
R009	Use of automation to deploy the system.
R010	Use of Configuration Management tool to ensure configuration integrity.
R011	Automate the deployment process wherever possible.
R012	Need to hold 10 Terabyte of data.
R013	Highest compute server that is available.
R014	Use of 100G links on the network to provide highest throughput.
R015	Need to provide a development system that is 1/10 capacity of the production system.
R016	Due to the importance and implication of system failure, security should be given the highest priority to prevent.
R017	Ability to maintain data integrity of the ship's design is of the highest priority in this project.
R018	Design will not use public cloud to maintain full control of the system and no external dependencies such as availability of the system and/or resources in the public cloud.

R019	Need to provide UPS for up to 5 hours in case of a power failure.
R020	Success of this project affect human lives design decision should based on proven technologies instead of use the latest available technologies that will have bugs. No room for error.

Design Assumptions:

ID	Assumptions
A001	There will be no security update to any of the products that we us from the vendor due to the world situation.
A002	There will be no maintenance window for software or hardware upgrade for the infrastructure except to swap out failed hardware modules. (Infrastructure include hypervisor, OS of the guest VM, storage controller firmware and any off the shelve application such as Microsoft Exchange or Microsoft Office).
A003	Technical personnel to support the project may not be available.
A004	Able to support 100% increase of workload in 6 months

Design Risks:

ID	Risk
R001	Hardware or software suggested in this design may not be available due the current world situation.
R002	Shortage of qualifying technical person can be risk factor to the success of the project.

III. **Logical Design:**

Elements in this manufacturing system are:

1. Compute server
2. Storage array
3. Networking equipment
4. Authentication Sever
5. Operating Systems
6. Database server
7. Database software for Management software of the hypervisor
8. Database software for the Web Application.
9. Hypervisor
10. Management software for the hypervisor
11. Configuration Management Tool
12. Continuous Deployment Tool
13. Cloud software suit
14. Software Compilation Server for development of the Web Application.

I. **Physical Design:**

TBD

II. **Implementation Plan:**

TBD