

Engineering for integration of DCSs

Masanori Hirakawa

Yokogawa Electric Corporation,
2-9-32 Nakacho, Musashino-shi, Tokyo, 180-8750 Japan
Masanori.Hirakawa@jp.yokogawa.com

Abstract: This report describes the point that the engineering method for integration of Distributed Control System (hereafter called DCS) accompanying operation integration of the DCS by which plant operation adjoins should be taken into consideration. Mainly there are communication load of the control bus of DCS, the resources which a system manages, division in operation and monitoring and security with engineering environment.

Keywords: DCS, integration, engineering, control bus throughput, operation integration

1. Introduction

About 30 years have passed since the DCS was introduced in the world. Each DCS maker's system can also be going updating time in recent years. The present DCS received the wave of information technology, and the throughput of their equipments was also improved very much. The present system should provide the operation and monitoring of each whole plant in a factory today, the present DCS gets higher capability and function. However, there are difficult for updating to a new system to once, and are updated one by one in the already existing systems are taken.

Explanation of terms and abbreviations in use of this paper as blow.

FCS: Field Control Station (Process controller)

OPS: Operator Station (Human interface equipment)

BCV: Bus Converter

BCVs are used to connect two or more domains of present systems and to connect a present system to earlier existing systems

Control Bus: transmit real time signal data between FCS and OPS mainly.

GW: Gateway

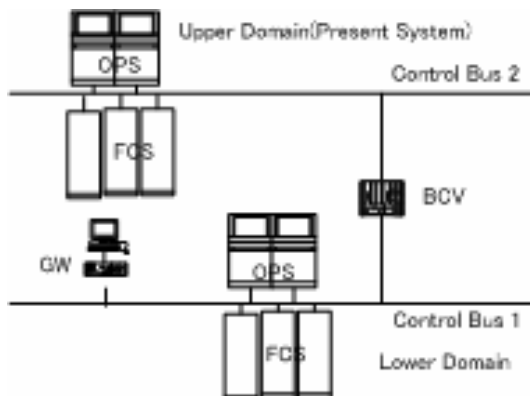


Fig.1. Example the Integration of DCSs

2. About each integration pattern of integration of DCSs

Now, there are the three following patterns in integration of DCSs between the present systems and existing systems.

It is the way which leaves an existing system as it is and is combined with the present system of a higher rank through a gateway to an existing control bus.

There are the following cases in this pattern.

1. the case which unifies only operation and monitoring., and
2. the case of integration also including maintenance of software.
3. It leaves a part of existing hardware (I/O cards), a part for the CPU cards and the communications cards is updated to the present system, and there is a system which aims at integration as a new system. In this case, the cable from the field to I/O cards can be employed efficiently as it is. Furthermore, the present FCS function can be used.
4. All existing hardwares are replaced and there is integration in the present systems..

From the field of succession of hardware resources, Explain the above 1-3 patterns in detail as blow.

No. 1. Integration of operation and monitoring

This is performed in order to connect birth control to an established control bus and to perform operation surveillance or data collection, and advance control from the higher rank newest system

No. 2. integration also including maintenance of software.

It is the system which passes through and transplants to a higher rank maintenance machine the database of FCS currently distributed for every established system, and could be made to perform Builder-maintenance work from the upper domain DCS.

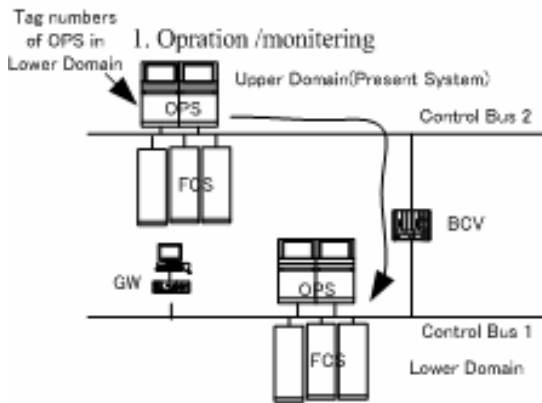


Fig.2.Operation & monitoring

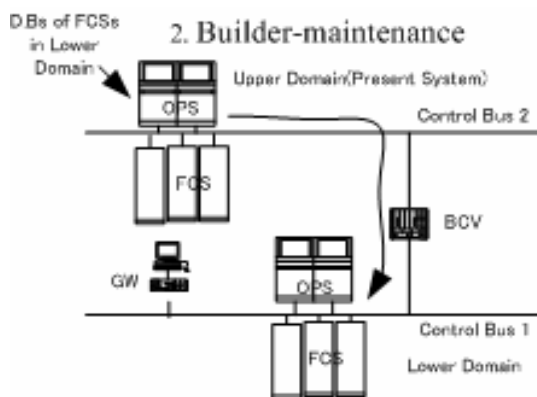


Fig.3. Builder-maintenance from the upper domain DCSs

No. 3. Migration

It is the pattern to which CPU of FCS is changed (employing I/O efficiently). A new function can be used for the advantage of this, without changing wiring of the spot.

3. Engineering for integration of DCSs

Here, the pattern of No.2 in the integrated pattern of the foregoing paragraph is explained.

That is because it has much engineering know-how.

The most important item is the explanation of the difference between present and the existing system to the customer.

Since existing was supplied and has already passed for ten years to 20 years, it needs to order the local system newest save and needs to check the use situation of resources

Below, the whole examination item view is described.

<Examination items for integration>

Capacity and performance

Capacity

Common resource

Uniqueness

Proplem of naming

Paformance

Control Bus load

Lower Bus load

(the existing system's control bus)

Upper Bus load (the present system bus)

FCS performance

Operation/monitoring and security

Opration /monitoring

Alarming from lower domain systems

security

Prant Opration to lower domain systems

Builder-maintenance to lower domain systems

Schedule for integration plan

Maintenace of plants

Transfer from exiting system database to upper domain system.

Others

Evidence between function of existing system and its of present system

Time adjust Function in total system between existing system and present system

The main items are explained in the above-mentioned item. They are Capacity and performance ,security and schedule.

•Capacity/Common Resouce

It is necessary to check whether there is any duplication by the tag number which is using each plant, and whether a tag number total is in restriction of a system. It is necessary to consider the resources relation of such systems.

For example

Check the amunt of Tag number

The degree investigation of duplication of a tag number

In the system based on tag number operation, a tag number is because a unique thing is required fundamentally.

•Load of control bus

The amount of communications of the control bus and speed increased also 40 times in 30 years.

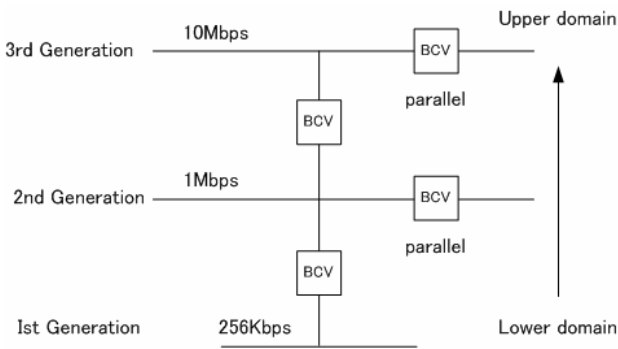


Fig.4. Control bus & BCV

Here, the points which should take into consideration on the engineering of integration is described. Since the distributed system is combined as one large system, integration of DCSs needs to examine both the control bus communication load of a main system (upper domain system; present system), and the control bus load of a subsystem (lower domain system; existing system).

As for the control bus communication load of a main system, the control bus communication as operation & monitoring from self and the communication to each subsystem from a higher rank basic system are added. The device which reduces the number of gateways and the amount of control bus communications by the side of a lower domain (existing) subsystem is needed with anticipation of load. It also influences the operation form of the system integrated.

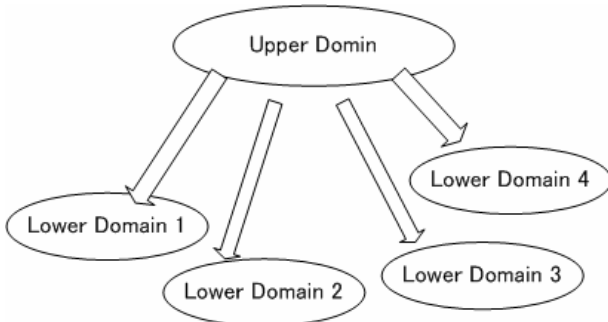


Fig.5. Communication between the upper domain and lower domains

If the load by the side of a higher domain also supervises the low domain of two or more systems, in the same domain, it will become the increase of communication load and the necessity of dividing also here (domain division) will occur.

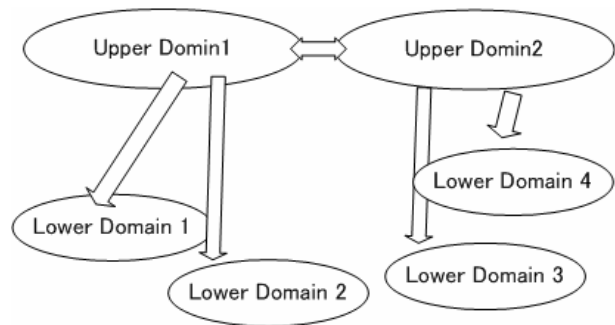


Fig.6. Division of Domain

• Operation / monitoring

& Alarming from lower domain systems

Since all systems are connected on one control bus or information communication, the measure against security of each system also needs to be inquired. The modifying work of software from an engineering work station operates it to the wrong plant side so that an operator may not operate the meter of other plants accidentally.

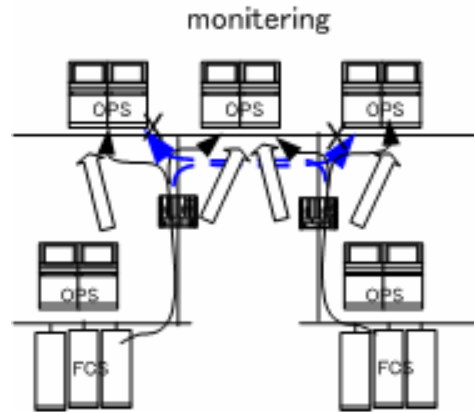


Fig.7. Monitoring & Alarming

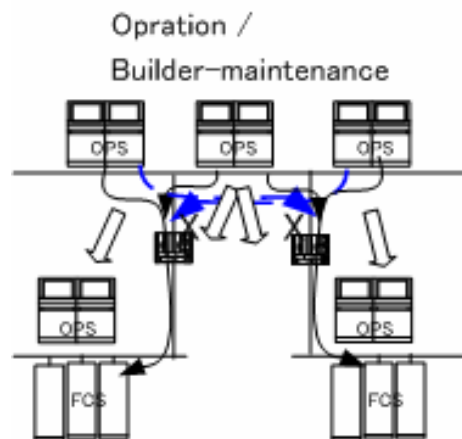


Fig.8. Security of Operation & Builder-maintenance

• **Schedule for integration plan**

For the transfer from exiting system database to upper domain system.

- SI Unit

There is a problem of SI unit in the matter of a situation of Japan. That is, delivery of the system in non-SI unit was forbidden from October, 1999.

Therefore, the thing displayed today (a meter figure, graphics, Logging). For this reason, change of an operation formula is needed. "A meter points out all the system products in connection with taking in the measured signal, and displaying or printing."

So,an established non-authorization-by-law measurement unit tag is converted.

Cautions are required when the target established system is using non-SI unit. Therefore, this is related with the schedule of integration. Since it is necessary to transplant the database of established DCS to a higher rank side, SI unit-ized work is needed. This schedule must also be included.

For example

- Pressure

mmH2O,kg/cm2 → Pa

• **4. Summery**

If the above is summarized,

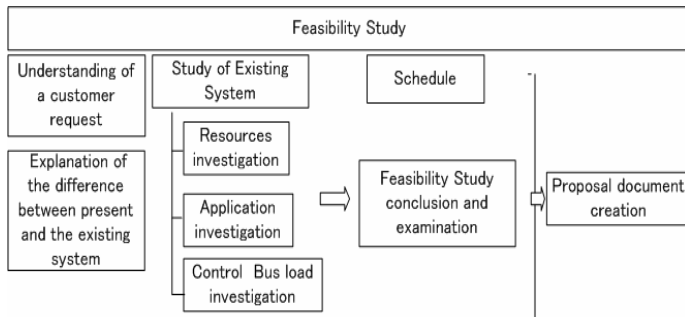


Fig.9.Flow of Feasibility Study

5. Conclusion

This report is an example of the author summarized JOB carried out several years ago .

In integration of the newal present systems, It is not necessary to consider the resources relation of every subsystems today. However, Having inquired above is not useless. It is necessary to consider examination of the communication load of a control bus, and examination of the solution method of the same tag number especially.

• **6 . Reference**