NENA
Integrating Applications on Intelligent Workstations Information Document

Abstract: This document will identify, define, discuss and offer information to help PSAP managers make decisions that are necessary to integrate multiple applications on a single hardware platform at the Enhanced 9-1-1 Public Safety Answering Point (PSAP).

NENA Integrating Applications on Intelligent Workstations Information Document

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1 Executive Overview

The emergence of intelligent workstations and multitasking operating systems has allowed the integration of multiple applications that had previously appeared on separate platforms. Integrating these applications on one workstation can provide a higher level of functionality and ease of use over individual dedicated equipment.

This integration of applications on a single platform leads to a higher level of responsibility for all associated vendors.

This document will identify, define, discuss and offer information to help PSAP managers make decisions that are necessary to integrate multiple applications on a single hardware platform at the Enhanced 9-1-1 Public Safety Answering Point (PSAP).

The existence of this document does not support, promote or defend any particular technology. Its sole purpose is to inform and offer solutions to the problem of integration to those wishing to either offer or accept such forms of communication.

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Reason for Issue/Reissue

NENA reserves the right to modify this document. Upon revision, the reason(s) will be provided in the table below.

Document Number	Approval Date	Reason For Issue/Reissue
NENA 04-501	03/31/2004	Initial Document
NENA-INF-029.2-2018	08/12/2018	Update to current template, update references to other documents, and comply with NENA's policy for updating documents.

2 Technical Description of Integrated Intelligent Workstations

Please refer to NENA-STA-028 "Recommended Generic Standards for E9-1-1 PSAP Intelligent Workstations" [[1]] for specific equipment recommendations regarding hardware, audio, and peripherals.

Integration on an intelligent workstation implies two or more applications residing on a single workstation (PC) to aid the call taker/dispatcher in everyday operation.

2.1 Examples of Integration

Some typical applications that may reside on the same workstation include:

- 911 Call Processing
- Support for hearing or speech impaired callers. e.g. TTY
- Radio
- CAD
- Mapping
- NCIC
- State/Provincial Law Enforcement
- Recorders
- DOT
- Alpha-numeric paging software
- Fax Software
- Virus protection software
- Streaming Video
- Browsers
- Different Email packages
- Voice Messaging
- Database Reporting Packages
- MIS software
- Communication Packages
- Business Office Automation Products
- AV products
- Computer-based Training Products
- General office software (e.g. word processing, presentation)

Intelligent Workstations (IWS) resolve many of the new issues facing PSAP managers today; however, they can also create some of their own. Problems can stem from many separate computer and network systems, CAD, Radio, Mapping and IWS, to name a few. Some of the issues that can be easily overcome with Intelligent Workstations are as follows:

- **Space Constraints**
  - Multiple Keyboards, Monitors & Computers
- **Work Constraints**
  - Disperse information
  - Duplication of information
- **Technology Constraints**
  - Multiple Operating Systems
  - Multiple System Vendors

There are a number of integration levels feasible with the use of IWS and these other systems. Depending upon the various applications in place different levels are achievable. The various levels are described in the NENA IWS document NENA-STA-028 [[1]].

3 Integrated Intelligent Workstation What is meant by "Integrated"? -

For an Integrated Intelligent Workstation, what is meant by "Integrated"? There are two prevailing definitions for "integration" of dispatch center equipment.

3.1 Human Interface Integration:

In a system exhibiting human interface integration, the user has the ability to interact with many different software applications using the same interface devices. In such a system, a single mouse/keyboard would be used to monitor and control the diverse software programs needed for the user to perform their job functions. In general, these software applications would share the same visual viewing space on one or more computer monitors.

Current operating systems provide the ability to access several different software applications simultaneously, using a shared mouse/keyboard/monitor, etc. These software applications can be presented simultaneously on the screen, or can be presented with some active displays and some quick-access icons used to display other applications as needed. This aspect of the Integrated Intelligent Workstation is easily customized by a user, who can choose in real-time which applications are actively viewed, and which are presented as icons.

The multiple software applications can all be displayed on a single monitor, or can be moved between multiple monitors (as shown below). In the case of multiple monitors,

there is still only one keyboard and mouse used to operate the programs on the various monitors. The mouse cursor freely moves between the screens as the mouse is moved.

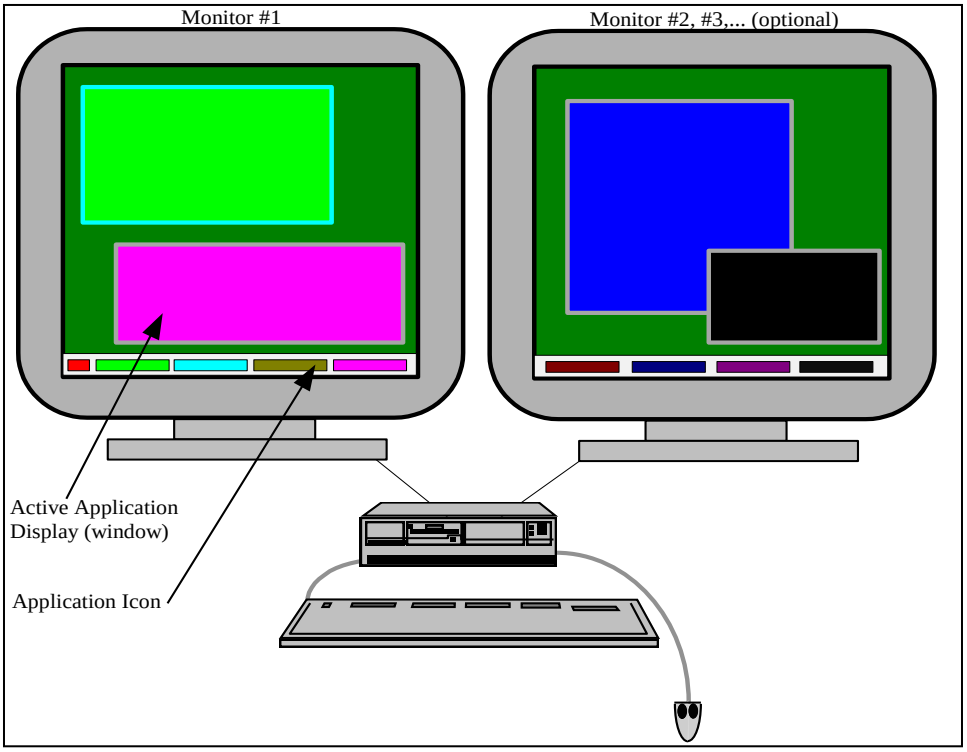

Figure 1: Human Interface Integration

3.2 Functional Integration:

In a system exhibiting functional integration, all of the elements of human interface integration (described above) are present. In addition, the software programs being accessed by the user would have the means to pass information *between each other*. Passing information automatically between programs allows the user to work more efficiently by eliminating the need for the user to see information in one window and then copy, paste or retype the information into another window. The user interface would look very similar to that shown above; the difference is that information would now flow between the different products (either automatically, or on request of the user).

Here is an example of how functional integration works. An E9-1-1 call is received and the ANI/ALI data is displayed in a window on a workstation. The ANI/ALI information for the received E9-1-1 call would then be automatically transferred to a CAD system where a new "incident report" is created that has the ANI/ALI information already filled in (as in figure 2 below). Another example would be a Mapping program that shows the location of each squad car in a police department. When the user clicks on a car displayed on the mapping

program, the dispatch console program would initiate a voice transmission to that vehicle. The user interface would communicate with both the E9-1-1 and Radio Dispatch software applications running on the workstation, and display information for both of those programs. A single window on the screen would monitor and control both E9-1-1 and Radio Dispatch features. This user interface would communicate with both the E9-1-1 and Radio Dispatch software applications running on the workstation, and display information from both programs.

Many operating systems allow programs on a workstation to communicate with each other, both through internal support and by means of a third party software. It is also possible for products to support an API (Application Programming Interface), which allows one application to monitor and control the actions of another application.

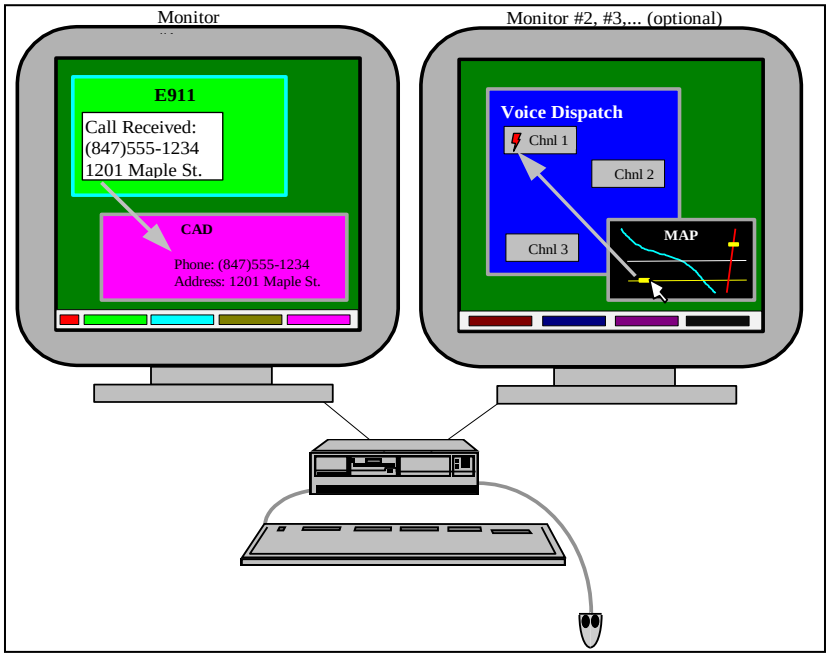

Figure 2: Functional Integration

4 In an Integrated Intelligent Workstation, how would the products be integrated?

In both of the integration alternatives discussed above, even though the user sees many applications (windows) on the Integrated Intelligent Workstation screen(s), not all of the computation for all of these programs is being done on the local workstation. Some application programs tend to perform their operations on the local workstation, accessing the server only periodically for non-real-time information. The application program may

require a lot of computer resources (RAM, Processor power, etc.) to be available on the local workstation in order to operate with acceptable performance.

This resource usage pattern does not hold true for all of the applications. Many software applications being considered for integration follow traditional client/server architecture. In this architecture, most of the processor-intensive operations take place on the servers. The user workstations are a means for a human to monitor and control the actions that are being processed by the server. Records management and E9-1-1 applications typically follow this architecture pattern. For these cases, the software residing on the user workstation is merely a "thin client". These types of applications do not require much of the workstation's processing resources, as most of the processing is being performed on a server dedicated to that functionality. Client applications for the client/server services only need enough computer processing resources to interact with the user, and to request the respective server to perform the operation. The requests and responses between the client and server software are typically done via a Local Area Network (LAN) (as in figure 3 below).

It will be important to suppliers of the integrated system to understand the computational requirements of each of these programs, under various traffic loads, to make sure that all of the software programs have the appropriate computer resources (RAM, Disk, LAN Bandwidth, and CPU cycles) available to meet required performance levels. The challenge in integration is to understand the computational requirements of each program (under various loads) to make sure not only that each program runs acceptably, but also that all of the programs continue to run in an acceptable manner together.

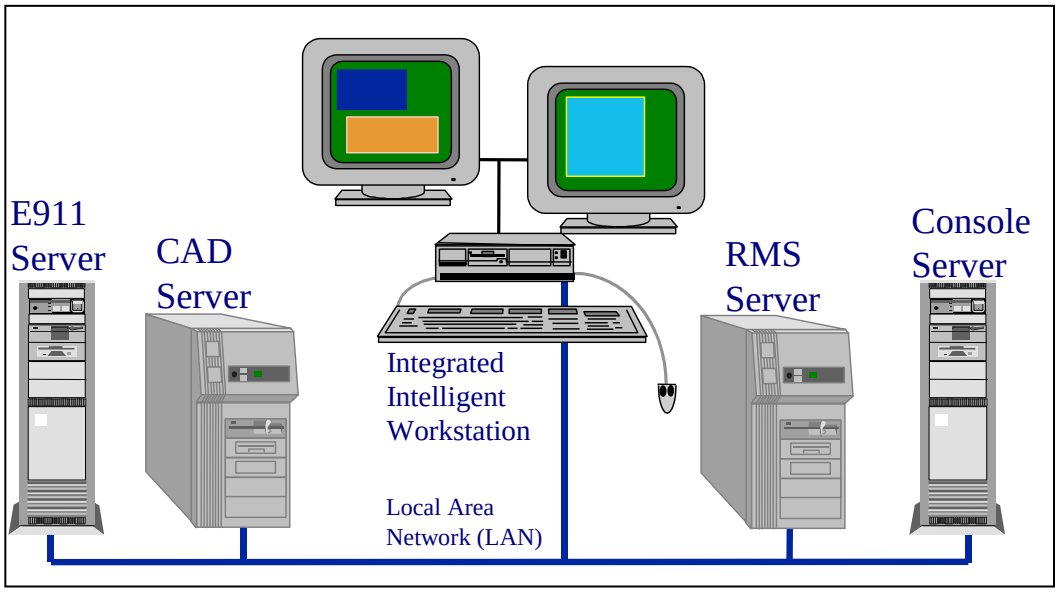

Figure 3: Integrated Dispatch Network

5 Recommendations

5.1 Human Interface Integration

Allow multiple applications to be presented to the user via a common device. A shared keyboard, mouse, and screen(s) are used to monitor and control all of the software programs.

This requires a detailed understanding of the resource requirements (Operating System, BIOS, CPU, RAM, Disk, and network bandwidth) imposed by each software application. Characterization of these parameters for each program, under various loads, must be done as an engineering task. This engineering task must result in defining a mechanism by which the system engineers can determine the correct workstation to use, given a customer's needs to ensure that the appropriate CPU, CPU speed, RAM, Disk Space, LAN throughput, etc. are selected.

The need for a particular computer must be based on a list of items capturing the customer's needs. Particular focus should be paid to maximum resource requirements with respect to application usage (e.g. peak call volume.)

This project must also define a mechanism by which the different software products will be released and tested together, to confirm software compatibility.

5.2 Functional Integration

Once we have defined the ability to properly size the user workstations, and have the ability to certify the compatibility of the various software programs, our attention should start to focus on functional integration. This involves cooperation between the designers of the various products to make sure that the data needed by one application will be available from another. Specific software interfaces must be defined so that data can flow between the applications. This offers many improvements to the efficiency of the telecommunicator.

Before the technical issues can be addressed, a study to map a telecommunicator's typical workflow must be done. A workflow map will indicate what data needs to be communicated between the software programs in order to ease the workload on the human user.

Some aspects also needed include a project plan, network diagrams, inter-operability planning and testing, and role assignments. For example, one individual or company may be assigned the responsibility of making sure their radio application works with CAD vendor X. Depending on the scope of the project, a system integrator may be hired to perform this and other overall functions.

6 Considerations: Maintenance, Alerts, Contingency Plans and Recovery

6.1 Maintenance

Depending on type and size of the applications being used, it may be important for a given PSAP to devise a maintenance plan for the total integrated system. Planning, scheduling, and coordinating these on-going activities needs to be considered. For example, on-going maintenance, such as database archiving and purging, can be scheduled to occur during off-peak hours, such as early morning. For successful ongoing maintenance of the integrated system, a single source needs to be identified to coordinate all activities. One person needs to be designated the contact for various vendors to coordinate through.

Some examples of coordinated maintenance activities are:

- Data archiving, purging and routine database integrity checks
- Software Patching
  - OS
  - Vendor applications
  - Database engines
  - Device drivers
- Interoperability testing for all updates
- Network administration changes affecting connectivity
- Consideration of network utilization to avoid network congestion
- Updating of overall system (including network) diagrams
- Virus software update and the ramifications of it affecting vendor software installations
- Sharing facilities for remote maintenance access

6.2 Alerts, Contingency Plans, and Recovery

Redundancy is desirable and should be built into most PSAP equipment and plans should be made to handle backup situations should they arise. Planning for emergencies should involve an action list. For example, it may be decided that a security patch for a database engine is needed immediately as a result of virus detection. Care must be taken to minimize interruption of service, or worse, default to a backup server if the software patches fail.

In larger systems with many vendors, it is important to have a coordinator manage the situation and ensure all personnel and vendors involved have handled the situations correctly. Many times a PSAP may have on-premise personnel to handle the initial

emergency. A complete understanding of the total picture of the system is required. This will include an understanding of any diagnostic tools available.

It is important that the alerts and error reporting schemes for all applications is understood in advance. Many vendor applications have the ability to route these events to specific devices such as pager, email, printers, specific workstations (such as supervisor stations), or servers. Advance planning for both maintenance and emergency conditions can avoid the confusion when these events occur.

Recovery involves making sure that all systems have been restored to their original configuration. This includes placing the primary equipment back on-line and logging the events that occurred for future reference.

7 Security

It is important to implement a security plan that incorporates user profiles, permissions and authentication in order to prevent unauthorized access to workstations. Unauthorized access can compromise the privacy of data. Unauthorized users may also modify applications and system parameters that could lead to system failure. See NENA 04-503 "NENA Technical Information Document – Network/System Access Security" [[3]].

8 Role Definition

System administrator(s) – In house personnel responsible for in-house network issues, overall health of the system, and a single-point of contact to be informed about any changes to the system. This person normally performs database updates, add users, etc. that are required on an on-going basis.

System Manager - Identify an upfront person responsible for all workstation, network issues, and the system in its entirety. This individual will also act as a liaison between the involved vendors. People who effectively fill these rolls may prevent these undesirable situations:

- Installation of operating system software patches that fix one application but stop others from working.
- Device driver updates that affect database connectivity and thus degrade or stop operation entirely.
- Network operation and connectivity issues that can bring down individual workstations.
- Deletion of programs or files that could prevent the workstation from operating properly or cause intermittent problems during operation.
- Introduction of viruses into the PSAP.
- Introduction of unauthorized software applications.

- Lockouts of a particular station or server due to unknown passwords at critical times.
- Inconsistent user interface and style on all workstations.

9 Summary

Rapid advances in technology have changed the face of communications in the everyday PSAP. The cost and availability of affordable hardware and software has allowed the dispatcher workstation to become efficient in terms of real estate and usage. Thus, the Integrated Intelligent Workstation has become one of the most visible and ever-changing resources in the center.

10 Impacts, Considerations, Abbreviations, Terms, and Definitions

10.1 Operations Impacts Summary

There are no operations impacts expected. Some references to other NENA documents were updated in this version.

10.2 Technical Impacts Summary

There are no technical impacts expected. Some references to other NENA documents were updated in this version.

10.3 Security Impacts Summary

This document provides best practices information for updating and patching software that is often required to improve security and therefor may encourage agencies to modify existing security procedures.

10.4 Recommendation for Additional Development Work

No additional development work is recommended or expected.

10.5 Anticipated Timeline

Not Applicable.

10.6 Cost Factors

Not Applicable.

10.7 Cost Recovery Considerations

Not Applicable.

10.8 Additional Impacts (non-cost related)

The information or requirements contained in this NENA document are not expected to have any impacts, based on the analysis of the authoring group.

10.9 Abbreviations, Terms and Definitions

See NENA Master Glossary of 9-1-1 Terminology, NENA-ADM-000 [1], for a complete listing of terms used in NENA documents. All abbreviations used in this document are listed below, along with any new or updated terms and definitions.

11 Recommended Reading and References

[1] NENA Master Glossary of 9 1 1 Terminology, NENA-ADM-000
[2] NENA Recommended Generic Standards for E9 1 1 PSAP Intelligent Workstations, NENA-STA-028 (originally 04-004)
[3] NENA Technical Information Document – Network/System Access Security, NENA 04-503

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