

“NEC Stadium Solutions” Played a Critical Role in Construction of the World Cup

FUJINAGA Seiji, Francisco Yoshihiro YAMAMOTO, Claudia Yokoo EGUTI, FUKUNAGA Kouichi, SAKAMOTO Shuusaku, KODA Takuya, KOBAYASHI Tetsuro

Abstract

NEC played a critical role in the stadium construction projects for the World Cup, integrating and delivering ICT systems into a single optimized infrastructure. Using these projects examples, this paper discusses NEC's expertise in contributing to integration and management on a global scale via our “Solutions for Society” business.

Keywords



NEC Stadium Solutions, system integration design, material procurement, project management, system integration

1. Introduction

For one incredible month in the summer of 2014, the world's attention was focused on Brazil for the World Cup. With national football teams from 32 countries battling for world supremacy, the competition was fierce, and every day brought fresh excitement to each of the 12 stadiums^{*1} where the matches were staged. After a month of astonishing performances, heartbreaking losses, and stunning triumphs, the World Cup came to a successful conclusion on July 12.

NEC participated in five^{*2} construction projects (hereinafter referred to as “the Projects”), serving as a subcontractor to the general contractors (hereinafter referred as “the Clients”). NEC's responsibility for the projects was system integration. This included designing the integration solution, procuring materials, and installing and constructing stadium ICT equipment (**Photo 1**).

The ICT equipment used in these projects ranged across a wide spectrum that included:



Photo 1 NEC projects in Brazil.

- IP networks
- Wi-Fi
- Digital signage, large LCD screens, monitors and displays
- CCTV security systems

^{*1} In total there were a total of 16 stadiums in Brazil when including the 4 practice stadiums

^{*2} NEC was responsible for systems integration at 5 stadiums - 4 of which were used for Cup matches (Arena Fonte Nova: Salvador, Arena Pernambuco: Recife, Estádio das Dunas: Natal, and Arena da Baixada: Curitiba) and 1 for practice (Arena do Grêmio: Porto Alegre).

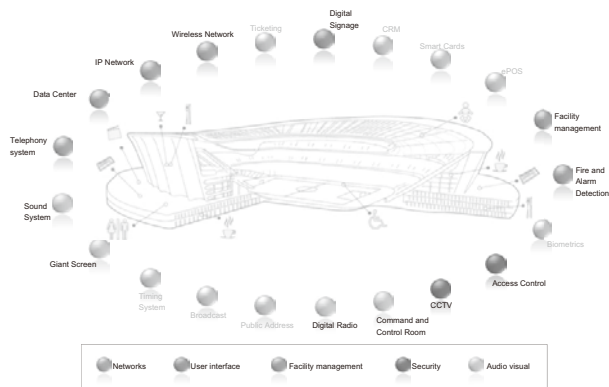


Fig. 1 Systems used in NEC Stadium Solutions.

- Access control at entrance gates
- IP telephony inside the stadium and facility management systems.

In addition to ICT equipment, NEC also provided fire detection and alarm systems, sound systems and timing systems, bringing the total number of equipment categories that NEC was responsible for to 13 (Fig. 1).

2. NEC Stadium Solutions

The World Cup was not NEC’s first experience at delivering integrated ICT to stadiums and facilities. Since 2006, the company has been delivering a wide range of ICT products and systems to many different customers (Table 1).

For many years now, NEC’s technological capacity has enabled us to supply the market with a diverse selection of ICT products. Today, we are leveraging that expertise and technology to facilitate the deployment of complete ICT solutions built around our business analysis, system integration structures, and project management skills.

NEC Stadium Solutions is a pre-defined, systemized approach to system-integration design, procurement and project management methodology required for stadium or facility construction projects. The benefits of taking this approach is that the time and cost associated with execution manufacturing and installation are reduced, while minimizing risk and improving management and maintenance efficiency.

3. System Integration Design Technology

When designing a system integration solution, the key is to formulate an effective plan for the project that covers not only the actual integration systems and technologies, but considers the specific concerns and requirements of the stadium construction, facilitates consolidation & centralization of systems

Table 1 NEC's ICT Experience.

Project	Country/region	NEC (division/company)	New/existing	Year
Universal Studio Japan • Face recognition (for security and matches) • Official application for smartphones (linked with GPS and electronic money) • Integrated electronic money solution • Attraction reservation system	Japan	Kansai Branch	Existing	2006 to present
Grenoble Foot 38 (total ICT solution)	France	NEC France	New	2008
Rhine Energy Stadium (IP telephony)	Germany	NEC America	Existing	2009
The O2 Arena (total ICT solution)	UK	NEC UK	Existing	2008

and provides sufficient flexibility for specification changes.

Requirements particular to a stadium construction project:

- Cost and schedule
- Meeting of specific stadium above and beyond specifications stipulated by the event organizer (e.g., FIFA)
- Flexibility for specification changes and schedule changes during the implementation of the project

3.1 System Architecture - Consolidation/Centralization

While possible to take the approach of installing ICT in stadiums as independent systems, NEC believe that wherever possible, in order to minimize complexity and simplify troubleshooting, systems should be consolidated and centralized. With this at the core of our system architecture philosophy, we were able to support customers’ needs with reliable, smoothly functioning systems installed on schedule.

Consolidation of data transmission methods and centralization of server functions makes it easier to share content and to achieve duplication of the entire system. This, in turn, assures the necessary flexibility for specification changes, makes systems easier to construct and install, and streamlines management/maintenance.

In Brazil, this system architecture approach was applied as shown below (Fig. 2).

- Consolidation of all data^{*3} transmission methods in and around the stadium using IP protocols
- Centralization of control functions (server functions) for all products in single data center
- Sharing of visual content between digital signage system and giant screens
- Duplication of the above-mentioned IP network and

*3 This data includes control, audio, and visual data.

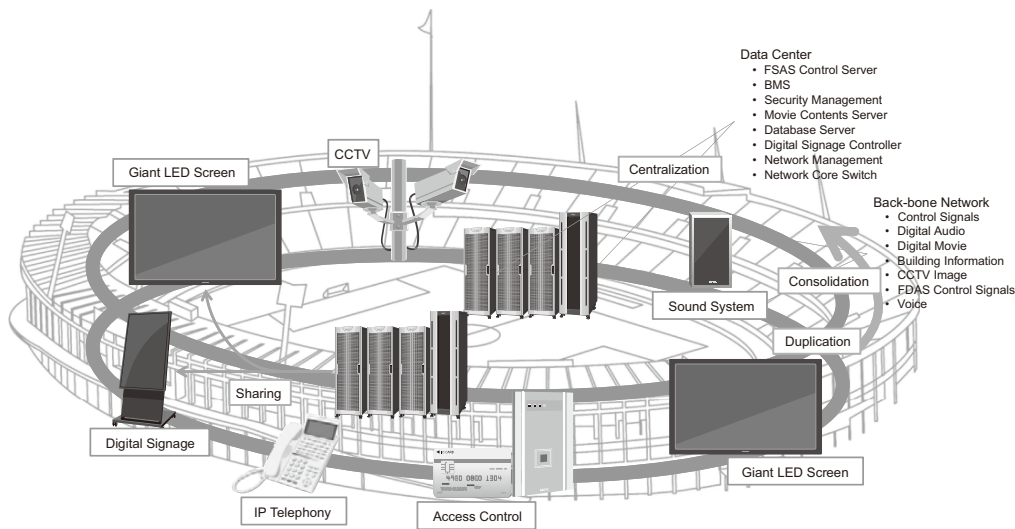


Fig. 2 System Architecture.



Photo 2 Command Operation Center (CoC).

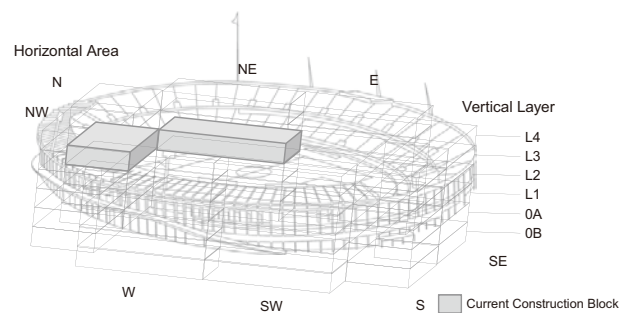


Fig. 3 Stadium construction blocks.

data center based on the two Command Operation Centers provided in each stadium.

3.2 Command Operation Center (CoC) Design

In NEC Stadium Solutions, the basic design and operation of the system for each facility was developed in cooperation with the Clients. This made it possible to optimize the selection of ICT according to the specific needs of the facility. At the heart of each Stadium Solution was the Command Operation Center, or CoC. Essential to the smooth functioning of the entire system, the CoC played a pivotal role in stadium management and was shared by the audio/video staff and security personnel, making proper installation and setup the key to the overall success of the operation (Photo 2).

In a single center, the CoC had to include an audio/video monitoring system for management staff equivalent to the

one surrounding the spectators in the stadium seats, as well as providing an environment where security staff could focus on surveillance monitors and alarms. Resolving these contradictory requirements required us to focus all our know-how and expertise on ensuring that the CoC was effectively designed to improve ease of management/maintenance.

3.3 Understanding Stadium Cable Layout Requirements

Installing ICT products in a stadium is a vast undertaking, in terms both of the time required and the complexity of the task. Enormous amounts of cable have to be laid out over a wide area - often at the same time as the facilities themselves are being constructed. Success in this case is predicated on conceiving a process design (for layout processes and testing processes) that effectively coordinates the work in each of the stadium’s construction blocks^{*4}, assuring smooth implementa-

^{*4} Construction blocks are determined by dividing the stadium into 8 zones (N, NE, E, SE, S, SW, W, and NW) in the horizontal direction and into the number of floors (different depending on the stadium).

tion and facilitating construction and installation (Fig. 3).

Thanks to the consolidated/centralized system architecture developed and refined in earlier projects, we were able to consolidate the cabling for the 13 ICT systems into five systems, giving us the flexibility we needed to effectively adapt to any changes in construction plans along the way. Simplifying the cable configuration had other benefits as well, including easier system installation, enhanced flexibility in the event of any specification changes, and streamlined management/maintenance.

4. Material Procurement Capability

NEC operates in more than 140 countries and regions around the world, giving us unparalleled access to a vast network of suppliers and partners. This enables us to provide optimized solutions that are perfectly customized to our customers’ needs.

After determining which product suppliers were capable of meeting the requirements for the specifications of the Projects, we consulted with the Clients in order to decide which products would be selected based on the product portfolio (Table 2). Thanks to NEC’s strong global presence, NEC Stadium Solutions proved able to take advantage of superior material procurement capability to deploy the best-possible products in any stadium configuration.

5. Project Management Technology

Based on the knowledge and expertise gained in earlier

projects, NEC developed a management system (“Stadium Solutions Project Management Standards”) optimized for stadium/facility construction projects. By strictly adhering to these standards, we cleared rigorous quality standards and successfully met all delivery deadlines in the Projects.

5.1 Process Management and Risk Management

In the Projects, we established a sophisticated management system called the Project Management Office (PMO) that facilitated cooperation between our sales, engineering, and delivery teams. At the same time, we introduced management methods that enabled us to command a bird’s-eye view of the entire stadium construction project in terms of progress management, risk management, task management, and quality management according to “Stadium Solutions Project Management Standards.” This ensured that we were always fully aware of the status of all aspects of the Project and were able to keep the Clients up to date with the latest developments.

Every week, the Clients held a progress meeting with all the subcontractors. Participating subcontractors from various fields including civil engineering, structural engineering, interior construction, electric installation, water supply and drainage, and ICT equipment (NEC) reported on their progress and discussed any problems and possible solutions. For example, if there was a problem that held up interior construction, that delay could in turn affect the electrical installation work, which

Table 2 Product portfolio.

Sub-System	Supplier	Scope	Alt Supplier 1	Alt Supplier 2	Alt Supplier 3	Alt Supplier 4	Alt Supplier 5
IP Network - Core	A	2 x Core Switch	NEC	I	J		
IP Network - Distribution and Access	A	72 x 48 ports Access Switch	NEC	I	J		
IP Network - Wi-Fi	A	101 x Indoor Aps + 100 High Density Aps + Wireless Controller	NEC	I	J	L	M
IP Security - Firewall and IDS	A	For WAN and LAN	NEC	I	J		
IP Telephony	A	125 IP phones, 100 WiFi Phones and 500 mailboxes	NEC	I	K		
Digital Signage SW	NEC	SW to manage 610 displays	A	S			
Professional LCDs	NEC	Displays for Control Room and other critical applications	A	S	AG		
Giant Screen	NEC	2x60m2 LED display, controller, startup, training, 1Y/Warr	G	S	AG	N	Local Supplier
Servers and Storage	NEC	Servers for all Applications in the Arena	AM	H	A	O	
Surveillance/Access Control - SW	NEC	Integrated SW for Surveillance and Access Control (Internal and Massive)	D	AH	A	P	
Access Control - HW	NEC	Embedded Electronics for 105 turnstiles and 127 door lockers	Q	R			
Access Control - Mechanical	C	105 turnstiles, 127 door lockers	T	U			
Surveillance System - Cameras	D	280 fixed cameras, 33 PTZ, 24 micro cameras and 34 HD	S	AI	AJ	A	
System Automation	G	xxx I/O Points and yyy devices	V	W	X	Y	
Sound System	D	Public Address according to FIFA requirements.	Z	AA	AB		Local Supplier
Radio Comm System	E	100 units + Repeater	AK				
Cabling	F	Fiber, UTP, etc	AL	AC	AF		

Expand NEC’s Solutions for Society business to sports and entertainment, starting with stadiums

Promotion and vitalization of the local community through a stadium

Encouragement of sports business, beyond the contest of the game

Creation of a new business field as NEC

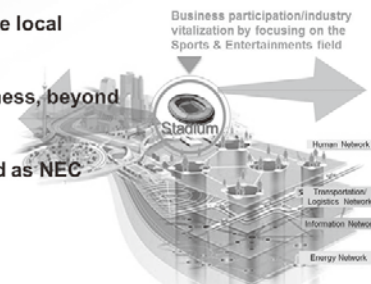


Fig. 4 Building a social solutions business.

would then affect NEC’s installation of ICT equipment. This made it necessary to evaluate potential risks and develop plans to deal with them.

The experience that went into “Stadium Solutions Project Management Standards” and the PMO is the key to our project management methodology in NEC Stadium Solutions.

5.2 Quality control

NEC has systemized the quality control standards for ICT products and facility construction. Under the management supervision of the PMO, the engineering team and delivery team of the Projects performed design and installation work based on these standards, successfully satisfying the rigorous inspection of a third-party organization and getting all work done on time when faced with the absolute deadline of the World Cup.

6. Conclusion

In this paper, we have reviewed the structure and operations of NEC Stadium Solutions and the role they played in preparing the infrastructure for the World Cup. Going forward, we intend to build on this experience to further enhance our capabilities for system integration design technology, material procurement, and project management technology in order to better match up our various leading-edge products and services with the needs of our customers and maximize their success on a global scale (Fig. 4).

NEC will aim to achieve a society with better life style by optimally using our state-of-the-art technologies and system integration capabilities.

Authors’ Profiles

FUJINAGA Seiji

Senior Manager
Global SI Service Business Development Division

Francisco Yoshihiro YAMAMOTO

Manager
Solutions Engineering
Engineering Division
NEC Latin America S.A.

Claudia Yokoo EGUTI

PMO IT Department Manager
PMP
NEC Latin America S.A.

FUKUNAGA Kouichi

Manager
Corporate Business Development Division

SAKAMOTO Shuusaku

Assistant Manager
Corporate Business Development Division

KODA Takuya

Assistant Manager
Corporate Business Development Division

KOBAYASHI Tetsuro

Manager
Corporate Business Development Division

* Wi-Fi is a registered trademark of Wi-Fi Alliance.

Information about the NEC Technical Journal

Thank you for reading the paper.

If you are interested in the NEC Technical Journal, you can also read other papers on our website.

Link to NEC Technical Journal website

Japanese

English

Vol.9 No.1 Special Issue on Solutions for Society - Creating a Safer and More Secure Society

Remarks for Special Issue on Solutions for Society - Creating a Safer and More Secure Society

NEC's Vision for Public Solutions

NEC's Public Safety Initiative

For a life of efficiency and equality

New Services Realized with the "My Number" System

"NEC Stadium Solutions" Played a Critical Role in Construction of the World Cup

Deployment of Eye-Catching, Visually Appealing Flight Information Systems

NEC SDN Solutions Accelerate New Service Implementations for Railway Stations

Cloud-Based Interpreting Service Using a Videoconference Telephone Compatible with Multiple Devices

Easy-to-Use, Smartphone-Oriented Internet Banking, featuring Color Universal Design

The World's Best Face Recognition System to Achieve Safety and Security in Our Society

Product Line-up for Face Recognition Solutions and its Social Applications

For a safer and more secure life

Healthcare challenge with ICT (Information and Communication Technologies)

Information Governance

Safety Awareness Network

Building a Safer City in Singapore

Securing the Future in Tigre

New Congestion Estimation System Based On the "Crowd Behavior Analysis Technology"

Speech/Acoustic Analysis Technology - Its Application in Support of Public Solutions

High-Sensitivity Camera for Round-the-Clock Surveillance

Imaging Solutions for Search & Rescue Operations

Emergency Mobile Radio Network based on Software-Defined Radio

For the security and safety of critical infrastructure

Centralized Information Control System Supporting Safe and Stable Shinkansen Transportation

Smart Water Management Technology with Intelligent Sensing and ICT for the Integrated Water Systems

A Water Leak Detection Service Based on Sensors and ICT Solutions

Harbor Monitoring Network System for Detecting Suspicious Objects Approaching Critical Facilities in Coastal Areas

Failure Sign Monitoring System for Large-scale Plants Applying System Invariant Analysis Technology (SIAT)

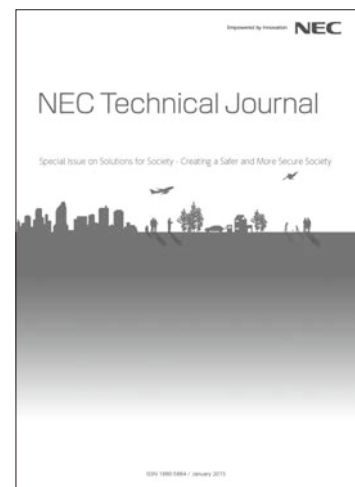
Infrared Camera Image Processing Technology and Examples of Applications

Cyber Security Factory - Our Commitment to Help Developing More Effective Methods of Coping with Today's Increasingly Sophisticated Cyber Threat

Advanced technologies for a Safer and More Secure Society

Technologies for Improving the Speed and Accuracy of Fingerprint Identification Systems in Support of Public Bodies

Compression Technologies Supporting Next Generation Broadcasting Services - Ultra-HD Digital Video Compression Technology and Real Time HEVC Compression Unit Corresponding to 4K HD Images



Vol.9 No.1

January, 2015

Special Issue TOP

NEC Information

NEWS

NEC Starts Operation of Satellite Integration Center

Development of Water Purification System Type2 Reverse Osmosis (WPS RO2) for Japan Ground Self-Defense Force
