

*Benefits of GIS-Based Computer Inventories
On the
Texas A & M University – Corpus Christi Campus*

Cynthia and Christine Calamug

ABSTRACT

Texas A & M University – Corpus Christi is located on an island with limited growth location for much desired computer labs. Geographic information systems used for the inventory of campus computers is beneficial for administrators as an inventory tool, which will save time, money and resources. Through this inventory, suitable study locations for students with wireless notebooks can be determined as well. Each computer, its operating system, and ports were collected into a GIS database. The information will be available for users to query about the computer infrastructure as well as their spatial locations on the Texas A & M University – Corpus Christi campus. With this query capability, the user can determine ideal study environments for future computers. An interactive, digitized map of the campus provides a visual representation of the distribution of spatial information. The GIS has the capacity to be updated by non-GIS administrators as computers, locations, and operating systems expand in number. The computer inventory project's resulting database will help the university with allocations and future campus expansion.

INTRODUCTION

The concept of taking inventories has proven to be an effective method as a means to conserve money, time, and resources for a vast assortment of agencies and institutions. The limited size of the Texas A & M University – Corpus Christi campus is due in part to its geographical location on Ward Island, a 240 acre sandbar within the city of Corpus Christi, Texas. Currently Texas A & M University – Corpus Christi lacks an inventory incorporating campus computer information with telecommunications information. A GIS - based computer inventory for a smaller scaled campus such as Texas A & M University – Corpus Christi is unquestionably feasible, since the Texas A & M University Corpus Christi campus's modest size grants ease in the implementation and maintenance of the computer databases, as opposed to other campuses of greater magnitude, such as the University of Texas at Austin.

A supportive inventory tool is the use of a geographic information system (GIS) given that it combines the visual, the databases, and provides administrators with the means to conduct spatial analyses to further aid in decision making processes. Time is saved because all computers are accounted for in one centralized system, which is the GIS, and whenever time is saved, money is saved. Resources are saved, because the inventory will take the guess work out of trying to determine the need for computers, therefore yielding a more accurate proportion. On top of this, the GIS's visual capabilities offer a better perception of the spatial locations of the computers as well as the ports on the Texas A & M University – Corpus Christi campus.

LITERARY REVIEW

GIS-Inventories have demonstrated their effectiveness when used as a tool for the challenges of real world situations. Due to the convenient visual capabilities of geographic information systems, many organizations and individuals have gained better understandings of their tasks and developments. Casey Trees Endowment was one such organization. One of Casey Trees' goals was to gather and maintain up-to-date information in relation to the urban trees in the Washington, D.C. area. The tree information produced by Casey Trees is utilized by tree care professionals, policy makers, and city residents. Casey Trees Endowment incorporated state-of-the-art, hand-held computers supporting geographic information system software in order to directly record urban tree data into a GIS database. The urban tree data was later graphically represented on a map, showing the locations of trees, the number of trees on each street, where sick or dead trees were located, as well as healthy trees. Casey Trees' findings allowed them to determine where to unearth unhealthy or dead trees in order to replant newer, healthy trees (Deutsch, Howard).

Another project, "Rehabilitation of the Part of the Water Supply Network," funded by the Austrian Government, introduced a geographical information system as a means to establish a water supply network inventory (Project GIS). Their purpose was to maintain, revitalize and develop the water supply and sewer systems in Sarajevo. Geographic

information systems' abilities allowed the project to be highly efficient in the search and repair of damages and leaks in the water system. The GIS inventory was a digital inventory comprised of all the water supply elements, sewer networks, reading system, and other general street, river, administrative border data. All water supply information was stored on a GIS server. Users were capable of editing the spatial and attributive data in the GIS databases, as the data on the GIS server were able to be viewed, used and printed by all users. Analysis was performed in order to make clear decisions about concrete actions to take, such as the priority of repairs, reconstructions, replacements, etc. This projects goal was to continuously track water loss and efficiently plan for the investigation of leaks (Project GIS).

Other industries have already taken hold of the GIS Inventory concept, such as the livestock industry. In Ontario, a GIS-based livestock inventory is under development to track the movement of livestock. Angus Geosolutions developed the template that is being applied in the creation of the national GIS inventory of livestock premises. The approach is to see where geography plays a role in emergency response, and the GIS database will be used for defending against foreign animal disease. Although not fully implemented yet, the inventory is already regarded as a valuable tool when tracking the movement of livestock (Cochrane, 2004).

METHODOLOGY

The academic and faculty buildings that are to be included in this project include, but are certainly not limited to, are as follows:

- ❖ Science and Technology Building
- ❖ Center of Instruction
- ❖ University Center
- ❖ Bell Library
- ❖ Center for the Sciences

- ❖ Early Childhood Center
- ❖ Corpus Christi Hall
- ❖ Classroom East
- ❖ Faculty Center

Due to the magnitude of this particular GIS task, the Science and Technology building was selected as a prototype to test and model the benefits of a GIS-based inventory. Organization of how data collection would be gathered required extensive planning in order to ensure that project time was maximized to the fullest. During the planning stage, the manner in which data collected from the Science and Technology building and storage methods were determined, as well as how it was to be organized, what types of software were to be used at that level, and best times to collect data. This was imperative since data collection dealt with having to gain admission into faculty offices.

Several important individuals possessing vital computer and telecommunication information regarding the Science and Technology building were immediately brought to our attention. Keith Franger, Director of Telecommunications, was among the group of people who provided our project with crucial telecommunication information on port identification numbers for the Science and Technology Building. A. Trivedi, Computer Lab Supervisor, provided computer information from an Microsoft Excel spreadsheet containing all the first and second floor computer data such as operating systems, property ID tag numbers, room numbers, Dell service tags, the make of the computers, etc. for the Science and Technology Building. The fields that were utilized in the inventory included the building and room number, property tag numbers, Dell service tags, computer type, and operating systems. Third floor computer information was hand-collected by foot. Dr. Tim Coppinger provided the AutoCAD drawings of the Science and Technology building, which he has made available on the TAMU-CC's Computing and Mathematical Science lab network's shared directory. The first, second, and third story floor plans of the Science and Technology buildings were obtained from these available shared files.

Microsoft Access was used to store the data obtained from the various sources because of its versatility with the movement of data and the ease of importing a .dbf file into a GIS and joining the .dbf file to GIS layers. As mentioned earlier, the fields that were employed include building, room number, port IDs, property tag numbers, Dell service tags, computer types and operating systems. (see figure 1)

Date	Building	RoomNum	PortID	Cmptr_Type	PrptyTagNum	OpSystem	DellTag	Notes
2/18/2004	ST	220 - 14		Optiplex GX 400	150100038063		3D4VT01	Electronics Prot
2/18/2004	ST	118		Optiplex GX 400	150100038064	Windows 98		
1/21/2004	ST	106	B67 / B68 / B6E	Dell Optiplex GX 400	150100038065	Windows XP	BD4VT01	Classroom
2/18/2004	ST	207C		Optiplex GX 400	150200038629	Windows 2000		Lyle, Stacey
2/18/2004	ST	221 - 02		Optiplex GX 400	150200038642		BYRWXD1	Electronics Prot
2/18/2004	ST	221 - 01		Optiplex GX 400	150200038643			Electronics Prot
2/18/2004	ST	221 - 03		Optiplex GX 400	150200038644		F3SWXD1	Electronics Prot
2/18/2004	ST	214cl		HP Color LJ4550N	150200038676			design lab
2/18/2004	ST	207A		Optiplex GX 400	150200038677	Windows 2000		Loon, Joseph
2/18/2004	ST	214 -24		Optiplex GX 400	150200038692	Windows XP		design lab
2/18/2004	ST	214 -10		Optiplex GX 400	150200038693	Windows XP		design lab
2/18/2004	ST	214 -05		Optiplex GX 400	150200038694	Windows XP		design lab
2/18/2004	ST	214 -01		Optiplex GX 400	150200038695	Windows XP		design lab
2/18/2004	ST	214 -20		Optiplex GX 400	150200038696	Windows XP		design lab
2/18/2004	ST	214 -17		Optiplex GX 400	150200038697	Windows XP		design lab
2/18/2004	ST	214 -06		Optiplex GX 400	150200038698	Windows XP		design lab
2/18/2004	ST	214 -02		Optiplex GX 400	150200038699	Windows XP		design lab
2/18/2004	ST	214 -03		Optiplex GX 400	150200038700	Windows XP		design lab
2/18/2004	ST	214 -25		Optiplex GX 400	150200038701	Windows XP		design lab
2/18/2004	ST	214 -16		Optiplex GX 400	150200038702	Windows XP		design lab
2/18/2004	ST	214 -13		Optiplex GX 400	150200038703	Windows XP		design lab
2/18/2004	ST	110		Dell Optiplex GX 400	150200038740		8GBM011	
2/18/2004	ST	116			150200038741			
2/18/2004	ST	111 - 05		Dell Optiplex GX 400	150200038742		5HBM011	Control System
2/18/2004	ST	111 - 01	A45 / A46 / A47	Dell Optiplex GX 400	150200038743		7HBM011	Control System
2/18/2004	ST	111 - 03		Dell Optiplex GX 400	150200038744		9HBM011	Control System
2/18/2004	ST	111 - 08		Dell Optiplex GX 400	150200038745		G3SWXD1	Control System
2/18/2004	ST	217 - 01		Optiplex GX 400	150200038745		CHBM011	Electronics Prot
2/18/2004	ST	111 - 02		Dell Optiplex GX 400	150200038746		DHBM011	Control System
2/18/2004	ST	111 - 07		Dell Optiplex GX 400	150200038747		GHBM011	Control System
2/18/2004	ST	111 - 04		Dell Optiplex GX 400	150200038748		JHBM011	Control System

(figure 1). Database with computer and port information

The information obtained from the previously mentioned individuals was manually input into Microsoft Access under the corresponding field names. The resulting Access .dbf file was joined to all three Science and Technology floor plan layers.

Originally, as the data collection was being collected, suitable study locations for wireless notebook computers were also to be scouted. The three fields that pertained to this aspect of the data collection process would mainly be opinionated and determined by the data collectors. Those fields would include noise levels, rating from one to ten, ten being the highest noise level, as well as traffic areas, rating from one to ten, ten being the highest

level of traffic in that specific location. The third field, and possibly the most important, would be whether or not the location had one of the Wi-Fi antennas for internet within the range needed to operate the computers.

However, this task was not accomplished for this project, as the majority of the Science and Technology building contains office space and classrooms that are not available to students at all times unless granted special access. In other campus buildings, this determination of suitable study locations by querying the database is possible. Such buildings include Corpus Christi Hall, as it has many open labs as well as open areas, the University Center because of its vast open areas and numerous sitting areas complete with tables, the Center of Instruction because of the available computer labs, and of course, the campus library, Bell Library.

The AutoCAD drawings of the Science and Technology building that were obtained from Dr. Tim Coppinger were viewed using Carlson Software 2004. While the AutoCAD files were opened, the desired layers were selected by freezing the unnecessary layers. The layers selected from the AutoCAD drawings were the annotations, which included room number and the room's purpose, lines that represented the building's walls, and polygons, mainly for enhanced visual appearance. This procedure was repeated for all three Science and Technology floor plans.

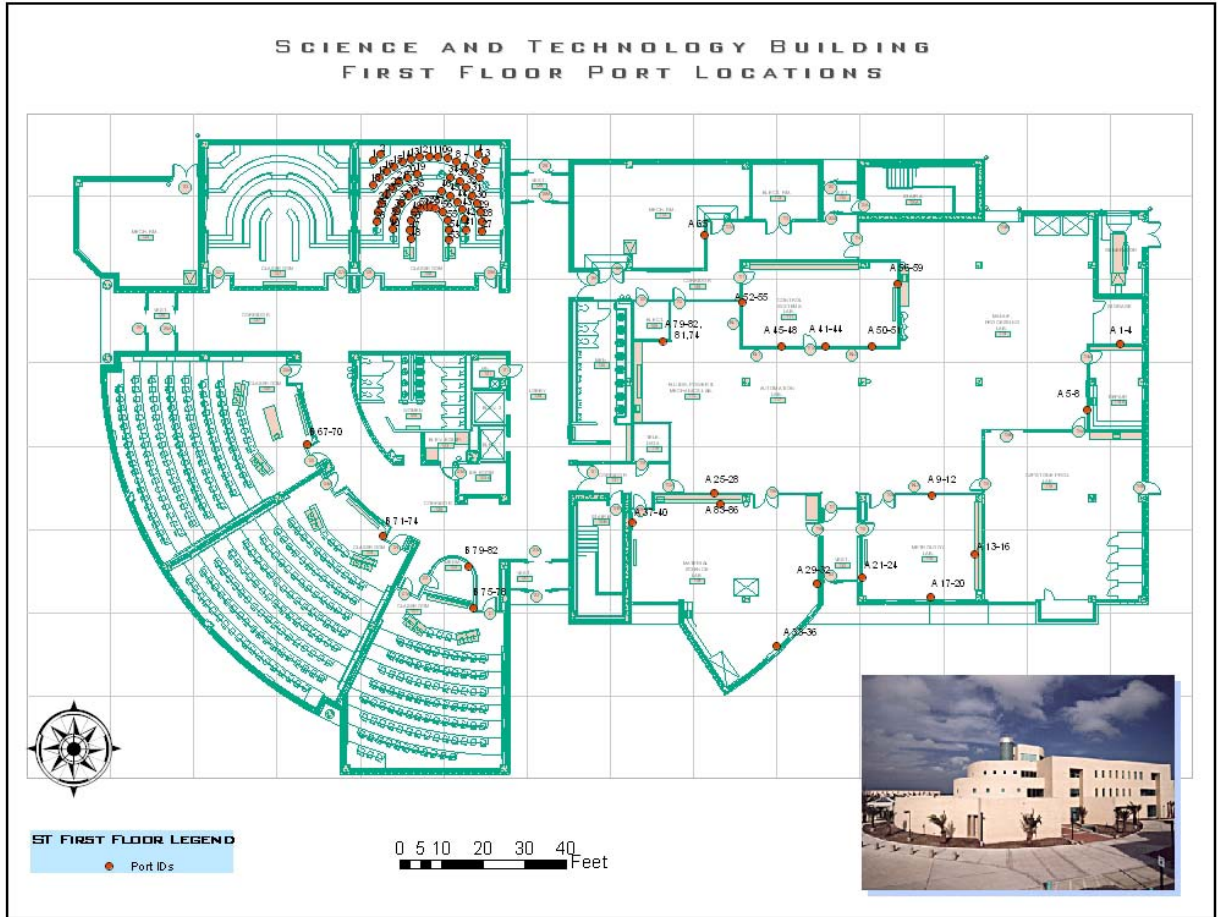
Environmental Systems Research Institute's (ESRI's) software, ArcMap 8.3 was employed to accomplish the goals of this project. The AutoCAD drawings had to be imported into ArcMap as .dxf files. Upon importing these files, they had four features associated with each file per Science and Technology building floor: annotations, polylines, and polygons.

For organization purposes, three group layers for each floor were created, holding all the separate features per floor. Three map files were saved, one floor per file, in order to have three different layouts.

Next, an interactive map of the Science and Technology building, which enables the user to use the identify tool to click on the available features on the map was created through the use of ArcMap. One can view the attribute tables and the Microsoft Access files, associated with that feature. The database containing all the computer information has the capability to be queried. Such queries may include what computers are available per floor, what operating systems they have, and port IDs per room. On top of that, hyperlinks were added to the features, linking Microsoft Word documents containing the port ID and computer information. This allows the map user to click on the feature to view the associated document which pops up on screen.

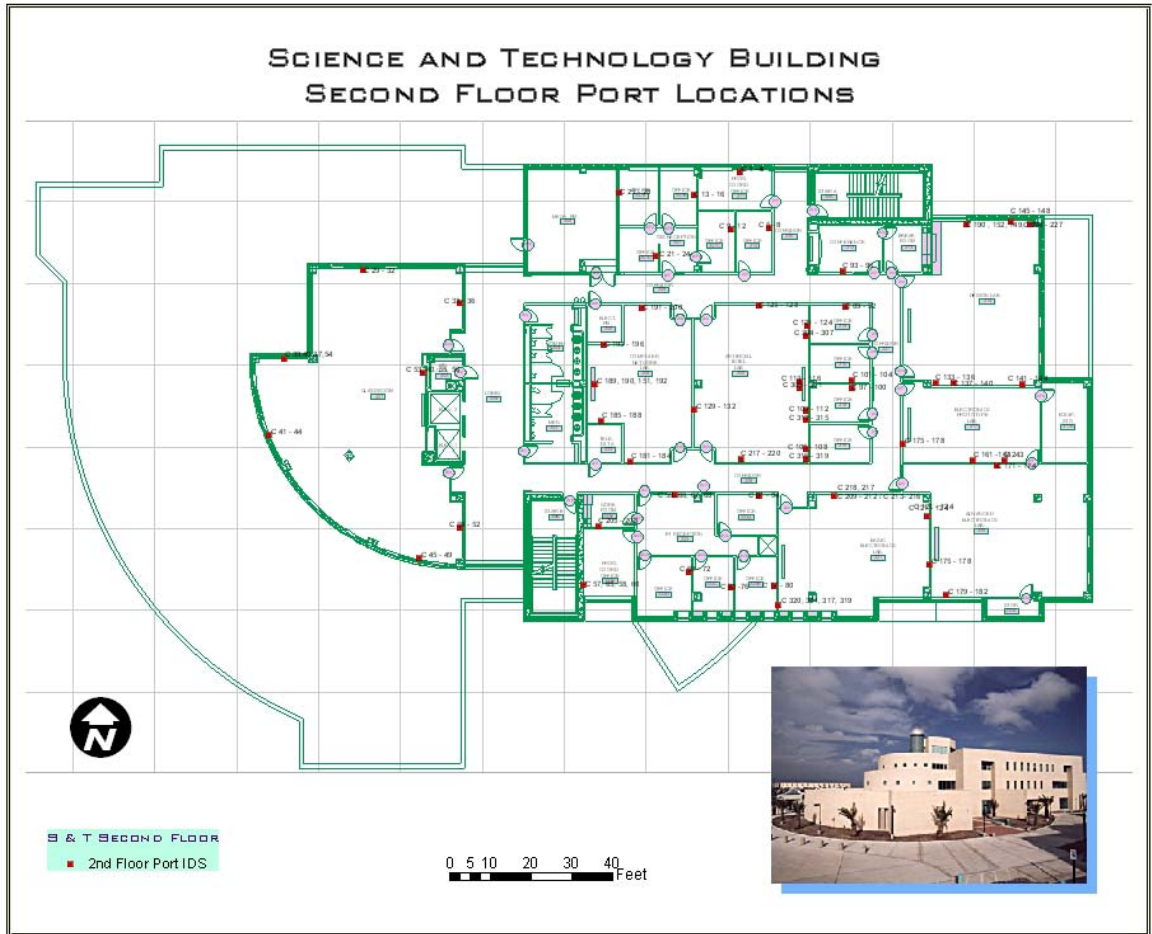
In order to allow the user to determine distances on the map, a grid was created by the creating two shapefiles, a polygon and a polyline shapefile. The polylines were offset inside the rectangular polygon vertically and horizontally by 20 feet, so each cell was a 20ft by 20ft square. Once this task of creating the grid with the polylines was complete, the edges were clipped to combine both the polygon and polyline layer. The grid will allow the user to discern the exact locations of the ports. This is useful, as many of the ports are behind large pieces of furniture and their spatial locations are either easily overlooked or are not readily accessible.

RESULTS

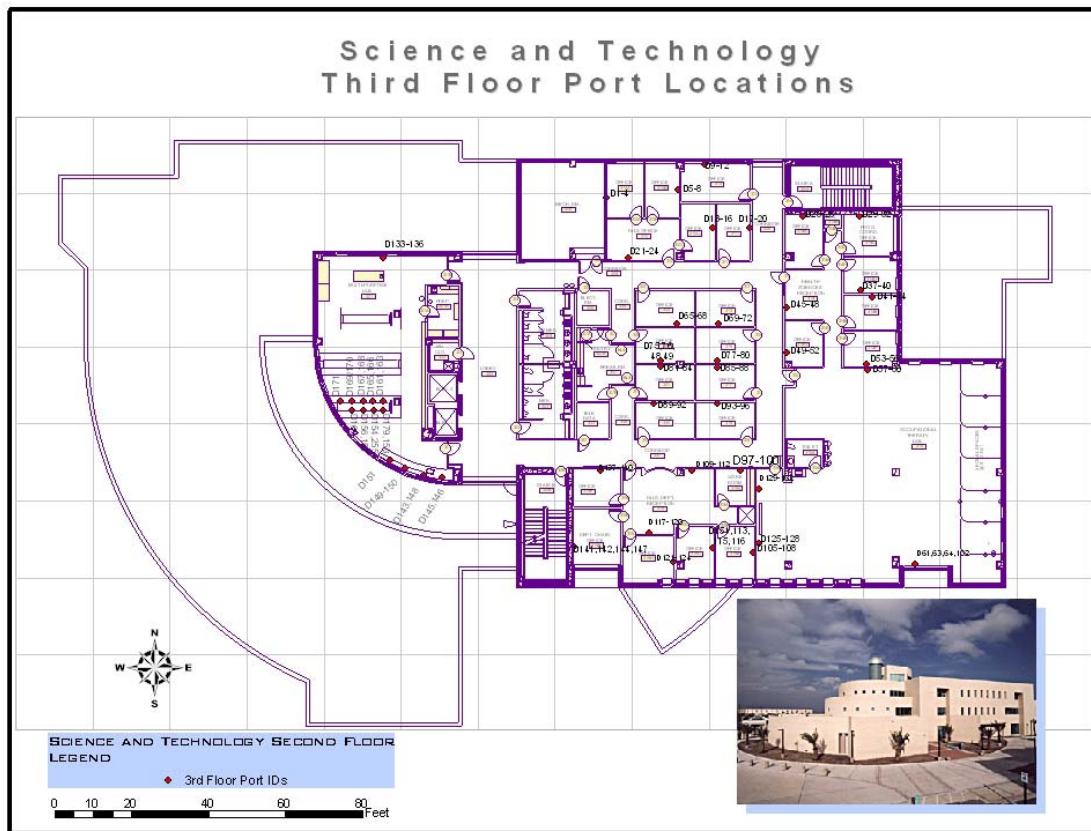


Map 1: First Floor Port Locations

SCIENCE AND TECHNOLOGY BUILDING SECOND FLOOR PORT LOCATIONS



Map 2: Second Floor Port Locations



Map 3: Third Floor Port Locations

As a result of our findings, three maps of the Science and Technology building were produced. Each map was a floor plan of the first, second and third floors of the building. The resulting maps show the locations of the ports in the building. Through the use of hyperlinks, one can access individual room information simply by clicking on each feature. Due to the nature of the Science and Technology Building, suitable study locations for students with wireless notebooks were unable to be determined. Spatial analysis will be able to be performed in the future as the computer inventory project progresses into other academic and faculty buildings on the Texas A & M University - Corpus Christi campus.

CONCLUSION

As this project serves as only a “snapshot” in time, much more updating will still remain as additional buildings are added to the campus. The resulting GIS inventory of the Science and Technology building has the means of being updated by non-GIS administrators as computers and their locations develop further. The ease of updating the GIS inventory is necessary as the project progresses from the Science and Technology building unto other buildings on campus. These users can easily access and modify the Microsoft Access files to fit the needs of the growing computer inventories. The number of computers as well as the information about them will be accessible to present and future users, and will continue to help the school conserve time, money and resources.

REFERENCES

Deutsch, B. & Howard, H. "Tree Inventories Program," Casey Trees Endowment, 2002.
(<http://www.caseytrees.org>).

"Project GIS: Development Project for the Geographical Information System."
(http://www.viksa.com/ba/enu/about_us/project_gis.html).

Cochran, B. "GIS Based Livestock Inventory Expected to Streamline Animal Tracking." Farm-Scape, Episode 1461. March 5, 2004.
(www.thepigsite.com/LatestNews/?AREA=LatestNews&Display=7189)

AUTHOR INFORMATION

Primary Author

Miss Cynthia Flores Calamug

Texas A&M University, Corpus Christi

2226 Redfish Bay Drive

Corpus Christi, TX 78418

US

361-937-0278

CynthiaCalamug@yahoo.com

Co-Author

Miss Christine Flores Calamug

Texas A&M University, Corpus Christi

2226 Redfish Bay Dr.

Corpus Christi, TX 78418

US

361-937-0278

ChristineCalamug@yahoo.com