Sustainability Drives the Smart Campus: GIS is the Platform

Presented by
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University of Massachusetts Amherst

Umass at a Glance:
• 28,635 Students
• 1,300 Full Time Faculty
• 5,000+ Employees
• 12.5 + Million square feet
• 200 + Major Buildings (Main Campus)
• 1,450 Acre Campus
• 1 FTE GIS Architect in A&F Support Services
• Individuals involved from Campus Planning, Design and Construction Management, Physical Plant
Agenda – Communication and Collaboration

• Sustainable UMASS
• Institutional Structure for Sustainability
• Why GIS is the Preferred Platform
• Current Infrastructure and Efforts
• Communication & Collaboration

Special Thanks to my colleagues for their contributions:
Dr. Alexander Stepanov, Ludmilla Pavlova, Jonathan Contract, Lukasz Czarniecki
ACUPCC, AASHE & STARS, Princeton Review, Sierra Club, Mass Recycle
**Sustainability is Complex:**

<table>
<thead>
<tr>
<th>Multifaceted Problem</th>
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</thead>
<tbody>
<tr>
<td>Failure to Understand Systemic Reality</td>
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<td>Skills and Capacities</td>
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</table>
## Sustainability Requires Systemic Knowledge & Action

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<thead>
<tr>
<th>Multifaceted Problem</th>
<th>Multifaceted, Systemic Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failure to Understand Systemic Reality</td>
<td>Systems Thinking</td>
</tr>
<tr>
<td>Skills and Capacities</td>
<td>Education and Training</td>
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<tr>
<td>Technology and Design</td>
<td>Expertise in green building, energy, transportation, etc.</td>
</tr>
<tr>
<td>Time and Money</td>
<td>Business Development, Finance and Accounting</td>
</tr>
<tr>
<td>Knowledge and Attention</td>
<td>Advocacy</td>
</tr>
<tr>
<td>Politics and Power</td>
<td>Leadership and Organizational Culture</td>
</tr>
<tr>
<td>Organizational Limitations</td>
<td>Social Marketing Techniques</td>
</tr>
</tbody>
</table>
The “Vision” is to create a fully integrated knowledge and information management system that provides decision support for all of the different divisions that make up the enterprise that is the University of Massachusetts.

- Centralized Data Warehouse
- Workflows and Business Practices
- Easy to Use Web Based Tools
- 3D and Visualization Tools
- Right People, Right Access, Right Tools for Decision Support
Campus as Systems

3. Campus as System

- Buildings
- Open Space
- Transportation/Transit
- Utilities
- Infrastructure

Educational Process
Research
Outreach
GPV Applications

Select an area of UMass campus using a map widget above, then start one of the apps ...

- **Landscape Management**
  This web application provides web-access to spatial layers related to landscape management, such as the tree inventory and open space areas. Certain data layers like the Tree Inventory are searchable.

- **Utilities Management**
  This web application provides easy access to the utilities/infrastructure data, such as steam, water, electric and drainage lines. It also includes information on the past utilities contracts (1947-2000), and surveyors' notes and annotation. All data layers are searchable.

- **Pavement/Hardscape Management**

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**Have an idea? Get Involved!**

If you have an idea regarding use of GIS on our campus or how specific information or an application (if available) would improve and simplify your everyday operations, please let us know. Contact **Niels La Cour** for more information and to share your ideas and suggestions for continuous improvement of these applications or development of new applications.
Campus as Systems: Buildings

3.1 Buildings

3.1.1 External Shells
- Collada, Photos, Textures, BIM

3.1.2 Footprints [GIS/CAD]

3.1.3 Internal Spaces
- 3.1.3.1 Space Geometry [CAD]
- 3.1.3.2 Function
- 3.1.3.3 Type
- 3.1.3.4 Owner
- 3.1.3.5 Organizational Use
- 3.1.3.6 Scenarios
- Excel

3.1.4 External equipment (MEP, HVAC)

3.1.5 Internal Equipment

3.1.6 Connections to external systems
- 3.1.6.1 Utilities
- 3.1.6.2 Loading Docs

Scheduling R25
HR Personnel

Space Management/TRIRIGA

BIM, CAD, NavisWorks

CAD/GIS
Campus as Systems: Open Space

3.2 Open Space

- 3.2.1 Trees, Brushes and Plants
  - TreeWorks - GIS/ CAD
- 3.2.2 Landscapes
- 3.2.3 Pictures

Educational Process
Maintenance
Student Life Events
Public Safety
Campus as Systems: Open Space
Campus as Systems: Transportation/Transit

3.3 Transportation/Transit

- 3.3.1 Roads
  - 3.3.1.1 Main Roads
  - 3.3.1.2 Secondary Roads
  - 3.3.1.3 Service Roads
- 3.3.2 Parking Lots [GIS/CAD]
- 3.3.3 Sidewalks
  - 3.3.3.1 Pedestrian Traffic
- 3.3.4 Driveways
- 3.3.5 Vehicles/Bikes/Pedestrians
- 3.3.6 Statistics: Traffic Counts, Parking Space Inventory
- 3.3.7 Bus Stops/Schedules

GIS: Condition Index
Faculty/Staff & Student Parking
Safety
Origins/Destinations

EXCEL

GTFS; PVTA; GIS
Campus as Systems: Transportation/Transit
Campus as Systems: Utilities

3.4 Utilities

3.4.1 Steam
3.4.2 Water
3.4.3 Sewer and Drainage
3.4.4 Electrical

CAD, GIS in Dev

Maintenance Upgrades to support other systems
Campus as Systems: Utilities
Campus as Systems: Infrastructure

3.5 Infrastructure

- 3.5.1 Lightpoles
- 3.5.2 Utility poles
- 3.5.3 Street Furniture
- 3.5.4 Signs/Signage
- 3.5.5 Emergency Phones
- 3.5.6 Other

CAD/GIS/Hardcopy Maps
Aesthetics
Public Safety
Data & Analytical Workflows (WF)

Client Applications & Systems
- Desktop
- Mobile
- Web

SCENARIO VISUALIZATION
- OPTIMIZATION [SAS/OR]
- ANALYTICAL TOOLS
- 3D Modeling

ArcGIS Server
- WebServices

Geo-Database
- Layers
- Attributes
- AUX

Rotation
- Shift
- Scaling
- Colors
- Ref to Assets

3D Assets/Textures
- ETL 1
- ETL 2
- ETL 3
- ETL 4
- ETL 5
- ETL 6
- ETL N

GIS File GeoDB
- Personal GeoDB
- ShapeFiles

CAD
- Georef.
- CAD
- FloorPlans
- TRIRIGA (Space)

BIM
- SQL Server
- XML

Other IT Systems
- Legacy Data
Data InterOperability WorkBench

Support for more than 300 data formats

• Visual programming
• Visual debugging
• Log files
Student Portal Web Map
Staff Viewer: Mark-up Tools
Staff Viewer: Mark-up Tools
Staff Viewer: Mark-up Tools
Web site was developed as permanent platform for web based participation process, communication and planning resources.

Over 3,500 Visits
Web Based Survey “Likes”

People like good outdoor spaces with nice plantings and views.

People like the views from the campus core.
Web Based Survey “Dislikes”

People comment on tired old buildings that need to be demolished and replaced.

People don’t like cars where only pedestrians should be and there are complaints about dangerous crosswalks and intersections.
place

campus
Why is it important?

Having a strategic plan of long-term growth and development is crucial for any successful organization.

The Master Plan outlines major phases of long-term development of our Campus, which will sustain and support the University’s mission.
The East Campus Pond Lawn is one of the largest and most visible of the Campus green spaces. It is also one of the most historic landscapes on campus, together with the west lawn, remnants of the "Central Park" or "Campus Green" shown in historic plans. The protecting and enhancing open space are key to maintaining its historical and aesthetic significance.
Master Plan Story Map

Research and Education Greenhouses

Completed 2011 - 16,085 gsf. Features sophisticated automated systems to control natural and artificial lighting, temperature, humidity, irrigation and fertilization. The control system can also adapt the interior environment to the sun, wind and weather. The facility has two research labs, a wet/dry classroom for botany instruction and a core facility for seed germination.
UMass has over 300 Sustainability Related Courses

- **New Faculty Fellows program launched:**
  - 11 Fellows for 2013/14
  - Partners: E&R + CFT + Library

- **Research: $31M Annually**
  - Almost $1 in every $4 of total research expenditures.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title and Description</th>
<th>Credits</th>
<th>Meeting Days</th>
<th>Term</th>
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<tbody>
<tr>
<td>ARCH-DES 497A</td>
<td>ST-Sustainable Building Systems</td>
<td>3 cr</td>
<td>TU</td>
<td>Fall 2013</td>
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<tr>
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<td>Fall 2013</td>
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<td>BCT 150</td>
<td>The Built Environment</td>
<td>4 cr</td>
<td>M W</td>
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<td>Energy Efficient Housing</td>
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<td>TU TH</td>
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<td>F</td>
<td>Fall 2013</td>
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<td>ECO 697PS</td>
<td>S-Perspectives on Sustainability</td>
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<td>F</td>
<td>Fall 2013</td>
</tr>
<tr>
<td>ECON 308</td>
<td>Application of the theories of political economy to environmental problems and issues. Topics...</td>
<td>3 cr</td>
<td>TU TH</td>
<td>Fall 2013</td>
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</table>
NSF Project Will Support Undergraduates Research in Offshore Wind Energy
NSF Project Will Support 10 Undergraduates Per Summer for UMass Amherst Research in Offshore...

New E-Waste Recycling Bin in the SGA office!
A new electronic waste collection bin has been installed in the SGA office located in room 420...

NSF Grant Funds Sustainable Agriculture, Clean Energy Partnership
The NSF has awarded an $810,000 grant to create collaborative programs combining clean energy...

IN THE SPOTLIGHT

UPCOMING EVENTS

Apr 09 Strengthening Ties for Collective... UMass Amherst Campus
Read More

Apr 10 Strengthening Ties for Collective... UMass Amherst Campus
Read More

Show all events »
Sustainability Explorer
Solar Panel Siting Study

Finding Potential Sites for Solar Panel Locations

[Map and data visualization]
Scope 3 GHG Emissions Study
Waugh Arboretum Viewer
Building Energy Data
Campus Energy Benchmarking Explorer
Energy Use by Building
GIS@UMASS

It’s all about Sustainability