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Brent Bursey
Geospatial Intelligence SME
President/CEO
Great-Circle Technologies, Inc.

Clearance: TS/SCI with full-scope lifestyle polygraph

Summary Qualifications: Mr. Bursey has more than 20 years of professional experience as a geospatial subject matter expert (SME). Throughout his career, Mr. Bursey has worked as a GIS consultant, senior software/systems engineer, technical lead for pure and applied R&D/deployed system components, senior GIS systems architect, technical/project/program/capture manager, multi-INT geospatial intelligence SME, and is currently the founder/president of a small geospatial intelligence professional services and software product business. His geospatial experience has spanned multiple markets, including environmental science, transportation/navigation, state & local governments, civilian agencies, defense & intelligence, and R&D. He has extensive experience working with full systems/software lifecycles, spanning from program/product/service conceptualization to requirements definition/validation (authoritative responsibilities on Industry-standards, DoD, IC, and International working groups) to component/system design to software development and engineering management to system/software/process integration, configuration management, testing, documentation, packaging, distribution, and maintenance. Mr. Bursey is the President, Founder, and CEO of Great-Circle Technologies, Inc. (GCT), a highly focused geospatial firm specializing in the design, development, and deployment of advanced geospatial intelligence systems and solutions. Mr. Bursey's experiences include:

- Chief Geospatial Architect for the AMC (formerly GAC)
- One of three authors of the Enterprise Geospatial Intelligence Architecture (EGIA)
- Contributing member of the Open GIS Consortium (OGC)
- Capture/Program Manager for NGA-Source Multi-Source (Multi-INT) Pilot Program
- Geospatial SME supporting NGA-POR
- Geospatial/Multi-INT SME, NGA-P technical representative to IC-MAP program
- Geospatial/Multi-INT SME, NGA-PORT Upstream Processing Working Group
- Sr. GIS Architect, NGA Commercial Joint Mapping ToolKit (C/JMTK) program
- Technical Capture Manager, NGA C/JMTK program
- Sr. GIS Architect/Technical Manager, OSD BRAC Information System (BIS) program
- Geospatial Systems Architect, (Army & Air Force) Joint Terrain Analysis Tools (JTAT)
- Capture/Program Manager, Area Limitation Mission Application Segment (AL-MAS)
- Project Manager, DARPA ISO Dynamic Multi-user Information Fusion (DMIF) program

- Project Manager, DARPA ISO Tactical Terrain Analyzer (TTA) program
- Technical Manager/System Architect, NIMA Joint Mapping ToolKit (JMTK) program
- Technical Manager/System Architect,
 - USMC AAV Segment
 - ECDIS Navigation Segment
 - SPAWAR/NAVSEA/Coast Guard NAVSSI Segment
 - UB/JMCIS ECDIS Navigation Segment
- Technical Manager, DMA Electronic Charting Display Information System (ECDIS)
- Technical Rep. for US Navy/Coast Guard/USMC at ISO IEC working group 7 (ECDIS)
- Technical Rep. for DMA/US Navy/Coast Guard/USMC at DISA JMTK working groups
- Sr. Systems Engineer, DISA DII COE (OS kernels, IR&TS, segmentation, JMTK)
- Sr. Software Engineer, mapping, charting, geodesy and imagery (MCG&I) segments:
 - DISA Global Command and Control System (GCCS) – deployed C⁴I-SR system
 - US Navy SPAWAR Unified Build (UB) – deployed C⁴I-SR system
 - Coast Guard Vessel Traffic System (VTS) – deployed C³ system
- Software Engineer, IA/CT DOT Mobile Accident Reporting System (MARS)
- GIS Consultant, various commercial clients and civilian agencies (Federal, state, local)

Education:

The Pennsylvania State University

Geography: Geographic Information Systems (GIS), Cartography, Remote Sensing, B.S.: 1988

Thesis paper: *Remote Sensing: Applied to Marine Environments*

Thesis paper: *Analysis of the Economic Impact of the Protozoan MSX on the Chesapeake Bay Fishing Industry*

Thesis paper: *Spatial Structural Analysis of the Mapping Analysis Package (MAP)*

Research Project: Digital Elevation Model (DEM) display package for PC-AT Vectrix card, written in MS-FORTRAN

Research Project: ERDAS Imagine analysis of a Virginia salt marsh (*Spartina patens*, *Spartina alterniflora*) using scanned color and near-IR space shuttle photographs

Research Project: Creating color separates on a gray-scale HP-Scanjet scanner using inexpensive, spectrally sensitive filters

Research Project: Summer field work (1985-1991) to extract 90cm and 10m soil cores from various Virginia *Spartina* salt marches, in support of “Soil Salinity Levels in a Virginia March,” unpublished

Software/Language/Hardware Experience:

Software:

C/JMTK, JMTK	SocetSet	SAS: GMAP
ArcGIS, Arc/INFO ArcPlot,	Geomatica, Spans	World Projection Package—
ArcEdit, GRID, TIN, Network	OGC (WMS, WFS/-TWMC, WCS,	WDBII
ESRI Fortran libraries	CSW)	Mapping Analysis Package
ArcView (most extensions)	OSSIM Toolkit	General Cartographic
ArcIMS	Map Info	Transformation Package
SDE, Oracle10 g Spatial	MOSS, GRASS	iSMART
Imagine Professional (Vector,	Atlas Pro, MapMaker	IONIC Red Spider
NITF, VirtualGIS,	AutoCAD	
Developer’s Toolkit)	Surface II, Surfer, DI3000	

Languages:

ANSI C, C++	DCE, RPC	Clipper
Java2, JAI, J2EE, JDO	UNIX shells (C, Bourne, Korn,	FORTRAN 77
Visual Basic 6, VBA	Bash)	HPGL
ADO, SQL	regular expressions	PostScript
.NET	SAS	Hypertalk
HTML, XML, GML, SOAP	TSO CLIST	nroff/troff
XSLT, WSDL, web services	ESRI (AML, Avenue, ArcObjects)	X-Windows (X11 XLib, Toolkit,
CORBA (Orbix, Visigenics)	ERDAS (EML, SML)	Motif)

Hardware/OS:

SUN Ultra and SparcStation	Solaris, SUN OS	PC and Macintosh
HP	HPUX	DOS
IBM RS6000	AIX	Windows 3.1, 95, 98, 2000
DG Aviiion	DGUX	NT 4.0, XP
IBM 3090	TSO MVS	Mac OS
DEC VAX and Micro VAX	VM	
Beowulf clusters	RedHat Linux	

Professional Experience Summary:**President/Multi-INT Geospatial Intelligence SME/Enterprise GI Architect, Great-Circle Technologies, Inc., (GCT) Chantilly, VA, February, 2000-Present**

Mr. Bursey has successfully grown GCT from a small geospatial consulting business into a rapidly growing professional services business and a geospatial intelligence COTS product developer/integrator/VAR for autonomous geospatial intelligence workflow (AGIW) processing functionality executing within traditional client-server architectures and rapidly evolving enterprise geospatial intelligence service oriented architectures (EGI-SOA) deployed on workstations, Beowulf/blade clusters and/or grid computing systems.

Mr. Bursey provides technical and/or programmatic support to the following efforts:

- Multi-INT Enterprise Geospatial Intelligence Architect, NGA-PT. Tailored the GCT proven MERLIN Solutions Framework to develop and deploy an enterprise geospatial intelligence service oriented architecture (EGI-SOA) in support of a tactical counter terrorism (CT) mission
- GCT Capture Manager and Program Director for NGA SMARTS ID/IQ contract under BAE Systems
- Chief Geospatial Technologist, OTI Analytic Methods Center (AMC) under GRAAMI. In this role, he has worked closely with the customer and other contract team members to develop a comprehensive geospatial intelligence vision, spanning the customer's enterprise and beyond to the entire geospatial community. In addition to providing a pragmatic vision, he has also successfully scoped and managed the implementation of several aspects of this vision, including a unique COTS-based commercial imagery autonomous orthorectification workflow called AutoOrtho. Based on the success of this workflow, the customer has asked him to continue thinking out of the box to and describe additional autonomous geospatial intelligence workflows (AGIW), including autonomous mosaicing, autonomous terrain extraction, and autonomous feature extraction

- Multi-INT Geospatial Intelligence SME leading OTI GRAAMI Geospatial Technology 5-year Roadmap task to provide the Agency with a comprehensive geospatial technology vision implementing next generation enterprise level geospatial tools and services across all domains, utilizing loosely coupled, Industry standards-based systems architecture standards (OGC, OASIS, XML, SOAP, web services), and tailored COTS. This effort has resulted in the creation of the Enterprise Geospatial Intelligence Architecture (EGIA), which is being embraced by a number of organizations, including both the GAC and CIO
- Geospatial Intelligence SME responsible for the creation of the Commercial AutoOrtho workflow under GRAAMI. This workflow provides fully autonomous orthorectification workflow for commercial satellite imagery, utilizing DTED (1, 2, SRTM) and CIB (1, 5, 10) for control
- Multi-INT Geospatial Intelligence SME responsible for conceptualizing and codifying implementation strategies for developing autonomous geospatial intelligence workflows (AGIW) processing system running on variably sized Beowulf (Linux) multi-node clusters, supporting autonomous geospatial product discovery, orthorectification, seamless/cloud-free mosaicing, and rule-based (Bayesian) feature extraction/change detection workflows for commercial, NTM, and airborne imagery
- Program Manager for a GCT team of INT-specific Intelligence SMEs supporting the Multi-Source Pilot (MSP) program at NGA-Source to demonstrate the value of multi-INT/multi-Source data to NGA-P (Production & Analysis) imagery analysts (IAs) and geospatial analysts (GAs). This pilot couples IAs and GAs with Intelligence SMEs to pragmatically demonstrate how multi-INT data can add value to geospatial intelligence analysis and products being developed on the production floor
- Supervising task-specific GA support to the Department of Homeland Security
- Multi-INT Geospatial Intelligence SME supporting the NGA-P liaison to the Intelligence Community Multi-INT Acquisition Program (IC-MAP). Duties include assisting NGA-P in capturing and codifying the “analyst’s perspective,” from NGA IAs, GAs, regional analysts (RAs), and all source analysts, and reflecting this perspective as requirements to the IC-MAP community, the IMINT IC-MAP integrator, the NGA GeoScout Program (Lockheed-Martin), NGA-A (Acquisition) and NGA-I (Innovision), as well as NGA-P corporate management
- Multi-INT Geospatial Intelligence SME supporting the NGA PORT working group on Upstream and Full-stream processing. Duties include reflecting the NGA-P “analyst’s perspective” to on-going transition programs within NGA-A and NGA-I, as well as the broader IMINT community
- Designed and built the GCT IRaD product JMV-IT (JMTK-Visualization Integrator’s Toolkit). The JMV-IT is a collection of system integration methodologies and software for reverse engineering and documenting the actual API contents of a specified ICSF build (Windows, HPUX, Solaris). ICSF represents the DISA Integrated Command, Control, Communications, Computer, and Intelligence (C4I) System Framework (ICSF) for C4I systems. The JMV-IT dynamically creates a stub framework for every library present within the specified build, providing a robust basis for inserting non-invasive metrics into an existing software build and/or providing the basis for developing a translation layer for any build API (both public and private), without requiring access to

source code, only header files and the corresponding dynamically-linked libraries (DLLs) or UNIX shared libraries (.so)

- Senior GIS Architect for the NGA Commercial Joint Mapping ToolKit (C/JMTK) program under Northrop-Grumman/TASC. The C/JMTK program is an 11-year, \$73M program awarded in June 2002 to provide ESRI COTS to the DISA DII COE community as a replacement for the GOTS JMTK functionality already deployed world-wide in DII COE C⁴I-SR systems, such as GCCS, GCCS-M, GCCS-I3, GCSS, CTIS
- Technical Manager/Senior GIS Architect for the OSD Base Realignment and Closure (BRAC) Information System (BIS) program under UNISYS. The BIS program was a four-year, \$43M program to provide a centralized OSD-managed DoD-wide, worldwide enterprise GIS system to manage physical assets associated with Base Realignment and Closure (BRAC) activities. This program was canceled due to the tragic events of 9/11
- Senior GIS Architect for the Joint Terrain Analysis Tools (JTAT) program for the Army Corps of Engineering (ACE), Engineer Research and Development Center (ERDC), Topographic Engineering Center (TEC), and the Air Force Electronic Systems Command (ESC). The JTAT program is focused on developing an application framework for implementing tactical decision aids (TDAs) focused on the prosecution of time-critical-targets (TCTs) and time-sensitive-targets (TSTs). This joint program integrates the best GOTS TDA algorithms with a COTS infrastructure leveraging ArcView, ArcIMS, SDE, Oracle, Imagine, and Java. This multi-INT geospatial intelligence program successfully integrates IRINT, ELINT, SIGINT, OSINT and IMINT intelligence products with DIA derived intelligence domain models and a Bayesian modeled terrain suitability geospatial context

Program Manager/Senior Systems Engineer/Senior Software Engineer, Pacific-Sierra Research Corporation, Arlington, VA, 1997-2000

- Capture manager for the Area Limitation Mission Application Segment program (now known as JTAT), \$9.5 million, three-year effort to develop a terrain delimitation and movement projection system for TCTs and TSTs
- Program Manager and technical lead for the JTAT program, managing a PSR staff of 14, along with two subcontractors: ESRI and Lockheed-Martin Mission System (LMMS), Denver. Responsible for capturing a \$1 million FY00 plus-up to the JTAT program
- Project Manager for the DARPA ISO Dynamic Multi-user Information Fusion (DMIF) program, responsible for managing the development of a DII COE based test and transition environment (T&TE) for discretized intelligence fusion engines. The DMIF program was focused upon the dynamic creation and tailoring of all source intelligence product creation from a distributed system architecture leveraging a collaborative team of analysts. DMIF incorporated IMINT, IRINT, ELINT, SIGINT, MASINT, GEOINT intelligence products with geospatial analysis and context to developed the tailored geospatial intelligence products. The DMIF T&TE provided a fully distributed Java Bean/COBRA/DCE-based drag-and-drop interface for configuring information fusion test scenarios by defining test threads comprised of segmented USMTF test message sets, fusion engines, web-based product finishers, and performance and effectiveness metrics (MOPs and MOEs). The T&TE infrastructure was largely based upon the Army All Source Analysis System (ASAS) with the addition of an Informix Dynamic Data Server, an object-relation hybrid database, and the development of a DMIF-specific schema.

Also responsible for managing the sole subcontractor in this effort, LMMS, as well as coordination with the three other prime contractors in this program

- Project Manager for the Tactical Terrain Analyzer (TTA) program, responsible for the productization, DII COE segmentation, and transition of this DARPA ISO seeded R&D program to the Army ASAS, Air Force Theater Battle Management Core System (TBMCS), and DISA/DARPA JPO Global Command and Control System (GCCS) programs. TTA is a terrain based spatial analysis engine designed to determine high value target suitability for the development of intelligence preparation of the battlefield (IPB) products. The extensive knowledge based target domain models support both mission order of battle (MOB) and ground order of battle (GOB) targets operating in a variety of activities. The IPB output products of TTA are formatted in NITF 2.0 and are generally used as the GIS modeled input to probabilistic (Bayesian) fusion engines
- Supported the Air Force 497th Intelligence Group in an assessment of JMTK for TBMCS
- Supported various mapping, charting, geodesy, and imagery (MCG&I) related projects designing customized spatial algorithms implemented within the PSR MCG&I object oriented toolkit, an imake based integrated development environment and set of custom libraries, which support MCG&I spatial analysis and visualization
- Responsible for recruitment and supervision of 15 software engineers, system engineers, and military domain analysts, as well as providing technical oversight for the programs that these staff members were supporting

Engineering Supervisor/Senior Software Engineer, INRI, Reston, VA, 1995-1997

- Responsible for recruitment and supervision of 22 software/system engineers, as well as providing technical oversight for the MCG&I development team focused on JMTK and electronic navigation (ECDIS) business opportunities with DMA/NGA, DISA, and the Services
- Technical lead for the visualization domain of the DMA/NGA JMTK program, responsible for the design, development, and integration of joint DoD visualization requirements into the JMTK baseline, which was largely based on the INRI developed Navy command and control system: Unified Build (UB). The JMTK tools provided low-level functionality for reading and dynamically displaying all DMA/NGA products and editions (ADRG, WVS, WVS+, WMM, DTED, DBDB, DCW, VPF [VMap; UVMap; VITD], RPF [CIB; CADRG], SLF, S57), DIGEST, FACC, all USGS 1395 map projections, every validated MADTRANS coordinate conversion and datum translation API, and tactical tracks supplied by a tactical message systems (USMTF, OTH-GOLD, TADIL-A, TADIL-B and TADIL-J formats) and MIL-STD2525. Additionally, was the technical representative for the Navy, Coast Guard, Marine Corps to the DMA/NGA DII JMTK working group, the DII JMTK design/engineering working group, and the DII JMTK objective architecture working group
- Technical lead for the various Navy, Coast Guard, and Marine Corps ECDIS systems and responsible for the design and development of various ECDIS segments for the UB system. This work focused on solving R&D development issues related to ship-centered displays, heads-up displays, integrated vector and raster products configured to support ECDIS specifications, and the development of a robust spherical and elliptical based set of map projections. Participated in the International Electro-technical Committee (IEC),

TC80, working group 7 (ECDIS) meetings chartered by the IHO and the IMO to develop a set of testing standards for the IHO ECDIS specification

- Technical lead for SPAWAR/NAVSEA/Coast Guard Navigation System Sensor Interface (NAVSSI) Display Control Subsystem for the ECDIS Navigation System on the UB Joint Military command Information System (JMCIS)
- Technical lead for DMA Joint Interoperability Warrior Demonstration (JWID) '95 Global GIS (GGIS) prototype

GIS Manager/Software Engineer/Systems Analyst, American Management Systems, Inc. (AMS), Fairfax, VA, 1989-1995

- Designed/developed a C++ PCMCIA GPS interface for gathering differentially-corrected accident locations for a pen-based Mobile Accident Reporting system (MARS) for the Iowa DOT, the Connecticut DOT, and the Des Moines Police Department
- Designed, developed, and implemented an Environmental Protection Agency (EPA), Region 4 database access, analysis, and display methodology, leveraging Arc/Info, ArcView, and Imagine within a customized set of client server applications communication between EPA HQ, EPA RTP data warehouse, and Region 4 via TCP-IP protocols on Apple Macintoshes, IBM PCs, Data General Aviiion UNIX workstations, DEC MicroVAX mini-workstations, and IBM 3090 mainframes via JCL submitted to the internal reader via FTP scripts
- Designed/implemented a multi-platform/operating system imake-based development environment
- Designed the porting of a large legacy Department of Education Model 204 database to Oracle
- Designed a variety UNIX client-server networks (Token-Ring/Ethernet) supporting multiple LAN, CAN, and WAN services, ranging from simple bulletin board systems to complex GIS database systems
- Designed six different geocoding algorithms to evaluate the locational accuracy of EPA monitored facilities as a bi-variate function of locational accuracy and execution cost
- Designed a highly compact, octree-based global spatial indexing scheme and a series of spatial algorithms based on this code to support spatial queries, proximal queries, and non-contiguous feature queries of geographic data stored in a variety of RDBMs for a venture capital initiative
- Participated in the design and development of an Emergency Response E911 system for Westchester County, PA. Responsible for the design of a topological database in Clipper to maintain county level geography
- Participated in the design and evaluation of the EPA-wide GIS systems and data warehousing infrastructure RFP and award, resulting in the procurement and integration of Arc/Info with several huge environmental DBMSs
- Designed a nearest neighbor/farthest neighbor (convex hull) extension to Arc/INFO
- Developed AML code for the Oregon Clean Water Strategy program

Auto-Cartographic Technician/Systems Analyst, Deasy Geographics Lab PSU, University Park, PA, 1988-1989

- Developed a procedure to model the spatial diffusion of AIDs in Ohio, producing an aNGAted graphic design to communicate model results to an audience ranging from school children to health care professionals, in support of research by Dr. Peter J. Gould
- Responsible for producing camera ready graphics and maps for journal publication, maintaining the lab's microcomputers and peripherals, and writing FORTRAN utilities

(2) Cartographic Technician Internships, Penn State University, University Park, PA, 1987-1988

- Taught first year cartography students basic map production techniques
- Responsible for producing camera ready graphics and maps for journal publication, maintaining the Deasy Geographics Lab microcomputers and peripherals, and writing FORTRAN utilities

Professional/Technical Memberships:

- Photogrammetric Engineering & Remote Sensing (PE&RS)
- Armed Forces Communications and Electronics Association (AFCEA)
- IEEE
 - IEEE Computer Society
 - Computer Magazine
 - IEEE Transaction on Visualization and Computer Graphics
 - IEEE Transactions on Software Engineering
 - IT Professional Magazine
 - IEEE Internet Computing
 - IEEE Design & Test of Computers Magazine
 - IEEE Member Digital Library
- British Cartographic Society
 - The Cartographic Journal
- International Institute for Aerospace survey and Earth Sciences (ITC)
 - International Journal of Applied Earth Observation and Geoinformation
- American Mathematics Association