



## Proposing Expansion of the National Institute for Whole Chain Traceability & Food Safety Research

To: Dr. Stephen McKeever  
Vice President of Research and Technology Transfer  
Oklahoma State University

Proposed by: Steve Holcombe, CEO  
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Date: 14 November 2011

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Mayfield, Dr. Johnson Thomas, Co-Directors of the  
*nascent National Institute for Whole Chain Traceability  
and Food Safety Research*

## *Proposal Summary*

The Web was originally conceived as a tool for researchers who trusted one another implicitly. Building in the missing layers of trust and provenance that make possible “whole chain” information sharing is one of the “next Big Things” for the Internet. Xerox PARC believes so. So, too, Pardalis.

The nascent National Institute is at this time one and the same as a USDA NIFSI project funded for approximately \$350K in modified direct costs for 3 years beginning 1 Jan 2012. While Pardalis’ technology is already at the heart of the NIFSI project, Pardalis is further offering a practical vision for the expansion of the National Institute with a global, patent-hardened open source licensing strategy branded with the Whole Chain Traceability Consortium™, a trademark of Pardalis, Inc.

Global patent portfolios are expensive and time-consuming to obtain and protect. Pardalis has been patiently building a formidable global patent portfolio in the U.S., China, the EU and other countries since 2001. These patents cover critical methods for introducing trust and provenance to whole chain information sharing.

With appropriate funding, the proposed open source licensed strategy – managed by Pardalis on behalf of the National Institute - is the most efficacious means for the National Institute to become a global leader in commercially viable whole chain traceability research. This means providing for operations at the National Institute that are viably relevant to large IT savvy customers such as Cargill, Tyson, McDonalds, Wal-Mart, Syngenta, Nestlé, Monsanto, ADM, etc.

The investment of this funding is essential in providing Oklahoma with the best opportunity to (a) rapidly expand the number of researchers, technicians, and support services for whole chain information sharing technologies, (b) rapidly grow Pardalis in Stillwater, and (c) globally expand the activities of the National Institute. Doing so will position OSU to attract \$10s of millions in federal research grants and/or privately funded research. Doing so will provide the greatest opportunities for introducing related high-paying, private sector jobs into the Stillwater economy.

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## The Promise of Whole Chain Information Sharing

Global trade in agricultural and food products is a series of discrete transactions between buyers and sellers. It is generally difficult – if not impossible – to determine a clear picture of the entire life cycle of such products.<sup>1</sup>



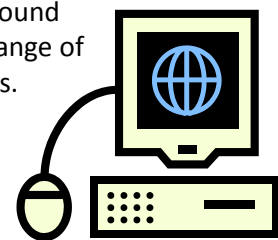
World population is increasing rapidly, and demand for agricultural products is increasing even more rapidly. Optimizing resource use will be critical to sustain the world's land, water, energy, and other resources while feeding its people. Concurrently, food safety is a pressing problem as evidenced by continuing outbreaks of food-borne illnesses. Developing and implementing *effective* strategies for “whole chain” traceability systems will optimize resources, reduce waste, and increase food safety, as well as protect the interests of various parties who make up the supply chain. There is a critical need to advance knowledge and understanding about the right mix of software, computer networking, mobile devices, market economics, standards, software licensing, security and privacy that will increase the *real-time* differential access to proprietary supply chain data. This access will help save people's lives in a food safety recall, verify sustainable agricultural practices, and learn more from consumers about their personal experiences with food products.

Both industry and government are attempting to address the food safety problem but the prevailing approach to traceability is “one up/one down” information sharing.<sup>2</sup> This approach is fraught with inherent delay, limiting consumers' and regulators' ability to identify in real-time the source of contamination and limiting mitigation efforts in the event of outbreaks or bioterrorism. This causes significant economic loss to industry, including firms and industries ultimately found to not be related to outbreaks. Progress regarding each of these issues is difficult – if not impossible – without the efficient sharing of information in supply chains. Yet, therein lays the rub.

Data along supply chains is commonly characterized as consumer data, producer data, food safety data, environmental data, sustainability data, etc. The perceived difference in data is found in its proprietary nature. But the Internet does not provide for the efficient exchange of information that retains its provenance and instills trust in information producers.

As Sir Tim Berners-Lee says, “The Web was originally conceived as a tool for researchers who trusted one another implicitly.... We have been living with the consequences ever since .... [S]ubstantial research should be devoted to engineering layers of trust and provenance into Web interactions.”<sup>3</sup>

As described below in more detail, the synthesizing of interoperable methodologies by Pardalis, Inc. with those of PARC, a Xerox Company, provides these layers of trust and provenance that make possible “whole chain” information sharing. This is undoubtedly one of the “next Big Things” for the Internet. Xerox PARC believes so. So, too, Pardalis.



## A National Institute for Whole Chain Traceability

Dr. Stephen McKeever, Vice President of Research and Technology Transfer at Oklahoma State University, will soon be announcing the founding of the National Institute for Whole Chain Traceability and Food Safety Research (hereinafter “National Institute”). The nascent Institute directly combines

multi-disciplinary research activities between OSU's Division of Agricultural Sciences and Natural Resources and the OSU Computer Science Department. It will be the first of its kind.<sup>4</sup>

*"Notwithstanding years of academic research by numerous universities, traceback investigations in agricultural and food supply chains still take weeks and months," said Dr. McKeever. "The FDA and the USDA Food Safety and Inspection Service, have clearly expressed an interest in whole chain systems providing for real-time investigations. There are also reasons to believe that these same systems may be multi-purposed to increase marketing opportunities for producers by, for instance, empowering consumers with mobile applications providing greater supply chain transparency about the foods they demand and purchase."*

The goals of the National Institute are epitomized by a vision of consumers able to point their smartphone at a food product bar code, and retrieve a global sourcing map and reliable information about the product.<sup>5</sup> It will focus research on providing real-time, whole chain information sharing in global agricultural and food supply chains relating to both food safety and food marketability.

*"The Institute will provide a new way of looking at information sharing in supply chains," said Dr. Brian Adam, speaking for the co-directors of the Institute. "Consumers increasingly expect real-time accessibility to trustworthy information on the Web about their food purchases. This in turn is driving increased focus by international trading partners for more transparent information sharing and data interoperability across complex, global supply chains. The capabilities of the Institute's partners will make this a reality while helping agricultural and food companies improve their supply chain management."*

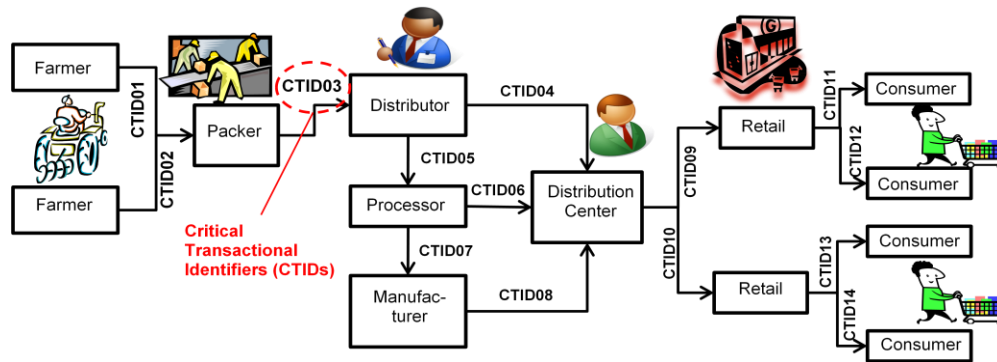
The founding of the National Institute is a milestone made possible by the "sharing is winning" efforts of the Whole Chain Traceability Consortium™, a branded trademark of Pardalis, Inc. Significant domestic and international letters in support have been provided. One such letter is from Prof. Sam Saguy, Professor of Food Technology and Innovation, The Hebrew University of Jerusalem:

*"It is worth noting that the initial funding and founding of the Institute is truly a milestone made possible by the activities of the Whole Chain Traceability Consortium (WCTC). Unfunded, multi-institutional activities do not commonly coalesce and stay together for as long as they have with the WCTC. Keeping such a group together in advance of [the USDA NIFSI] funding is no small challenge. The WCTC participants ... have ... implement[ed] what we have coined in our publication<sup>6</sup> on open innovation as: "sharing-is-winning" principles."*

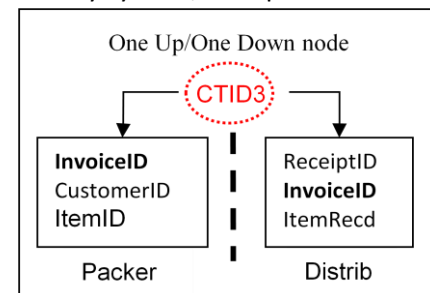
For more details, see a draft of the full news release attached as Appendix 1.

## **"Whole Chain" Means the Entire Supply Chain**

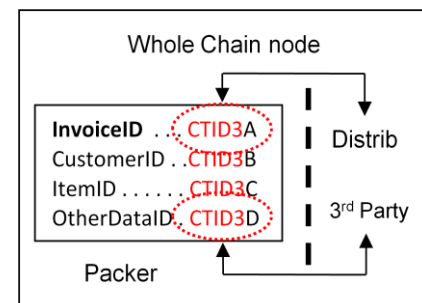
A "whole chain" product tracing system consists of information elements provided by persons in the supply chain to other persons in the supply chain or to regulatory officials (e.g., during a traceback investigation).<sup>8</sup>



A useful explanation of the benefits of a “whole chain” produce traceability system, over prevalent “one up/one down” traceability, may be made with critical traceability identifiers (CTIDs), critical tracking events and nodes.<sup>9</sup> Critical tracking events are those events that must be recorded in order to allow for effective traceability of products in the supply chain. A node refers to a point in the supply chain when an item is produced, processed, shipped or sold. Critical tracking events can be loosely defined as a transaction. Every transaction involves a process that can be separated into a beginning, middle and end.



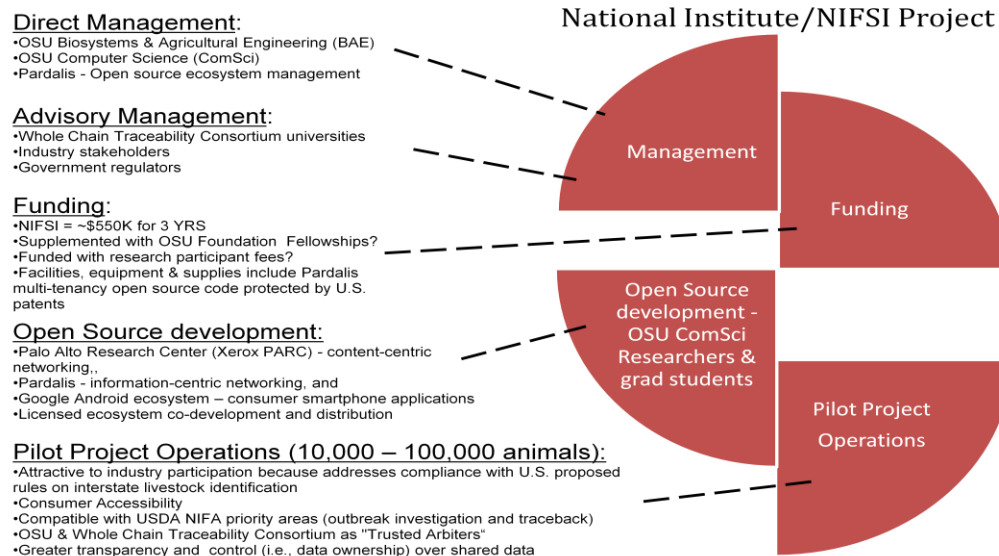
While important and relevant data may exist in any of the phases of a critical tracking event transaction, the entire transaction may be uniquely identified and referenced by a code referred to as a critical tracking identifier (CTID). The challenge is in using even top of the line “one up/one down” product traceability systems that, notwithstanding the use of a single CTID, are inherently limiting in the data sharing options provided to both stakeholders and government regulators. With a stakeholder-driven “whole chain” product traceability system - *in which CTID3 is essentially assigned down to the datum level (i.e., CTID3A, CTID3B, CTID3C, etc.)* - transactional and other data may in real-time be granularly placed into the hands of supply chain partners, food safety regulators, or even retail customers. This is a vision of “whole chain” sharing that goes well beyond “one up/one down” information sharing, and **addresses the need for the introduction of trust and provenance into Web interactions.**



Whole chain information sharing provides a way for authenticated information – such as sustainability factors, pathogen test results, production and harvest information – to be relayed in real-time up and down the supply chain, while protecting proprietary or confidential information. Such systems will also facilitate improved supply chain management. Thus, this data sharing contributes to effective stewardship of both natural and human resources. In most supply chains, transactions occur across multiple firms, each with proprietary information. Whole chain Web technologies will permit producers and firms to share with one another information that will help improve supply chain coordination while protecting other information. Because they can protect key information, firms have more incentive to share relevant information that will improve both food safety and supply chain coordination.

## The Significance of the Funded NIFSI Pilot Project

In June, 2011 Dr. Mike Buser submitted a standard project proposal of up to \$600K for 3 Years for Funding Opportunity Number USDA-NIFA-ICGP-003445 entitled an "Advancement of a whole chain, stakeholder driven traceability system for agricultural commodities: beef cattle pilot demonstration". The proposal was designed to directly address priority area 111.F under the National Integrated Food Safety Initiative (NIFSI) for strengthening national traceback systems; promoting an outbreak response system that shortens the time between outbreak detection, resolution, and recovery; and improving methods for communicating with consumers about traceback and foodborne illness outbreaks. Co-PIs included Brian Adam (OSU), Blayne Mayfield (OSU), Johnson Thomas (OSU), Tim Bowser (OSU), Steve Ricke (UARK), and Phil Crandall (UARK). Collaborators included Pardalis and the Noble Foundation.



In September, 2011 Dr. Buser received confirmation of funding<sup>10</sup> with these comments:

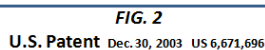
*"Expertise and strong collaborative relationships of the team were evident in the written proposal. The proposed system would be attractive to industry participation. The use of open source software and the ability to add consumer access to the traceability system set this proposal apart from other similar proposals."*<sup>11</sup>

*"This was an innovative and well-communicated proposal. Two individual reviewers judged the objectives to be highly likely to succeed. This approach was judged to be a promising way to bring product traceability to U.S. beef."*<sup>12</sup>

The timing now of Dr. McKeever's announcement about the National Institute is only made possible – as a practical matter - by the funding of the NIFSI project. Without this funding the announcement would carry little, if any, weight. The National Institute is at this time one and the same as the NIFSI project. Pardalis' proposal, below, is directed toward expanding the scope of the National Institute..



Pardalis' intellectual properties empower end-users of a distributed, multi-tenancy system with control over the authoring, registration and networked distribution of registered, radically identified, **immutable informational objects**. Pardalis' interoperable methodologies make information potentially more available, trustworthy, and traceable in supply chains (Holcombe 2007, 2011)<sup>13</sup>.



Furthermore, Pardalis accelerates the commercial relevance of the project by introducing into the project a developed a back-end, enterprise-class system designed from its IP for a "whole chain" product traceability for "widgets". See Appendix 4.

One of the primary contributors to the technological foundations of today's Internet, Van Jacobson<sup>16</sup> joined the Palo Alto Research Center<sup>17</sup> (PARC), a Xerox Company, in 2006 to initiate and lead its content-centric networking research program, now known as Project CCNx.<sup>18</sup> Project CCNx is being touted as the “next Big Thing” to come out of Silicon Valley. Jacobson's goal is to adjust the layered architecture of the Internet with **immutable named data**.<sup>19</sup>

## How do PARC's and Pardalis' Technologies Relate to Each Other?

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consideration.



The mutual interests of Project CCNx and the Traceability Consortium intersected in a May, 2011 teleconference moderated by this writer on behalf of the Whole Chain Traceability Consortium™ (WCTC). It was agreed that Project CCNx and the WCTC would actively explore funding opportunities which combine the internet architectural research work of Project CCNx with the WCTC's vision for information sharing in supply and demand chains. While PARC is addressing long-term adjustments deep within the layered Internet, the WCTC is focused on sooner commercialization opportunities for changing the Web. This was viewed as a potential “win/win” for PARC and the WCTC.

Subsequently, this writer, Blayne Mayfield and Johnson Thomas were invited by Van Jacobson (and Jim Thorton, CCNx Program Manager) to the first CCNxCon held in early September, 2011 at the PARC headquarters in Palo Alto.

Based on the foregoing, the following questions may be asked and answered:

- Is the technology of Project CCNx well enough understood that its potential can be evaluated at a reasonable level of confidence?
  - *Yes, the NSF certainly believes so. Yes, our attendance at CCNxCon confirms, too.*
- Does the technology of Project CCNx represent an extension or application of the state-of-the-art?
  - *An extension for providing a new architecture for the Internet.*
- Does Pardalis’ technology compliment the technology of Project CCNx?
  - *Yes, both technologies are premised on the **networking of immutable data**. These methods are critical for providing layers of trust and provenance to the Internet (PARC) and the Web (Pardalis) that make possible whole chain information sharing.*
- Does Pardalis provide sooner ag and food supply chain commercialization opportunities?
  - *Yes, the National Institute will be the first to provide these new methodologies for networking and information sharing. But to maintain this competitive advantage, there must be appropriate funding.*
- What is its probability of success?
  - *High (with appropriate funding).*
- What does “success” mean in this context for OSU, the WCTC and Pardalis?
  - *Success for OSU means leveraging Pardalis’ existing global patent portfolio, and the open source properties of Project CCNx, to achieve worldwide recognition as a leader in the research and commercial application of “whole chain” information technologies to ag and food supply chains. Success for the participants in the Whole Chain Traceability Consortium™ is provided by the competitive advantages of extending active “whole chain” research into the multiplicity of research areas related to ag and food. Success for Pardalis comes from a “sharing is winning” approach within ag and food supply chains that leverages Pardalis’ global IP into bringing significantly increased interoperable Web services to the full spectrum of global supply chains.*

## More about Pardalis

Pardalis, Inc., Stillwater, Oklahoma, is an Oklahoma advanced information technology company and a 2004 OCAST/i2E TBFP awardee.<sup>21</sup> The CEO position is held by this writer of which a bio sketch is found in Appendix 2. Pardalis has over 40 shareholders with the majority of shares held by Holcombe family members. Since the 1920's, four generations of the Holcombe family have attended (or are attending) OSU.

Global patent portfolios are expensive and time-consuming to build.<sup>22</sup> Since August, 2001 Pardalis has been patiently building its portfolio for information-centric networking co-invented by this writer and Dr. Marvin L. Stone,<sup>23</sup> OSU Biosystems Professor Emeritus. *The value in Pardalis' portfolio to the National Institute lies in its global coverage in an increasingly mobile, wireless, networked world.* For similar reasons, the emergence of PARC's Project CCNx (content centric networking) provides a comparative project for underscoring this value. Pardalis' patents are positioned in China, the U.S., the EU and many other countries. See, again, Appendix 5.



Beginning in 2003 Pardalis used Microsoft tools (.NET/SQL) to design and develop from its intellectual property a multi-tenant, enterprise-class, software-as-a-service (SaaS) system for businesses of all sizes in complex product supply chains to cost-effectively deposit, share and track data assets in real-time. While the core SaaS system is supply chain agnostic, Pardalis first gained market traction in the beef livestock industry in late 2005 with the then likelihood of a national, mandatory animal identification program being introduced by the USDA.

Pardalis commercially deployed its web-connected service to a livestock auction in Columbus, Texas. Small livestock producers brought their calves into the auction for sale where they were RFID tagged. The fee charged to the producers was an affordable \$5.00 per animals, including the cost of a RFID tag. The tags were automatically captured, a seller code was entered, and affidavit information was also entered as to the country of origin (USA) of each calf. Buyers paid premium prices (\$25 on avg.) for the tagged calves over untagged calves. In a series of weekly sales about 5,000 calves were RFID tagged. For the first time ever, after each sale, and at the speed of commerce, all seller, buyer and sales information was uploaded into a data account that was password controlled by the livestock auction as a trustee for each seller. The livestock auction granularly shared data forward to buyers' data accounts.

Unfortunately, this promising, market-driven model could not be scaled to other livestock markets because in 2006 the USDA essentially terminated its efforts to introduce national mandatory livestock identification. Holcombe found a 'safe harbor' for the system first with the Dickinson Research Extension Center of NDSU (2006-2009) and now in OSU within and between the College of Agriculture and the Department of Computer Science.

Currently, this writer has catalyzed the formation of the Whole Chain Traceability Consortium™ for uniquely blending food sciences, engineering sciences, computer sciences and social sciences to

research and implement real-world, real-time solutions to the limitations of one-up/one down information sharing in agricultural and food supply chains.

## More about the Whole Chain Traceability Consortium™ (WCTC)

The Whole Chain Traceability Consortium™ (WCTC) is Pardalis' branded name for an informal, multi-disciplinary research and commercialization project. Furthermore, the WCTC is a significant, multi-institutional, multi-state combination of human resources that coalesced in the summer of 2010 around the preparation and submission of two significant USDA NIFA AFRI coordinated agricultural projects. In those efforts significant time and energy was, and has continued to be, contributed by participating researchers and educators. These efforts are gratefully acknowledged and in particular the efforts of Dr. Mike Buser and Dr. Brian Adam at Oklahoma State University. At its core the WCTC may be characterized as including the following:

### Whole Chain Traceability Consortium™ (OSU, NDSU, MSU, UARK, Pardalis)



Whole Chain Traceability Consortium™ is a trademark of Pardalis, Inc. Free use with attribution.

- Oklahoma State University
  - Biosystems & Ag Engineering (Mike Buser, Paul Weckler, Ning Wang, Carol Jones)
  - Agricultural Economics (Brian Adam)
  - Computer Science (Blayne Mayfield, Johnson Thomas)
  - Food & Agricultural Products Center – FAPC (Roy Escoubas, Tim Bowser)
  - National Institute for Microbial Forensics & Food and Agricultural Bio-security – NIMFFAB (Jacqueline Fletcher)
  - Center for Engineering Logistics and Distribution – CELDi (Ricki Ingalls)
  - OSU Multi-spectral Laboratory - OSU UML (David Goad)
- Michigan State University
  - Ag Experiment Station (Steve Pueppke)
  - Center for the Study of Standards in Society (John Stone, Paul Thompson, Lawrence Busch)
- University of Arkansas
  - Food Science Department (Jean-Francois Meullenet, Steven Ricke, Phil Crandall)
  - Department of Biological and Agricultural Engineering (Marty Matlock)
- North Dakota State University
  - Former VP of Extension (D.C. Coston)
  - School of Food Systems (Deland Myers)
  - Ag Economics (Saleem Shaik)
- Pardalis Inc.
  - Steve Holcombe, CEO
  - Marvin L. Stone, Regents Professor Emeritus, OSU

To underscore the foregoing it is worthy of note that the WCTC was acknowledged by the NIFSI reviewers as bringing significant value:

*“Quality partnerships. PI [Dr. Mike Buser] and many participants and organizations (including traceability software developer, Pardalis) involved in the proposal are also involved in larger project called “Whole Chain Traceability Consortium”. Oklahoma is the lead institution. As such they have existing productive relationships including the aforementioned traceability research project. A communications strategy for the PIs is included in the proposal.”<sup>24</sup>*

A more expansive view of what both the WCTC and the National Institute may become – with appropriate funding – is to be found in the NSF Partnerships in International Research and Education (PIRE) pre-submission made 19 October 2011 made by Dr. Brian Adam. This pre-submission proposes to extend the application of the NIFSI project from a domestic supply chain into global supply chains. The goal is to increase real-time access to proprietary information in global supply chains that “may help save people’s lives in a food safety recall, verify sustainable agricultural practices, and learn more from consumers about their personal experiences with food products.” The PIRE participants include international participation from the Chinese Agricultural University-Beijing and the University of Wageningen, The Netherlands. See Appendix 3 for more details.

## Why is Pardalis’ Role Critical to Expanding the National Institute?

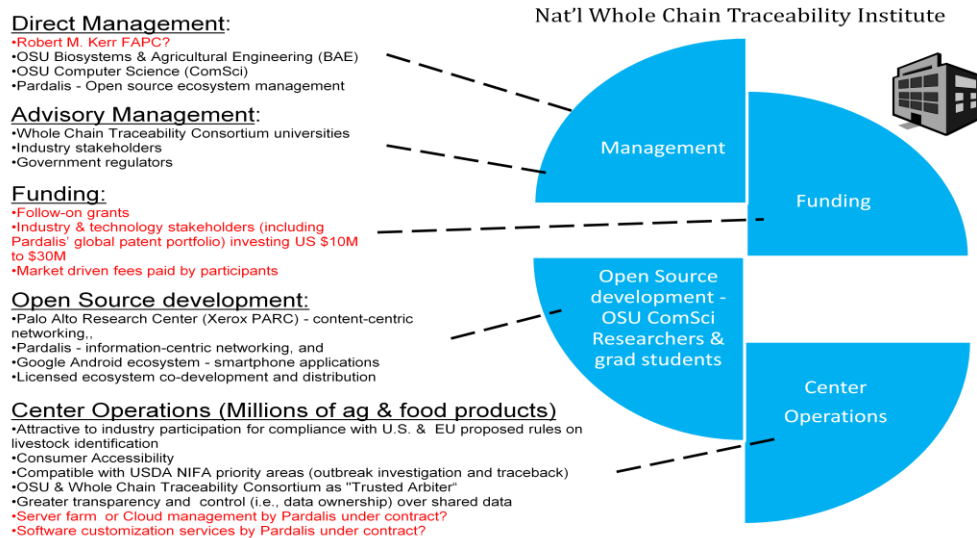
Pardalis has organizational, technical, legal and fund-raising know-how for scaling the National Institute to global commercial relevancy. The legal risks come in two contexts. There are legal risks vis-a-vis the interfacing of enterprise proprietary software licensing versus emerging open source licensing as, for instance, with mobile phone applications. This is further discussed, below. There are also risks of liability for an expanded National Institute that are – with proper guidance – negligible. That proper guidance begins with a survey of “U.S. Open Records, Privacy & Regulatory Recall Powers” relevant to the current and projected activities of the National Institute”. Nothing scares away the prospect of funding more than the fear of liability. This survey will place that fear in a business manageable context.

The National Institute must have a plan for networking scalability that will attract the interest of – and funding from – large IT savvy customers companies like Cargill, Tyson, McDonalds, Wal-Mart, Syngenta, Nestlé, Monsanto, ADM, etc. Pardalis provides that technology know-how for identifying the “best of breed” approaches for information-centric networking via a proprietary “server farm”, a “cloud based” solution or with one or more hybrid packages.

Pardalis has prior organizational experience with market-driven information sharing at the production level of a major agricultural supply chain. **Nothing beats the experience of executing the market-driven Texas livestock auction project, described above, at the speed of commerce.** And the specter of a national traceability mandate looms again (as it did following the 2003 “mad cow” case) with the USDA’s proposed rules for unique identification of livestock in interstate commerce.<sup>25</sup>

Pardalis understands the power of social media in two contexts. One context is in terms of using social networking sites like LinkedIn, Twitter and Facebook for outreach purposes. See the end of Appendix 2.

The other context is in the engineering of the multi-tenant SaaS deployed for the Texas livestock auction project. Social networking on the Web requires multi-tenancy. Pardalis' existing software system is a commercially tested prototype for the social Web interactions within complex enterprise supply chains. See, again, Appendix 4.



But most significantly Pardalis offers a practical, global vision for the expansion of the Whole Chain Traceability Consortium™ with a branded, patent-hardened open source licensing strategy. With the proposed funding, below, this branded, open source licensing strategy is the most efficacious means for the National Institute to become a global leader in commercially viable "whole chain" traceability research. The NIFSI project begins this licensing model but NIFSI funding, by itself, is far from enough.

**Caveat:** There is a caveat in the founding of the National Institute. The announced founding guarantees raised visibility for OSU but without a relationship between OSU, Pardalis and the branded WCTC, as a proposed below, the visibility garnered by the founding of the National Institute at OSU may only compel other institutions to announce their own "whole chain" or "full chain" institutes. While this may affect OSU's opportunities for leadership the visibility for Pardalis will nonetheless open up global opportunities where and how its patent portfolio may be used. This is quite simply because it is expensive and time-consuming to obtain and protect global IP. Pardalis has been patiently doing so since 2001. As described above, there cannot be whole chain information sharing without the critical use of networked, immutable data objects.

## What would Expansion of the National Institute mean to Stillwater?

This is an open question.

The expansion of the National Institute would not guarantee that a connected ecosystem of high-paying private sector jobs will sprout up in Stillwater or anywhere else in Oklahoma. Oklahoma is a "fly over state" when it comes to the kind of networking technologies emerging from Xerox PARC and already innovated by Pardalis. The opportunities - for landing high-paying, private sector jobs in Oklahoma that

are related to these new kinds of networking - go through Pardalis. The opportunities are here and now with OSU and Stillwater because of Pardalis. If Oklahoma and, in particular, Stillwater are to reap the benefits of commercializing information-centric networking, then Pardalis must be provided with investments, contracts for services or other financial incentives. If not, then Pardalis will use the visibility of the National Institute – and Pardalis’ branded WCTC - to seek its viability in Fayetteville, East Lansing, Fargo, Palo Alto, Seattle, Mumbai, Sydney, Amsterdam, Shanghai, or elsewhere.

Thus, it is not inconceivable that the National Institute becomes a global leader but that Oklahoma and Stillwater see relatively little economic impact in the private sector. Of course nobody ever knows to miss what they never had, right? But will the question in Stillwater one day be asked: “How did we let home-grown Pardalis get away from Stillwater?”

We’ll see.

## **Pardalis’ Proposed Funding Stages 1 - 3**

The investment of the following funds are essential in providing Oklahoma with the best opportunity to (a) rapidly expand the number of researchers, technicians, and support services in the area of food safety within the State of Oklahoma, (b) rapidly grow an existing, home-grown advanced technology company in Oklahoma, and (c) expand the activities of the National Institute. Doing so will position OSU to attract \$10s of millions in federal research grants and/or privately funded research. Doing so will provide the greatest opportunities for introducing related high-paying, private sector jobs into the Stillwater economy.

Stage 1 - USDA NIFSI funding (~\$346K in “modified direct costs” for 3 yrs commencing January 1, 2012)

Stage 2a - OSU seed funding of \$50K for “A Content-Centric Food Traceability System” submitted to the OSU Provost by Johnson Thomas, Blayne Mayfield, Michael Buser, and Brian Adam (Summer, 2011) for graduate student researchers (September 1, 2011 - August 31, 2012).

Stage 2b - A 1-year contract award (\$125K including \$30K for travel) to Pardalis for the 2012 calendar year for (a) putting forth “best efforts” for soliciting Stage 3 funding commitments from private and governmental sources for an estimated \$10M to cover the first 6 years of operation of the National Institute, (b) preparing a survey of “U.S. Open Records, Privacy & Regulatory Recall Powers” relevant to the current and projected activities of the National Institute (due 30 Mar 2012), (c) providing an option during the 2012 calendar year for the National Institute to license under a marketing agreement the Whole Chain Traceability Consortium™ brand with Stage 3 funding, and (d) providing an option during the 2012 calendar year to further exclusively license under a marketing agreement the application of Pardalis’ global patent portfolio relative to agricultural and food supply chains with Stage 3 funding.

Stage 2d – A separate 8-month contract award (est. \$50K) commencing 1 Jan 2012 for technology consultation services provided by Pardalis for comparatively identifying the “best of breed” approaches to networked scalability of the National Institute (due 1 September 2012).



Stage 2e - A separate 9-month contract award (est. \$50K) to Pardalis commencing 1 Jan 2012 for a jointly copyrighted report advising on the joint filings of continuation patent applications and “follow-on” patent applications by OSU and Pardalis springing from Pardalis’ IP portfolio in Appendix 5 (due 1 Oct 2012).

Stage 3 - **Expansion of the National Institute.** See high-altitude, projected funding, below.

### Stage 3 - Expansion of the National Institute

Current Stage 1 “Modified Direct Funding” costs for the National Institute/NIFSI Project:

Year	EEs	Con-tracts	Travel	Equip/ Material	Servers/ Licenses	Pardalis IP/TM	Stage 1 Funding
‘12	68,808	34,000	16,500	15,778	0	0	135,086
‘13	80,232	9,000	16,500	11,280	0	0	117,012
‘14	63,701	7,000	13,949	9,280	0	0	93,930
Total							\$346,028

Projected Stage 3 “Modified Direct Funding”\* of the National Institute for first six calendar years:

Year	EEs	Con-tracts	Travel	Equip/ Material	Servers/ Licenses	Pardalis’ IP/TM	Stage 1 Funding	Total
‘12	50,000	95,000	30,000	5,000	0	10	135,086	315,096
‘13	1,091,982	20,800	145,150	58,850	203,680	125,000	117,012	1,762,474
‘14	1,095,399	21,216	148,116	58,450	495,230	127,500	93,930	2,039,841
‘15	1,120,005	21,632	151,908	46,900	558,300	130,050	0	2,028,795
‘16	1,145,180	22,048	155,768	45,750	719,200	132,651	0	2,220,597
‘17	1,170,940	22,464	159,716	45,750	295,787	135,304	0	1,829,961
Total	5,673,506	203,160	790,658	260,700	2,272,197	650,515	346,028	\$10,196,764

\* Up to 3% COLAs for EEs (employees), Contracts, Travel, Servers/Licenses, and Pardalis IP/TM (patents & trademarks). EEs include total PI and student salaries, wages & benefits. Travel, food & lodging calculated for 15 - 20 domestic and international conferences per year beginning 2013 including attendance fees. Servers/Licenses do not include an allocation for peak data volumes, nor any application of discounted academic licensing. Sales/Use taxes of 8.75% are included. Servers are presumed to be physically placed with OSU. Significant cost savings may be had from a “cloud-based” approach or a hybrid approach. (And so the Stage 2d proposal, above). Costs for office space and utilities are not included in these budget estimates. No costs are projected here for technology transfer services that may be provided by the Office of the Vice President of Research at OSU. Other disclaimers would probably be appropriate but, again, this is a high-level projection only.

Total estimated costs for the first six years of a National Institute – after deduction of Stage 1 Funding - are estimated to be **\$9,850,736 for a \$/YR average of \$1.62M/YR**. It is proposed that this would provide for operations at the National Institute that are viably relevant to large IT savvy customers. These estimated costs are less on a \$/YR basis than any of the following funding comparables.



## Funding Comparables for an Expanded National Institute

Description	Funding	Duration	\$/YR
NSF funded Named Data Networking project <ul style="list-style-type: none"> <li><a href="#">Multi-university research project announced Aug 2010</a></li> <li><a href="#">Lead by PARC's Content-Centric Networking (CCNx) Project</a></li> </ul>	\$8.00M	3YR	\$2.67M
The EU's TAS3 project <ul style="list-style-type: none"> <li><a href="#">TAS3 trusted personal data store project</a></li> <li><a href="#">Multi-university research project ending Dec 2011</a></li> </ul>	€12.91M (\$17.98M)	3YR	\$5.99M
The EU's OKKAM project <ul style="list-style-type: none"> <li><a href="#">OKKAM "Internet of Things" project</a></li> <li><a href="#">Multi-university, research project ended June 2010</a></li> <li><a href="#">Now being commercialized</a></li> </ul>	€7.40M (\$10.31M)	30MTH	\$4.12M
University of Illinois at Urbana-Champaign <ul style="list-style-type: none"> <li><a href="#">ADM Gives to Found Institute to Reduce Global Postharvest Loss of Grains, Oilseeds</a></li> </ul>	\$10.00M	5YR	\$2.00M
The EU's SmartAgriFood project <ul style="list-style-type: none"> <li><a href="#">Multi-university ICT project ending Dec 2012</a></li> </ul>	€4.97M (\$6.93M)	2YR	\$3.47M

## Stage 3 - Pardalis' Marketing Agreement & IP Proposals

A branded, patent-hardened open source licensing strategy is proposed for Stage 3 as follows:

- That Pardalis' branded, patented-hardened open source licensing program for the global "food supply chain" (as modeled by the NIFSI project) be exclusively managed by Pardalis on behalf of the National Institute for 5 years commencing 1 January 2013 at \$125K per year (plus a 2% annual COLA) and thereafter for the lifetimes of the patents at a mediated/arbitrated royalty price.
  - Pardalis' global patent portfolio would be licensed under a marketing agreement limited to the "food supply chain".
  - Pardalis' Whole Chain Traceability Consortium™ brand would be licensed under the same marketing agreement.
  - Food supply chain** (a *working definition*) - the system of organizations, people, activities, information, data and resources involved in originating, producing, processing, manufacturing, transporting, certifying and/or exchanging (including selling, buying and brokering) seed stock, food or a food product for human or animal consumption.
  - All improvements made by the National Institute to source code contributed by Pardalis – or covered by Pardalis' IP - will be open sourced under Pardalis' management. All related application programming interfaces (APIs) - or other interoperable interfaces between software programs - shall additionally be open sourced under Pardalis' management.
  - Any patents filed by OSU researchers related to the networking of immutable data or metadata shall be continuation patents or jointly owned "follow on" patents to Pardalis' IP portfolio.
- For each competitive research, education and/or extension funding submission lead by OSU and/or the National Institute involving Pardalis' IP or technology, the lead PIs will make "best efforts" to fund Pardalis' participation for not less than 5% of modified direct costs.
  - The USDA NIFSI project provides a model for this approach.

- This funding pays for the practical, global vision for the expansion of the Whole Chain Traceability Consortium™ with a branded, patent-hardened open source licensing strategy.
- Pardalis, in dealings outside of the food supply chain, will have the right to purchase improvements at market rates to any source code – open sourced or not - developed by the National Institute that is covered by Pardalis' IP, or covered by IP jointly held by Pardalis and OSU.
  - OSU will recognize a credit of \$870,499, plus a 2% COLA from 1 Jan 2012, for previous developmental costs directly attributable to the engineered CPA system, which Pardalis may first draw down upon to compensate OSU for purchase of such source code improvements. See Appendix 4.
  - Any source code developed by the National Institute that is covered by Pardalis' IP (or jointly held by Pardalis and OSU) shall be opened to Pardalis. Pardalis shall have exclusive use of such source code in dealings outside of the food supply chain under the terms of a separate marketing agreement with OSU.

## **Appendices**

### **Appendix 1 – Draft National Institute News Release**

*Oklahoma State University announces formation of National Institute for Whole Chain Traceability and Food Safety Research™*

STILLWATER, Oklahoma, October \_\_, 2011 - Dr. Stephen McKeever, Vice President of Research and Technology Transfer at Oklahoma State University, and Executive Director of the Oklahoma State University Multispectral Laboratories, today announced the founding of the National Institute for Whole Chain Traceability and Food Safety Research™. The Institute directly combines multi-disciplinary research activities between OSU's Division of Agricultural Sciences and Natural Resources and the OSU Computer Science Department. It will focus research on providing real-time information sharing in global agricultural and food supply chains relating to both food safety and food marketability.

"Notwithstanding years of academic research by numerous universities, traceback investigations in agricultural and food supply chains still take weeks and months," said Dr. McKeever. "The FDA and the USDA Food Safety and Inspection Service, have clearly expressed an interest in whole chain systems providing for real-time investigations. There are also reasons to believe that these same systems may be multi-purposed to increase marketing opportunities for producers by, for instance, empowering consumers with mobile applications providing greater supply chain transparency about the foods they demand and purchase."

The founding of the Institute is a milestone made possible by the Whole Chain Traceability Consortium™ (WCTC). The WCTC is comprised at its core of researchers and collaborators from Oklahoma State University, North Dakota State University, Michigan State University, the University of Arkansas, and Pardalis, Inc., an Oklahoma advanced technology company. The WCTC informally coalesced in 2010 during the preparation of funding proposals directed toward food safety and traceability. The founding of the Institute is anticipated to accelerate private and public funding opportunities sought by the WCTC. Letters in support of the Institute have been given by Dr. Deland Myers, Professor and Director, Great Plains Institute of Food safety, School of Food Systems, North Dakota State University, Dr. Steve Pueppke, Director of Michigan State University AgBioResearch, Lawrence Busch, Founding Director, Center for the Study of Standards in Society, Michigan State University, Dr. John V. Stone, Co-Director & Senior Research Scientist, Center for the Study of Standards in Society, Michigan State University, Dr. Jean-Francois Meullenet, Head & Professor, Department of Food Science, University of Arkansas, and Steve Holcombe, Founder and CEO, Pardalis, Inc., Stillwater, Oklahoma.

The Institute's initial research is being funded with a \$543,000 grant under the USDA's National Integrated Food Safety Initiative for a 3-year pilot project entitled "Advancement of a whole chain, stakeholder driven traceability system for agricultural commodities". This research will compare and contrast an information-centric networking system for supply chains provided by Pardalis with similar methodologies emerging from Project CCNx at the Palo Alto Research Center (PARC), a Xerox company, and the multi-university Named Data Networking Project funded by the U.S. National Science Foundation. Co-directors at Oklahoma State University of this research will be Dr. Brian Adam, Professor, Department of Agricultural Economics, Dr. Michael Buser, Assistant Professor, Department of Biosystems and Agricultural Engineering, Dr. Blayne Mayfield, Associate Professor, Department of Computer Science, and Dr. Johnson Thomas, Associate Professor, Department of Computer Science.

"PARC encourages the investigation and development of the CCNx technology through the work of the National Institute for Whole Chain Traceability and Food Safety Research and other organizations," said Jim Thornton, PARC Principal Engineer and CCN program manager. "PARC works with leading organizations, universities, and government agencies, with the goal of achieving productized CCN solutions."

Future comparisons are being planned regarding the methodologies emerging from the EU funded Smart Food and Agribusiness Project at the University of Wageningen, the Netherlands, and Strategic Research on Key Technology of Agricultural Information Technology funded by National Science Foundation of China.

The Institute's educational, research and outreach functions are to globally promote and accelerate sustainable agricultural and food research in whole chain traceability and information sharing technologies by:

- establishing strategic research partnerships with government organizations, NGOs, additional universities, and large and small industry stakeholders seeking to develop traceability products and services;
- integrating whole chain research activities among research partners including, but not limited to, research relating to sensors, precision agriculture, the "internet of things", social media, cloud computing, security, and trusted identities;
- supporting the standards vital to ensuring interoperability among technical and social dimensions; developing courses to provide training on best practices, technologies and standards for sustainable, whole chain systems in agriculture and food supply chains; and
- fostering an open source software developers' ecosystem among research partners to accelerate a transformation in whole chain information sharing in agricultural supply chains and consumer demand chains.

“The Institute will provide a new way of looking at information sharing in supply chains,” said Dr. Brian Adam, speaking for the co-directors of the Institute. “Consumers increasingly expect real-time accessibility to trustworthy information on the Web about their food purchases. This in turn is driving increased focus by international trading partners for more transparent information sharing and data interoperability across complex, global supply chains. The capabilities of the Institute’s partners will make this a reality while helping agricultural and food companies improve their supply chain management.”

The Division of Agricultural Sciences and Natural Resources (DASNR) at Oklahoma State University, the Robert M. Kerr Food and Agricultural Products Center (FAPC), the National Institute for Microbial Forensics & Food and Agricultural Biosecurity (NIMFFAB), the OSU Computer Science Department, and the OSU Center for Excellence in Logistics and Distribution (CELDi), joined Dr. McKeever in his announcement.

Additional letters of support were provided by Billy Cook, Ph.D., Exec. Vice-President & Director, Agriculture Division, The Samuel Roberts Noble Foundation, Dr. Sjaak Wolfert, Sr. Scientific Researcher on ICT in Agri-Food Supply Chain Networks at the University of Wageningen, the Netherlands, Prof. Maohua Wang, College of Information and Electrical Engineering, Chinese Agricultural University – Beijing, China, Vladimir Krasojevic, Research Director at Gartner, Zurich, Switzerland, Dr. Sam Saguy, Professor of Food Science, Technology, and Innovation, Hebrew University of Jerusalem, Leonardo Bonanni, Founder and CEO, Sourcemap Inc., and John Bailey, Executive Director, Top 10 Produce LLC.

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## Appendix 2 – Steve Holcombe Biosketch

**Steven L. Holcombe, J.D.**

**LinkedIn Profile -** <http://www.linkedin.com/in/steveholcombe>

## Professional Preparation

1982 - Juris Doctorate

University of Tulsa College of Law

1979 - Bachelor of Arts/Biology

Westminster College, Fulton, MO

## Professional Legal Affiliations

1982-Present

Oklahoma Bar Association, Active Member #4287

1984-Present

U.S. District Court, Western & Northern Districts of Oklahoma

## Synergistic Honors and Awards

Co-inventor: *Informational object authoring and distribution system*, U.S. Patent 6,671,696. Also issued in Australia, China, India, Mexico and New Zealand. Pending in Brazil, Canada, Europe, Hong Kong and Japan.

Co-inventor: Common Point Authoring System for Tracking and Authenticating Objects in a Distribution System, U.S. Patent 7,136,869. Also issued in China, Hong Kong and New Zealand. Pending in Australia, Brazil, Canada, EU, India, and Mexico.

Co-inventor: Common Point Authoring System for Complex Sharing of Hierarchically Authored Data Objects in a Distribution Chain, U.S. Patent 7,949,668. See [Pardalis Announces Issuance of Third U.S. Patent](#) (24 May 2011).

Presenter: “Proposing a Global Whole Chain Information Sharing Center for Food and Ag Supply Chains”. Presentation to Association of Overseas Chinese Agricultural, Biological, and Food Engineers, 2011 Annual Int’l Meeting of American Society of Agricultural & Biological Engineers. Food traceability presentations sponsored by Michigan State University to the AAAS (’07), the Third International IFAS Conference on Nanotech (’07), the Beijing Food Traceability Symposium (’07), and the University & Industry Consortium (’08).

Politico: General Election Candidate for District Attorney, Okla. (2002)

Author: *Tulsa Law Review*, Author of Two Juried Publications (1980-82)

## Synergistic Enterprise Management

Founder, CEO and General Counsel, Pardalis, Inc., an Oklahoma corporation (1994-present)

- General management and in-house legal duties
- Interaction with 5 member board, 40+ shareholders & 10 fulltime employees
- Intellectual property development, deployment and monetization (see below)
- Website management at [Pardalis.com](http://Pardalis.com)

### Synergistic Enterprise Activities

[This text substantially included within the body of the proposal]

### Other Synergistic Publications (non-juried)

- [A New Way of Looking at Information Sharing in Supply Chains](#) (5 Aug 2011)
- [Real-time, Supply Chain Test Marketing of New Product Lines](#) (1 March 2011)
- [The Bullwhip Effect](#) (17 January 2011)

## Synergistic Social Networking

Manager, *Data Ownership in the Cloud*, LinkedIn Networking Group

- 900+ professionals and growing
- The largest social networking site on the Web dedicated to “data ownership”

Manager, [Whole Chain Traceability Funding Opportunities](#), LI Networking Group

- The “home page” for the Whole Chain Traceability Consortium
- 30+ researchers and closely affiliated individuals

Owner, [@Steve\\_Holcombe](#) on Twitter

- Tweets relevant to Pardalis Inc., Data Ownership in the Cloud, and the Whole Chain Traceability Consortium

## Appendix 3 – NSF PIRE Project Submission Summary

**Title: PIRE proposal for advancement of a whole-chain, stakeholder-driven traceability and supply chain management system to improve food safety and reduce food waste**

### Project Summary

Global trade in agricultural and food products is a series of discrete transactions between buyers and sellers. It is generally difficult – if not impossible – to determine a clear picture of the entire life cycle of such products. The goals of the proposed NSF PIRE research are epitomized by a vision of consumers being able to point a smartphone at a food product bar code, and retrieve a global sourcing map and reliable information about the product.

World population is increasing rapidly, and demand for agricultural products is increasing even more rapidly. Optimizing resource use will be critical to sustain the world's land, water, energy, and other resources while feeding its people. Concurrently, food safety is a pressing problem as evidenced by recent outbreaks of food-borne illnesses. Progress regarding each of these issues is difficult – if not impossible – without the efficient sharing of information in supply chains.

Both industry and government have attempted to address the food safety problem. Outside of vertically integrated firms, unfortunately, the prevailing approach to traceability is “one up/one down” information sharing. This approach is fraught with inherent delay, limiting consumers' and regulators' ability to identify in real-time the source of contamination and limiting mitigation efforts in the event of outbreaks or bioterrorism. This causes significant economic loss to industry, including firms and industries ultimately found to not be related to outbreaks. It also causes waste because uncertainty about which food is safe and which is not causes regulators to err on the side of caution.

Developing and implementing *effective* strategies for “whole chain” traceability systems will optimize resources, reduce waste, and increase food safety, as well as protect the interests of various parties who make up the supply chain. Data along supply chains is commonly characterized as consumer data, producer data, food safety data, environmental data, sustainability data, etc. But data is data. the so-called difference in data is not in its categorization per se but in its proprietary nature. The proposed NSF PIRE research will advance knowledge and understanding about the right mix of software, computer networking, mobile devices, market economics, standards, open source software licensing, security and privacy that will increase the *real-time* differential access to proprietary supply chain data. This access may help save people's lives in a food safety recall, verify sustainable agricultural practices, and learn more from consumers about their personal experiences with food products.

Special attention will be given in this approach to stakeholder identification and engagement processes, particularly as they relate to standards development initiatives among public and private actors representing local to global interests in the establishment of whole chain traceability systems for food safety and public health. In fact, the U.S. celebration of World Standards Day adopted the theme of safety and sustainability, recognizing the crucial role of standards, noting that “...above all, standardization provides an adaptive framework for developing the most effective solutions to critical global challenges” (Standards Day).

These global challenges make our international partnerships especially critical. Food safety issues involving the European Union and China, two very important trading partners, highlight the importance of developing technology with culturally-compatible standards to enhance safety along while enhancing sustainable and transparent trade. Initiatives in both countries – the SmartAgriFood Project in the European Union, and in China the Key Laboratory of Integrated Research on Modern Precision Agriculture Systems at China Agricultural University, along with NSF of China and the Ministries of Agriculture and of Science and Technology European, indicate significant motivation in both countries to address these issues.

Lead Institution: Oklahoma State University

PI and Project Director: Dr. Brian D. Adam, Professor, Dept. of Agricultural Economics, Oklahoma State University

Length of Study: 5 Years

Estimated Total Budget: \$5,000,000

Co-PIs:

**Oklahoma State University**

Agricultural Economics

Dr. Brian Adam

Dr. Chanjin Chung

Biosystems and Agricultural Engineering

Dr. Mike Buser

Dr. Ning Wang

Dr. Paul Weckler

Computer Science

Dr. Blayne Mayfield

Dr. Johnson Thomas

Food & Ag Products Center/Biosystems & Ag Engineering

Dr. Tim Bowser – process engineer

Industrial Engineering & Management

Dr. Ricki Ingalls

Dr. Tieming Liu

Dr. Manjunath Kamath

Dr. Satish Bukkapatnam

Dr. Balabhaskar Balasundaram

**U. of Arkansas - Food Safety and Food Systems**

Dr. Steven C. Ricke

Dr. Philip Crandall

Dr. Marty Matlock

Dr. J.F. Meullenet

**Michigan State University**

Center for the Study of Standards in Society (CS3)

Dr. Larry Busch – Founding Director, Univ. Distinguished Prof. of Philosophy

Dr. John Stone – Co-Director and Senior Research Scientist, Prof. of Sociology

Dr. Paul Thompson – W.W. Kellogg Chair in Ag, Food, and Community Ethics and Prof., Philosophy

Dr. Kyle Whyte, Asst. Prof., Philosophy

Dr. Scout Calvert, Visiting Scholar

**North Dakota State University**

Dr. Saleem Shaik – Agricultural Economics (supply chain and risk management)

**University of Wageningen (Netherlands)**

Dr. Sjaak Wolfert

Corporate and Institutional Collaborators include:

**Pardalis, Inc.** – Steve Holcombe, CEO

**SourceMap Inc.** – Leo Bonanni, CEO

**Top 10 Produce, LLC** – John Bailey, E.D.

**MarketMaker** – Dar Knipe, Program Dir.

**Food & Ag Processing Center (OSU)** –

Roy Escoubas, Director & Professor

International Collaborators include:

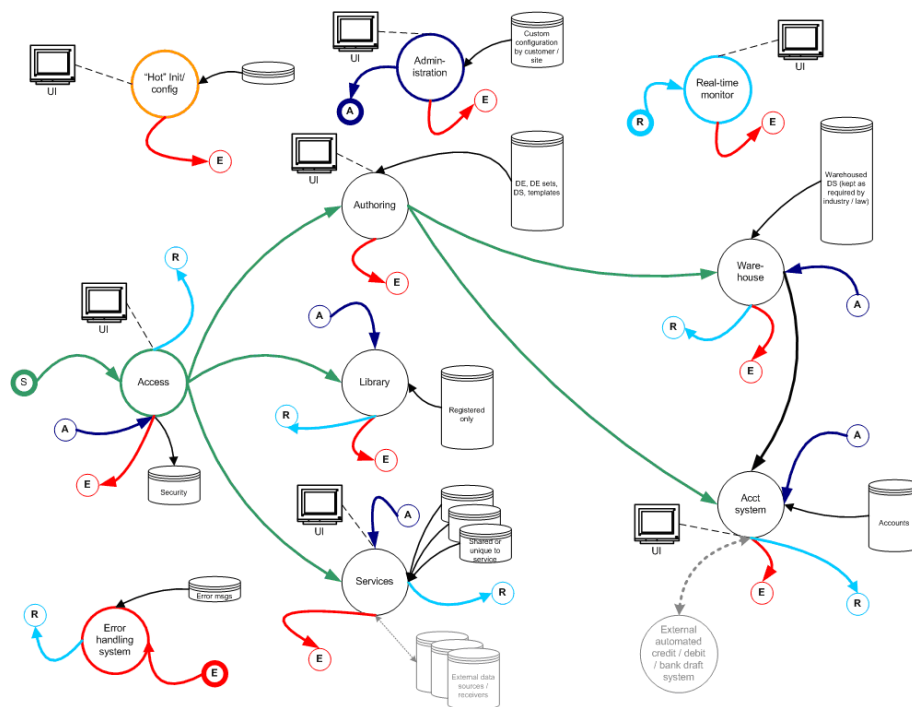
**China Agricultural University-Beijing**

Dr. Maohua Wang



## Appendix 4 – Common Point Authoring (CPA) System Development Costs

As engineered the CPA system for information-centric networking is a back-end, enterprise-class system designed for "whole chain" product traceability for "widgets". The current application programming interface (API)<sup>26</sup> is designed with a graphical user interface (GUI) for the beef livestock supply chain but there is seemingly no limit to the numbers of APIs (or GUIs) that may be customized for supply chains. The CPA system critically provides for minimal, precise disclosures of product identity data that are traceable and controllable by authoring end-users. Furthermore, it empowers end-users to asynchronously and granularly author and publish traceable, immutable data objects in competitively-segmented supply chains.



Name	Description	Salary %	Employment Dates	Cumulative Salary
KL	Computer software engineer (applications & management)	100%	Jun 2003 – Mar 2006	\$232,111
DM	Computer software engineer (applications)	100%	Nov 2003 – Aug 2006	\$228,980
SR	Computer software engineer (applications)	100%	Sep 2005 – Aug 2006	\$60,122
TC	Computer software engineer (systems architect)	100%	Aug 2004 – Aug 2006	\$149,926
RM	Computer software engineer (systems architect)	100%	Jan 2004 – May 2004	\$38,820
LK	Computer software engineer (systems architect consultant)	100%	Irregular dates	\$4,092
JC	Computer software engineer (user interfaces)	100%	Jan 2005 – May 2006	\$102,006
Holcombe	CEO/Founder (Corporate & inventor management)	20%	Jun 2003 – Aug 2006	\$54,442
			Total -	\$870,499

## Appendix 5 - Pardalis' Global IP

Country	App/Patent Number	Status	Expiry Date
Australia	2002323103	Granted	12-Aug-2022
Brazil	PI0212087-9	Pending	12-Aug-2022
Canada	2457936	Pending	12-Aug-2022
China (PR)	ZL 02820809.9	Granted	13-Aug-2022
Europe (EU)	02757063.9	Pending	12-Aug-2022
Hong Kong	04108499.5	Pending	12-Aug-2022
India	590/CHENP/04	Granted	12-Aug-2022
Japan	2003-521884	Pending	12-Aug-2022
Mexico	251,221	Granted	12-Aug-2022
New Zealand	531849	Granted	12-Aug-2022
United States	6671696	Granted	24-Mar-2022
Australia	2004282842	Pending	23-Sep-2024
Brazil	PI0415224-7	Pending	23-Sep-2024
Canada	2541329	Pending	23-Sep-2024
China (PR)	0480037094.4	Granted	23-Sep-2024
Europe (EU)	04784834.6	Pending	23-Sep-2024
Hong Kong	07103059.5	Granted	23-Sep-2024
India	1573/CHENP/06	Pending	23-Sep-2024
Mexico	2006/004007	Pending	23-Sep-2024*
New Zealand	546907	Granted	23-Sep-2024*
United States	7136869	Granted	10-Oct-2023
United States	11/595569	Pending	TBD

\*presumed

What might the market value of this portfolio be in an increasingly mobile, wireless, networked world? See this recent Economist article, [Doing the Maths – Valuing Patents](#). Google recently paid \$510,204.08 per patent to Motorola. This exact amount Novell sold patents for at a 2010 auction. From this perspective Pardalis' 23 patents represent a market value of \$11,734,693.

## Endnotes

<sup>1</sup> Laptop life cycle world **supply chain map** by leonardo bonanni - leo.media.mit - hyperexperience.com

<sup>2</sup> Both the USDA and the FDA are showing official interest in “whole chain” product tracing. Product Tracing Systems for Food, 74 FR 56853; Major industry trade associations like the United Fresh Product Association are calling for “whole chain” product traceability. *Food safety is a cost of doing business*, The Farm Press News, 27 Aug 2010 - <http://southwestfarmpress.com/news/food-safety-0830/index.html>; “The fractured federal food safety infrastructure makes coordination very difficult, and makes very real the possibility that a Katrina-like response could follow a food emergency.” Smith Dewaal C., Food Protection and Defense: Preparing for a Crisis. MINN. J.L. SCI. & TECH. 2006;8(1):187-198 - [http://milst.umn.edu/uploads/Ne/I7/Nel7F6maClu2xtpVgX-0ng/81\\_dewaal.pdf](http://milst.umn.edu/uploads/Ne/I7/Nel7F6maClu2xtpVgX-0ng/81_dewaal.pdf); Government regulatory agencies and the agricultural industry are experiencing a “global trust bust” in regards to the prevention, detection, and real-time traceability of agricultural food products. Presentation by Frank Yiannas, Vice President of Food Safety, Walmart, at the second annual meeting of the Arkansas Association of Food Protection, Springdale, Arkansas, Sept 29, 2010.

<sup>3</sup> Web Science Emerges, SciAm (Oct 2008) Vol 299 Num 4, Pgs 76 - 81 by Nigel Shadbolt & Tim Berners-Lee (emphases added)

<sup>4</sup> While there are national food safety centers in existence such as the Joint Institute for Food Safety and Applied Nutrition <http://www.iifsan.umd.edu/> (jointly administered by the FDA and the University of Maryland), the National Center for Food Protection and Defense <http://www.ncfpd.umn.edu/> (a DHS Center of Excellence at the University of Minnesota), and the National Center for Food Safety and Technology <http://www.iit.edu/ncfst/> (a research consortium between Illinois Institute of Technology and the FDA), none of these institutes address the multi-faceted technology and stakeholder issues that affect the real-time traceforward or traceback investigations of foodborne illnesses.

<sup>5</sup> This language adapted from "SourceMap: Eco-Design, Sustainable Supply Chains and Radical Transparency" found at <http://blog.sourcemap.com/2011/06/sourcemap-eco-design-sustainable-supply-chains-and-radical-transparency/>. The accompanying graphic is from the SourceMap website at <http://www.sourcemap.com/>

<sup>6</sup> Reinventing R&D in an Open Innovation Ecosystem, Traitlet, Watzke, Saguy, Journal of Food Science, Vol 76 Issue 2 (Mar 2011) - <http://onlinelibrary.wiley.com/doi/10.1111/j.1750-3841.2010.01998.x/abstract>

<sup>7</sup> Letter of support addressed to Dr. Brian Adam dated 9 Oct 2011.

<sup>8</sup> Product Tracing Systems for Food, 74 FR 56849, <http://edocket.access.gpo.gov/2009/pdf/E9-26479.pdf>.

<sup>9</sup> See the text and graphics of Appendix I - Critical Tracking Identifier (pp. 155 - 159) of IFT/FDA Traceability (Product Tracing) in Food Systems, Vol. 1, by Institute of Food Technologists, 28 October 2009 - <http://www.ift.org/knowledge-center/focus-areas/food-safety-and-defense/~media/Knowledge%20Center/Focus%20Areas/Traceability/IFT223042503TO6v1technical103009.pdf>

<sup>10</sup> With a standard 9.5% budget driven by the political uncertainties in Washington D.C.

<sup>11</sup> Quoted Positive Aspects of the Reviewers' comments in "Package for Proposal 2011-04848 Submitted to USDA\NIFA". Program: National Integrated Food Safety Initiative, Project Director: Michael Buser, Proposal Title: Advancement of a whole chain, stakeholder driven traceability system for agricultural commodities: beef cattle pilot demonstration.

<sup>12</sup> Id. Quoted Synthesis of Comments in "Package for Proposal 2011-04848 Submitted to USDA\NIFA".

<sup>13</sup> Holcombe, Steve, Methods for Protecting Data Ownership Rights Along Complex Supply Chains (2007) <http://cs3.msu.edu/research/pubs/nanotechnology/>; Holcombe, Steve, A New Way of Looking at Information Sharing in Supply Chains (2011) (See Slide 17 for globally published patents and applications) <http://pardalis.squarespace.com/blog/2011/3/29/a-new-way-of-looking-at-information-sharing-in-supply-demand.html>

<sup>14</sup> See [http://hub.opensolaris.org/bin/view/Main/licensing\\_faq#HWhatdoestheCDDLsayaboutpatents](http://hub.opensolaris.org/bin/view/Main/licensing_faq#HWhatdoestheCDDLsayaboutpatents)

<sup>15</sup> See <http://www.opensource.org/>

<sup>16</sup> See <http://www.parc.com/about/people/88/van-jacobson.html>

<sup>17</sup> See <http://www.parc.com/about/>

<sup>18</sup> Project CCNx, <http://www.ccnx.org/>

<sup>19</sup> See Slide 9 of this PARC presentation representing the value to PARC of Van Jacobson's emerging "content-centric networking" - <http://www.eweek.com/c/a/IT-Infrastructure/Xerox-PARC-Research-Center-Looks-Back-on-40-Years-of-Invention-844840/>.

<sup>20</sup> Named Data Networking Project, <http://www.named-data.net/>. See also NSF Award # 1040868, <http://www.nsf.gov/awardsearch/showAward.do?AwardNumber=1040868>

<sup>21</sup> See <http://www.i2e.org/industry/2004-tbfp/>

<sup>22</sup> See [Wanna be a mobile player? Get ready to spend on IP](#). "Think outside of the United States Patent and Trademark Office. It'll be expensive and time-consuming to protect IP by obtaining patent protection across the globe, but it's probably necessary. Already ... Apple and Samsung are battling in the courts of various countries, and patent filings are piling up in China as companies look to ensure they're able to maximize their IP investment in what should be a hotbed of industry growth."

<sup>23</sup> See [http://bioen.okstate.edu/faculty/stone\\_index.htm](http://bioen.okstate.edu/faculty/stone_index.htm)

<sup>24</sup> Reviewers' comments in "Package for Proposal 2011-04848 Submitted to USDA\NIFA". Program: National Integrated Food Safety Initiative, Project Director: Michael Buser, Proposal Title: Advancement of a whole chain, stakeholder driven traceability system for agricultural commodities: beef cattle pilot demonstration.

<sup>25</sup> The USDA is calling for the unique identification of livestock in interstate commerce. USDA APHIS Proposed Rule, Docket No. APHIS-2009-0091, Traceability for Livestock Moving Interstate 76 FR 50082, 11 Aug 2011 - <http://www.mdfarmbureau.com/GRB/USDA%20livestock-animal%20ID%20proposal%20GRB%207.pdf>. Extension of comment period - <http://edocket.access.gpo.gov/2011/pdf/2011-25656.pdf>

<sup>26</sup> An application programming interface (API) is an interface implemented by a software program that enables it to interact with other software. It facilitates interaction between different software programs similar to the way the user interface facilitates interaction between humans and computers. <http://en.wikipedia.org/wiki/Api>