

WHY MINNESOTA?

Creativity • Expertise • Momentum



Internet of Things: Why is Minnesota a Leader?

- ✓ Creative idea incubator and patent powerhouse
- ✓ Fast-growing, networked IoT community
- ✓ Tech-savvy workforce with multigenerational expertise
- ✓ Highly developed sectors in:
 - Sensors and automated controls
 - Systems engineering
 - Medical devices and digital health
 - Data centers
 - Advanced manufacturing
 - Logistics
 - Water technology



Why Minnesota?



WHAT IS THE INTERNET OF THINGS?

The Internet of Things (IoT) combines the data gathering capacity of sensors and smart devices with the power of cloud computing and data analytics. This data communication drives understanding and interactions between people and products in specific environments.

IoT is revolutionizing processes and changing products used throughout the business world and in everyday life – creating new opportunities across industries and consumer sectors.

Smart homes. Smart cities. Smart power grids. Smart retail. Smart supply chain. Smart farming. Connected cars. Connected health. Wearables. These are some of the more common IoT applications. A few examples:

- **Processes** – Businesses, industries and government entities are using IoT to improve efficiency and save resources. On a farm, moisture sensors in a field can provide data that – through cloud computing and data analytics – is combined with weather forecasts to enable more targeted and effective watering of crops.
- **Products** – Homes and vehicles are seeing a large growth in IoT applications, often to provide increased safety, security or convenience. For example, applications allow homeowners to use their cellphone to lock the doors of their house – and enable trucking companies to predict tire failure on long-haul trucks to prevent downtime and schedule proactive maintenance.
- **People** – Individuals today can wear IoT technology – or have it implanted in their bodies. A patient may have an implanted heart monitor that sends heart function data to the patient’s physician.





INNOVATION IS IN OUR DNA

Minnesota is uniquely suited to be a leader in Internet of Things technology and applications. The state has a long tradition of innovation and creativity – and has been home to companies that have changed the way the world lives.

Minnesotans have always been inventing and spearheading new technologies. Wearable pacemakers (Medtronic), “black box” flight recorders (University of Minnesota and General Mills) and furnace thermostats (Honeywell) are among the many products that have been developed and commercialized here.

A Patent Powerhouse

Proof of the state’s innovative culture is reflected in Minnesota’s patent results:

- 1st in the number of medical device patents per capita
- 1st worldwide in the number of patents – 2,048 – in medical device light, thermal and electrical applications (class 607) between 2011 and 2015
- 8th nationwide in electrical computers, digital processing systems and related patents (based on a grouping of more than 20 technology classes) between 1996 and 2015
- Top 10 nationwide in patents in various other IoT-related industries including software development; database and file management; semiconductors; and navigational, measuring, electromedical and control instruments

Patent information source: U.S. Patent and Trademark Office, most recent available data as of April 2019

These results not only illustrate Minnesota’s creative and enterprising culture – but also reflect the expertise that exists here when it comes to navigating the patent process.

An Early Computing, Tech Center and Smart Device Leader

Historically and culturally, Minnesota has been, and continues to be, an electronics and computing leader. It began in the 1950s and ‘60s when that era’s computer giants – companies such as Engineering Research Associates and Control Data Corporation – got their start in Minnesota.

Minnesota is a leader in device technology. The region became known as Medical Alley for its pioneering role in medical device technology. It also has been a leader in industrial data collection and control with firms such as Honeywell, Rosemount and Eaton.

Today, Minnesota has over 450 software companies. Technology firms operate statewide in a wide variety of industries.

Minnesota frequently ranks in the top 10 in innovation and technology:

- 5th in Technology and Innovation (*CNBC, 2018*)
- 8th in Technology and Sciences (*Milken Institute 2018 State Technology and Science Index*)





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FAST-GROWING, NETWORKED IoT COMMUNITY

Data analytics is key to the success of IoT, and Minnesota has an active analytics cluster. MinneAnalytics, a non-profit that serves Minnesota's data science and analytics community, is the nation's largest community-driven data analytics group.

It's easy to find help and connect with resources in Minnesota's supportive environment. Tech entrepreneurs can get feedback on their innovations through competitions such as MN Cup – the largest statewide innovation competition in the country – and the Tekne Awards. There are dozens of conferences, innovation accelerators, meetups, hackathons and startup support groups that welcome newcomers and offer opportunities for networking.

Minnesota's IoT community is connected and growing quickly. For instance, IoTFuse, a non-profit based in Minneapolis, organizes regular meetups, hackathons and an annual conference. Its Meetup.com group reaches about 2,000 members and meets monthly to talk about a wide range of IoT topics. The annual IoTFuse Conference attracts over 1,500 attendees, over 400 organizations and over 25 speakers. An offshoot conference, MedFuse, debuted in 2018 with a focus on IoT opportunities in medical care.

Learning opportunities are also abundant through the University of Minnesota, University of St. Thomas and other academic institutions, as well as through professional associations such as the Minnesota High Tech Association.

Support from Private and Public Sectors

Resources also spark momentum. Local entrepreneur associations, angel investor groups and accelerators are devoted to helping innovators bring their ideas to fruition. Large corporations are partnering with innovative startups. Out-of-state and foreign direct investment also plays an important role.

Minnesota received \$642 million in venture capital investments in 2018, ranking 2nd in the Midwest and 15th nationwide, according to the PwC/CB Insights MoneyTree™ Report.

Financial services received the largest share of venture capital investments in Minnesota (42%), followed by health care (32%) and internet (16%).



The state of Minnesota offers a Research and Development Tax Credit and other incentives and assistance to help entrepreneurs and startups. (See Resources on page 8).

Bottom line: Minnesota has a robust tech community with the momentum, enthusiasm and resources to be a leader in IoT now and into the future.



TECH-SAVVY WORKFORCE AND GREAT QUALITY OF LIFE

Minnesota has a skilled, tech-savvy workforce, enabling employers to find the talent they need to thrive. Of note is the multigenerational nature of our technology talent. Each generation is committed to passing along its knowledge and helping the next generation succeed.

This is a culture that nurtures talent from a young age and helps high school and college students develop their tech skills. Our high schools have strong pre-engineering and software development programs – and routinely win national awards in robotics development and other technology competitions.

Minnesota ranks 6th in advanced degrees in science and engineering as a percent of all degrees conferred in science and engineering. (*National Science Foundation, Science and Engineering Indicators 2018*).

This talent pipeline translates into skilled workers. More than 130,000 people are employed in occupations related to IoT, including computer and information technology and telecommunications, according to Emsi (2018).

Minnesota ranks 5th nationwide in employment in computers and electronic products manufacturing – and 1st in the concentration of medical device manufacturing employment.



What's more, the state ranks:

- 7th in Technology and Science Workforce (*Milken Institute 2018 State Technology and Science Index*)
- 10th nationwide in individuals in science and engineering occupations as a percentage of all occupations (*National Science Foundation, Science and Engineering Indicators 2018*).

This translates into strength in many IoT-related sectors – including sensors and automated controls; systems engineering; medical devices and digital health; data centers; advanced manufacturing; logistics and water technology.

Stellar Quality of Life

Some of the state's technology talent is homegrown, but many people move here from other places – attracted by the quality of life Minnesotans enjoy. Salaries are lower than on the East and West Coasts – but so is the cost of living. Once people come here, they tend to stay.

Minnesota – and many of its cities – are at the top of numerous quality of life rankings (see more at CompareMN.com):

- Best State for Women (*WalletHub, 2019*)
- 2nd in Quality of Life (*U.S. News & World Report, 2018*)
- 3rd in Quality of Life (*CNBC and Forbes, 2018*)



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MINNESOTA COMPANIES EMBRACE IoT

Large and small companies across Minnesota are embracing a broad range of IoT solutions for use in a wide variety of industries. Here are thumbnails of a few established and emerging firms, all with headquarters or significant operations here.

Medtronic – was founded in 1949 as a medical equipment repair shop. Today, Goldman Sachs calls it “notable among Internet of Things.” The company offers remote digital monitoring for conditions such as heart failure, asthma, diabetes and hypertension. With its operational headquarters in Minnesota, Medtronic employs about 10,000 people in the state.

Rosemount Inc. – founded in 1956, Rosemount began with a focus on the rapidly growing aerospace industry, fueled by the expansion of the U.S. space program. Today, it makes instruments to measure pressure, temperature, level and flow in industrial-fluid systems, sending information to the control rooms of oil refineries, power plants, waste treatment sites and food facilities.

3M – started in 1902 as a small-scale mining venture. Today, this diverse giant has sales of nearly \$33 billion worldwide. One third of 3M’s sales come from products that were invented within the past five years. A Fortune 500 headquartered in Minnesota, 3M manufactures IoT products with applications in hardware and services.

Honeywell – *Business Insider* has called Honeywell one of the “Top IoT companies to watch.” An early entrant in the IoT revolution, the company employs over 2,600 people here. It has long been a leader in sensors and controls for industrial, commercial and residential applications. One of its recent spinoff companies, Resideo Technologies, also employs about 700 people in Minnesota.

75F – has developed an HVAC system that uses sensors placed throughout commercial buildings to help create a customized and more efficient air environment. The sensors feed data to a smart control device. Cloud-powered predictive algorithms combine sensor data with weather forecasts to proactively regulate airflow using computer-controlled dampers.

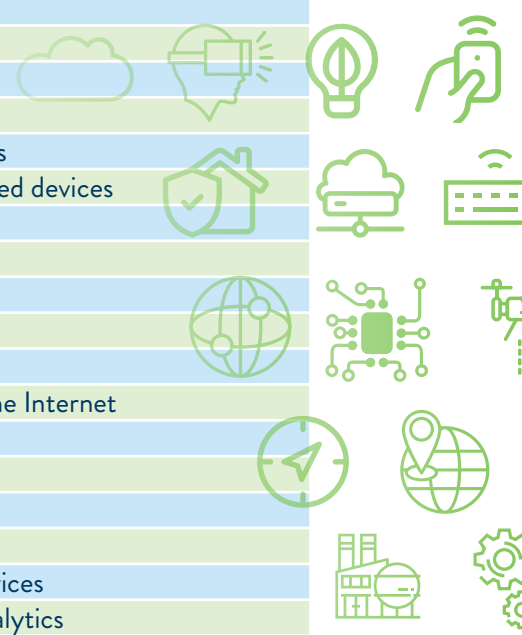
IrriGreen™ – manufactures advanced landscape irrigation systems that conserve water. The company uses digital technology to water to the exact landscape shape, saving up to 50 percent of the water required by conventional technology.

ZTR Control Systems – has developed SmartStart® systems which Georgia Port Authority is using to reduce carbon emissions on locomotives. Their retrofit application on 11 locomotives reduces emissions by up to 18 tons a year. Fuel savings were estimated at over 50,000 gallons a year.

A SAMPLING OF MINNESOTA COMPANIES WITH IoT PRODUCTS AND SERVICES

Companies in Minnesota are developing and applying a broad range of IoT products and services in areas that include aerospace; agriculture; art and design; cloud; computers and electronic devices; health care; human resources; product strategy; remote monitoring; security; smart buildings; and smart homes and vehicles. Here are just a few examples:

Company	Examples of IoT Products and Services*
3M	Web processing tapes, application software, sensors
75F	Sensors, temperature control systems for businesses
Abbott	Remote patient monitoring systems
Accredent	Connected data-driven product strategy and digital transformation
Anser Innovation	Internet-based software and hardware using IoT technologies
Atmosphere IoT Corp.	An IoT development platform and range of services
Banner Engineering	Vision sensors, wireless sensor networks
Boston Scientific Corp.	Remote patient monitoring systems
Ceridian Corp.	Human capital management software/cloud HCM platform
Coherent Solutions	Custom software development; design for cloud systems
Digi International	IoT connectivity products
Digi-Key Electronics	Electronic components distribution and development platform
Eaton	Smart meters and smart grid
Exosite	Cloud-based IoT software platform
Fluid Labs Inc.	Learning water meter
Geissler Corporation	Technology for animal health industry
Grove Streams LLC	Cloud-based services
Harmony Enterprises Inc.	Smart waste management
Honeywell	Sensors, switches, controls, monitors
IBM	Computers, software development
Insight Enterprises	Data center services and solutions
IrriGreen LLC	Advanced landscape irrigation systems
Itron	Smart grid solutions
KnectIQ Inc.	Data protection, secure access and authentication to IoT devices
Lockheed Martin Corp.	Sensors, radars for military applications
Logic PD Inc.	Design and development of embedded and connected devices
Medtronic	Remote patient monitoring systems
MTS Systems Corp.	Testing and sensing solutions
MultiTech	Data communications equipment
New Boundary Technologies	IoT application suites
NimbeLink	Cellular-based IoT solutions, embedded modems
Punch Through Design	Engineering consultancy specializing in connected devices
Qumu Corp.	Platform for businesses to share video
Reemo	Remote mobile health platform for seniors
Rosemount Inc.	Measurement and analytical technology
Seagate	Data storage solutions
SkyWater Technology Foundry	Semiconductor-based solutions
SmartThings	Technology that connects household items to the Internet
SPS Commerce	Cloud-based solutions for suppliers, wholesalers
Table Trac Inc.	Casino management systems
Tennant	Self-driving floor care machines
Uponor	Heating and cooling, plumbing systems
Zivix	Portable digital guitar-connecting to mobile devices
ZTR Control Systems	Operational efficiencies, fleet management, analytics



*Companies may have multiple products and services, with not all of them listed here.

Sources: Hoovers; ReferenceUSA; company websites



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A VAST ARRAY OF RESOURCES

For a list and links to dozens of innovation resources – including state programs, academic programs, association and trade groups, angel investor groups and funds, networking and mentoring groups, support services, space providers, classes, competitions and events – visit mn.gov/deed/innovatemn-resources.

Minnesota has a broad range of academic institutions and organizations with expertise in IoT and IoT-related fields. Among them are:

University of Minnesota – which offers educational and partnership opportunities for IoT innovators and businesses, including through its Technological Leadership Institute and its Office for Technology Commercialization. The University's Carlson School of Management runs the MN Cup – the largest statewide startup competition in the country.

MinneAnalytics – is a large non-profit supporting Minnesota's IoT analytics community through industry-specific conferences, national and local university data analysis competitions, and other events.

Minnesota High Tech Association (MHTA) – is a non-profit association of more than 350 high tech companies and organizations with a vision of making Minnesota one of the country's top five technology states.

IoTFuse – is a non-profit that connects Minnesota's IoT technical community – including makers and innovators. It organizes monthly meetups, hackathons and annual conferences (IoTFuse.com).

A GREAT CLIMATE FOR BUSINESS

For established companies and startups alike, Minnesota is a top spot for business. We have what it takes to grow large companies: Minnesota has 19 Fortune 500 companies, and ranks third nationwide for Fortune 500 companies per one million people. The state is also home to six of the largest private companies in the country, ranking 13th nationwide in 2018, according to Forbes.

It's not Minnesotan to brag, but Minnesota has 50+ national top 10 rankings across categories that include business climate, innovation, education, workforce, infrastructure and quality of life.

Minnesota has ranked among the top 10 states for business 10 times (CNBC, 2007-2018), including first and third (2015, 2017). Minnesota also ranks 3rd in 5-Year Business Survival Rate (*Bureau of Labor Statistics, 2013-2018*). Minneapolis-St. Paul International is ranked the best airport of its size in North America and the most on-time airport of its size worldwide.

STATEWIDE BUSINESS EXPERTISE

Minnesota DEED is the state's principal economic development agency. Our experts can assist with any IoT business plans you might have.



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