BHADALE GROUP OF COMPANIES
- IT AND REAL ESTATE

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Quantum Systems Engineering Services Catalogue

Bhadale IT Pvt. Ltd. (https://www.bhadaleit.com/)

Bhadale Group of Companies

Bhadale Group of Companies consists of:

1. **Bhadale IT Pvt. Ltd** is an IT and Computer Engineering subsidiary company

   This division provides consultation in areas of cutting edge technologies, research outsourcing, and software consultation related to data center and related engineering practices

2. **Bhadale Engineering Pvt. Ltd** is a multi-engineering subsidiary company

Various divisions under this group provide design, & development of various IT and Engineering programs.

Bhadale Group has aggressive programs in place to serve the niche market. Below is related to cloud ecosystems

Bhadale Group IT Division, Quantum Services department

Below are few of our service offerings:

1. Quantum systems engineering adoption ecosystems planning
2. Business Use case based quantum systems engineering design
3. Open and proprietary quantum and classical ecosystems & integration
4. Partner ecosystems based solutions
5. Quantum cloud ecosystems implementation
6. Industrial domain specific quantum services
7. Project specific services
8. Custom ecosystems services

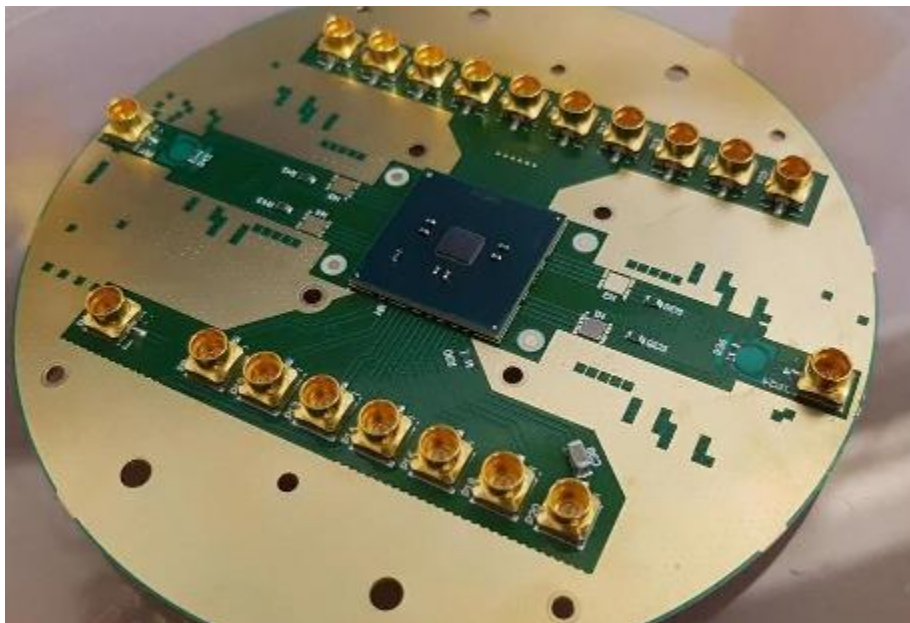Details of the above are put in the table below

Service details

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We have a large set of subcategories; few are mentioned below with details tabulated

Service No	Service Name	Key Service features
1	Quantum systems engineering adoption ecosystems planning	We offer a wide range of quantum ecosystems based services for the convenience of our clients based on their business needs, and startup mission : • Classical IT systems assets (domestic, hyper scalar, supercomputers) based custom quantum hybrid ecosystems • Quantum Industrial taxonomy based ecosystems like Industry 4.0, Quantum storage, memory , interconnects, & firmware • Ecosystems covering multi-engineering disciplines like cryoelectronics, subzero Kelvin scale refrigeration units, power supply, & harness • Systems Ecosystems like IaaS, IaaC, system assets virtualization • Popular market platforms like Intel, Dell, IBM, GCP, & Red Hat Few of the software engineering services: • Horseshoe Modernization Model [1] [2] • Quantum reengineering process [2] • INCOSE Systems Engineering based frameworks, processes and elements • System level engineering services for various devices of various forms, factors, sizes, shapes, quality need • Quantum systems design for medical gadgets, digital meters, industrial robots, electro-mechanical systems, MEMS, nano-electronics, manufacturing equipments, Industry 4.0 systems, Telecom devices, mobiles, newer modes of transportations, space travel systems, underwater systems, military aids, systems for various types of personal, home, use etc

		• Lab Setup and configuration for photonic , other quantum material based test rigs • Calibration, metrology and systems design for various experimental use cases Based on our vast experience and expertise in serving the engineering and IT industry, we offer accelerated speedup in adapting to the ecosystem and use IEEE, NIST, ISO standards. We leverage on our tie-ups and partnerships with various institutes, universities and network
2	Business Use case based quantum systems design	Client business specific system design, with a general focus on domain and special focus on client enterprise needs. Few of our services: • Requirements analysis to draft the systems landscape with various types of elements, subsystems across various enterprise divisions • Business models design based on use cases as a platform independent model and systems engineering • Technology based platform specific models for target quantum servers, computing backend simulators and other ecosystems • A business ecosystem modeling based on industry frameworks and existing business priorities • Systems platform design based on the needs of the interrelated systems, System of Systems (SoS) and Cyber Physical Systems • Business use case modeling using Model Based Systems Engineering (MBSE), and SysML • Design of various quantum computer assets, equipments, inventory and the related processes that help in the scoping and development of the architecture, engineering design, inventory, purchase decisions, program and project planning • System business design using SysML, and Hybrid systems using classical and quantum assets for various industries and DSL. • Ready to use quantum business solutions for more than 50 industries that will be personalization to your ecosystems and business needs
3	Open and proprietary quantum and classical hybrid ecosystems planning & integration	We offer planning for open source tools, products, frameworks, and integration services for existing and new ecosystems. Few of our services are: • *Quantum Internet alliance* based integration for end nodes (trapped ion qubits, diamond NV qubits, neutral atom qubits) and quantum repeaters (rare-earth-based memories, atomic gases, quantum dots) and integration of both subsystems • Quantum Cloud systems / server development using various industrial taxonomies Classical platforms integration leading to quantum ecosystems • Open Stack, Open Nebulla, Linux, Java based systems ecosystems • Open Networking, Open Virtualization , Open Orchestrator etc • Full systems stack integration, interoperability across various system layers, quantum interfaces, protocols, quantum chips, control and data planes etc

4	Partner Ecosystems based quantum solutions	We offer partner ecosystems based solutions. Few are mentioned below: • Google • IBM • Intel • Dell • D-Wave Google industrial solutions based offerings for various domains for platform hosting, infra outsourcing, memory allocations (LUN, VM Slices, spinning of virtual environment based on minimum core kernel runtimes). IBM Circuit solutions for various stages of the server functions like hardware level qubit controls, QASM assembly level programming, low level interfaces to kernel, subroutines Intel quantum computing chips , control circuits, interconnects, hardware for various qubits like superconducting qubits, quantum dots, silicon chips (CMOS, MOSFET , FPGA) , Cryoelectronics, Horse Ridge II [3] cryogenic quantum control chip We offer extended services for full stack integration, quantum memory based operations, & cryogenic based operations
5	Quantum cloud planning and implementation	We offer services from various partners systems offerings. Few of our services: • Cross-partner ecosystems systems design, and development • Offering our unique expertise in quantum data center engineering • Migration of classical systems design, overlay tiers to multi-partner ecosystem • Offering a centralized or decentralized governance systems • Cross cloud security systems • Multi cloud managed systems framework design using Infra-as-a Code, Infra-as-a Service concept • Custom systems ecosystem design based on project needs • Planning for various quantum and classical shared services, resource pooling and management of inventory from a central console • Engineering principles of various disciplines are optimized using Co-Design for proper and graded performance
6	Industrial domain specific quantum services	We offer unique tailored ecosystems for 50+ domains based on the leading partner solutions. One sample domain offerings : • Quantum military systems for improvised missile systems, ambient sensors, precise clocking and real time quantum computing (able to solve years of supercomputer's effort) • Quantum military systems for improvised anti-missile systems using a sleuth photon fabric with detectors able to detect many airborne, water based and

		land missile dispatches from various earth's/ sea layers • Quantum foreign object ecosystem shield for better protection and safeguard of protected and other assets offering 100+ more safety points than classical protection • Quantum biosphere and ecology protection system for safety of the earth resources from hostile attacks like missiles, air, water or land based bio-chemical warfare deliveries includes real time signature matching of various viruses, flies, birds, or vector based attacks • Quantum aided military supplies for various types of operational and capability needs to handle, counter or defeat the enemy cause
7	Project specific services	We offer services based on popular projects like migration, quantum systems frameworks, quantum technology stacks. We cater to specific needs like systems configuration, security specific to Big data, Data science, AI/ML, Micro services, real time streaming, mobile etc. Few of our system services are: • Quantum Project Systems Requirements analysis • Identifying project specific quantum system ecosystems • Designing the development tools, apps, services related to systems • Integrating and testing the systems into the program environments • Offer value added systems services to improve performance
8	Custom ecosystems services	As per client needs based on our offers, mixture of these along with client specified systems We are flexible to offer our consultants on a project or a time basis, as an internal or external hire based on your business needs. We place our consultant based on your specified merit and work needs. We have a team of licensed engineers and developers who can be of help in your project and quantum solutions

References:

1: https://insights.sei.cmu.edu/blog/information-technology-systems-modernization/

2: http://ceur-ws.org/Vol-2705/short4.pdf

3: https://www.intel.com/content/www/us/en/newsroom/news/2nd-gen-horse-ridge-cryogenic-quantum-control-chip.html

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