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Course Title: ROBUST COMMUNICATIONS SOFTWARE

Overview:

Carrier-grade software is required in products that implement communication networks, such as routers, switches, servers, gateways, and mobile handsets. Firms that operate communications networks are known as *carriers*. A *carrier-grade* product is one that satisfies a carrier's strict quality requirements, which typically include

- Availability: <5 minutes downtime per year (five nines, or 99.999%)
- Reliability: <1 failure per 10,000 sessions (four nines, or 99.99%)
- Scalability: >100,000 users per system (site), and millions of users per network
- Capacity: efficient software that reduces CPU and memory costs

Although many products claim to be carrier grade, the fine print often reveals that this only refers to their hardware. But in today's complex communications products, *software* is usually the cause of outages and improper behavior. This course covers a broad range of carrier-grade software techniques that have been proven in flagship products and that significantly improve a product's chances of satisfying the most extreme requirements.

Objectives:

- Participants learn about the forces that affect the design of carrier-grade software.
- Participants gain an appreciation of why many software techniques that are common practice in the general computing industry are inappropriate in carrier-grade products.
- Participants acquire knowledge of numerous software techniques that are critical in carrier-grade products but which are seldom used in the general computing industry.
- Participants gain an understanding of the rationale that underlies each software technique so that they can determine if its usage is appropriate in a specific setting.
- Participants learn about software tools that improve designer productivity and that help to manage the capacity of carrier-grade software.

Audience:

- Software engineers who are designing, implementing, and debugging products that face carrier-grade requirements.
- CTOs, directors, and managers of products that must provide carrier-grade quality.
- Customers who need to perform due diligence on carrier-grade products.

*Duration***:** approximately 7 to 8 hours

*Number of Participants***:** 10 to 30

*Format***:** lecture, with ongoing questions and answers

Outline:

- Requirements and Characteristics of Carrier-Grade Software Systems
- Using Object Orientation Effectively
- Operating System Techniques: Scheduling, Threads, Processes, Memory Protection
- Distributing Work
- Recovery Techniques: Exceptions and Signals, Audits, Escalating Restarts
- Efficient and Robust Messaging
- Overload Controls
- Failover
- In-Service Software Upgrades
- Software Optionality
- Field-Safe Debug Tools

Prerequisites:

Before attending the course, participants are encouraged to read the first two chapters of *Robust Communications Software: Extreme Availability, Reliability and Scalability for Carrier-Grade Systems*, which are available at www.pentennea.com/book.html.

Materials for Participants:

- Handout containing all lecture slides
- Recommended (to be supplied by participants' organization): *Robust Communications Software: Extreme Availability, Reliability and Scalability for Carrier-Grade Systems.* Author: Greg Utas. Publisher: Wiley, 2005.

About the Instructor:

GREG UTAS obtained an Honours BSc in Computer Science from the University of Western Ontario (Canada). In 1981 he joined Nortel Networks, where he served as the principal software architect for various switching products. As Chief Software Architect of GSM Core Networks, he led a team of 50 designers who redesigned the product's call processing software using object-oriented techniques. For this work, he received the Nortel Technology Award for Innovation and became the first software architect at Nortel's Director level. In March 2002, Greg joined Sonim Technologies as Chief Software Architect, responsible for the design of push-to-talk services for wireless networks. He left Sonim in May 2004 to become a consultant specializing in carrier-grade software.

Greg is the author of the recently published *Robust Communications Software*. He has presented papers at the International Switching Symposium, the International Workshop on Feature Interactions in Telecommunications and Software Systems, and at ChiliPLoP, a patterns conference. He has also written a patterns paper for *IEEE Communications* and contributed a chapter to the book *Design Patterns in Communication Systems*.