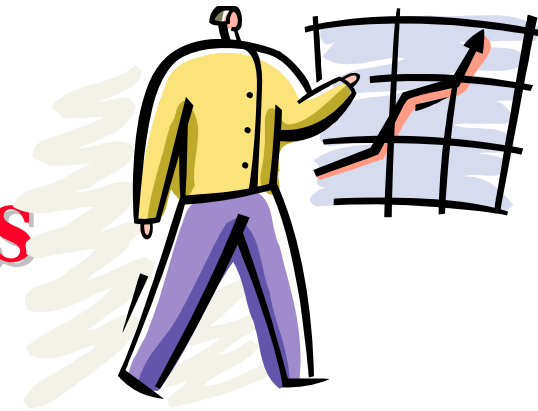


Application Key Performance Indicators for Mobile WiMAX



Raj Jain

Washington University in Saint Louis

jain@cse.wustl.edu

Presentation to WiMAX Forum Application Working Group
Meeting, Orlando, FL, February 4-9, 2009

These slides are also available at:

<http://www.cse.wustl.edu/~jain/wimax/kpi.htm>



- ❑ What is a Key Performance Indicator
- ❑ KPIs for Telecom Applications
- ❑ Steps in KPI Study

What is a Key Performance Indicator

- ❑ Gives a good indication of performance
- ❑ Commonly used in business
- ❑ Metrics to define and measure business goals
- ❑ Examples:
 - GNP (Gross National Product)
 - ARPU (Average Revenue Per User)
 - Dow Jones Index

KPIs for Telecom Applications

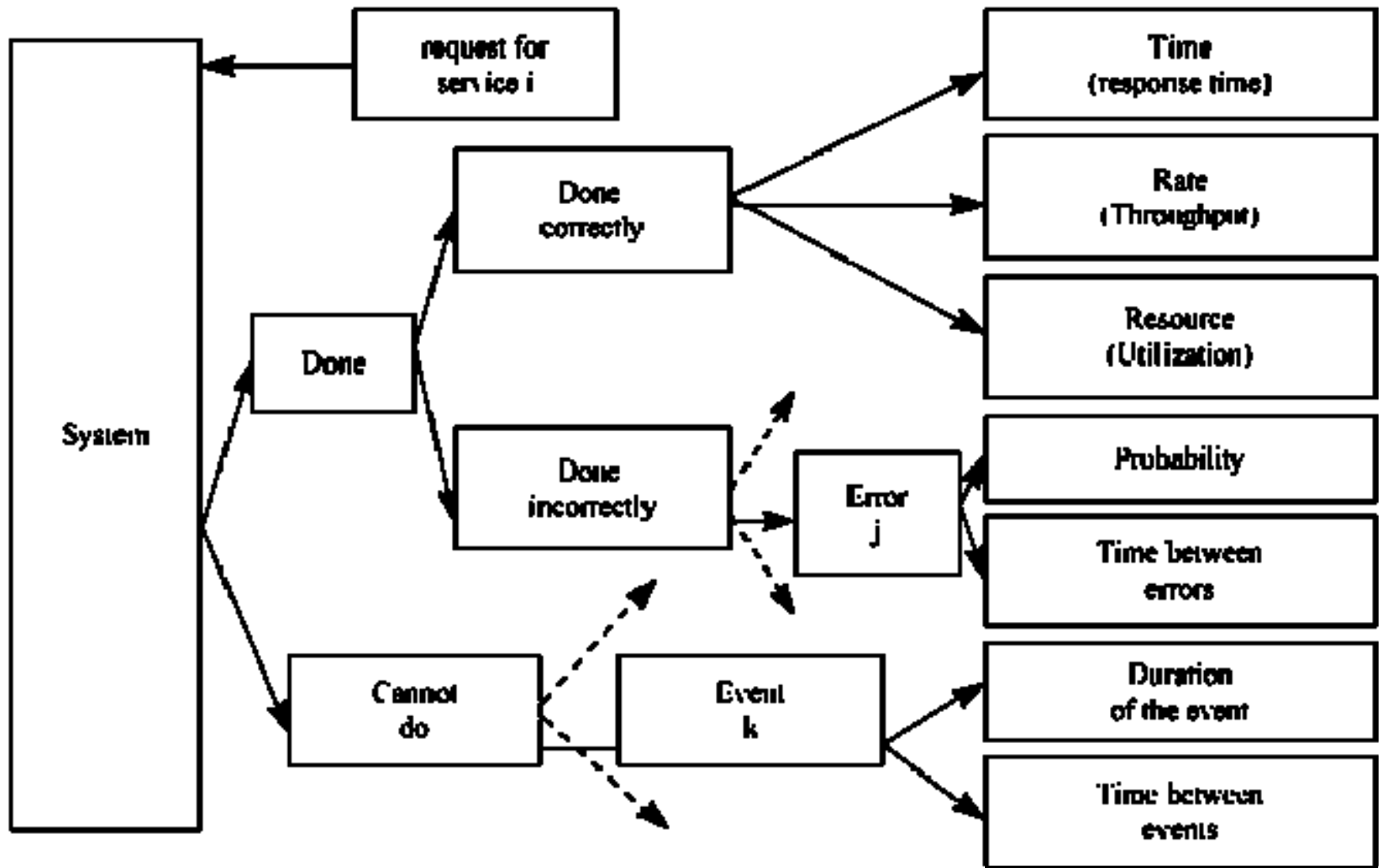
- ❑ Connection Establishment Success Rate
- ❑ Connection Drop Rate
- ❑ Handover Success Rate
- ❑ Throughput
- ❑ Block Error Rate

Ref: UTRAN and GERAN KPI (3GPP TR32.814, March 2007)

3GPP KPIs Categories

- ❑ Retainability: Call drop rate
- ❑ Availability: Cell unavailability
- ❑ Integrity: Block error rate

KPIs – Complete Set



Selecting KPIs

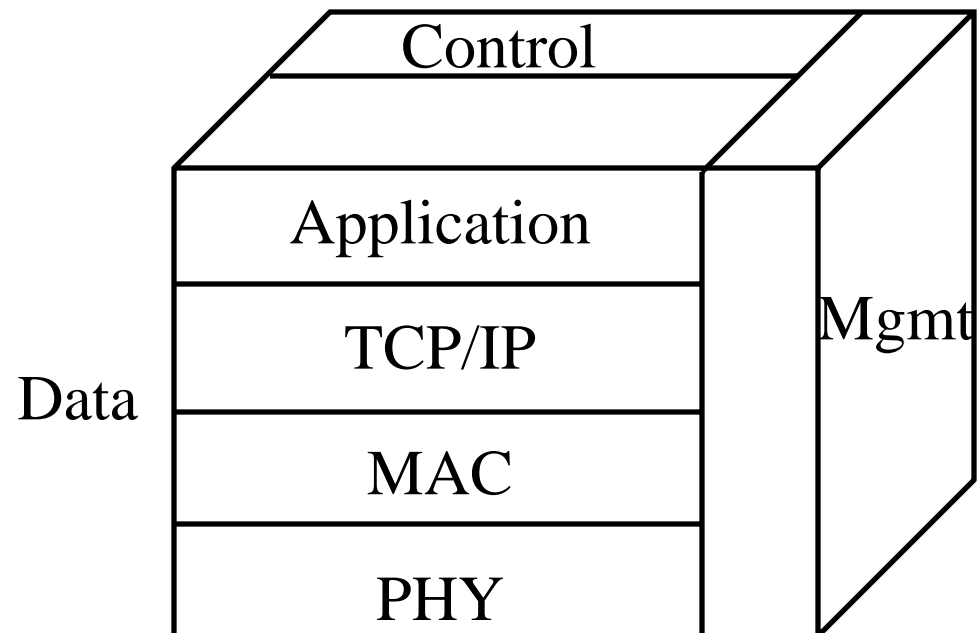
- ❑ Include:
 - Performance Time, Rate, Resource
 - Integrity: Error rate, probability
 - Availability: Time to failure and duration
- ❑ Consider including:
 - Mean and variance
 - Individual and Global
- ❑ Selection Criteria:
 - Low-variability
 - Non-redundancy
 - Completeness

Steps in KPI Study

- ❑ Key Applications
- ❑ For each application:
 - User perceived performance
 - Relationship to measurable quantities
 - Precise definition and formula for computation

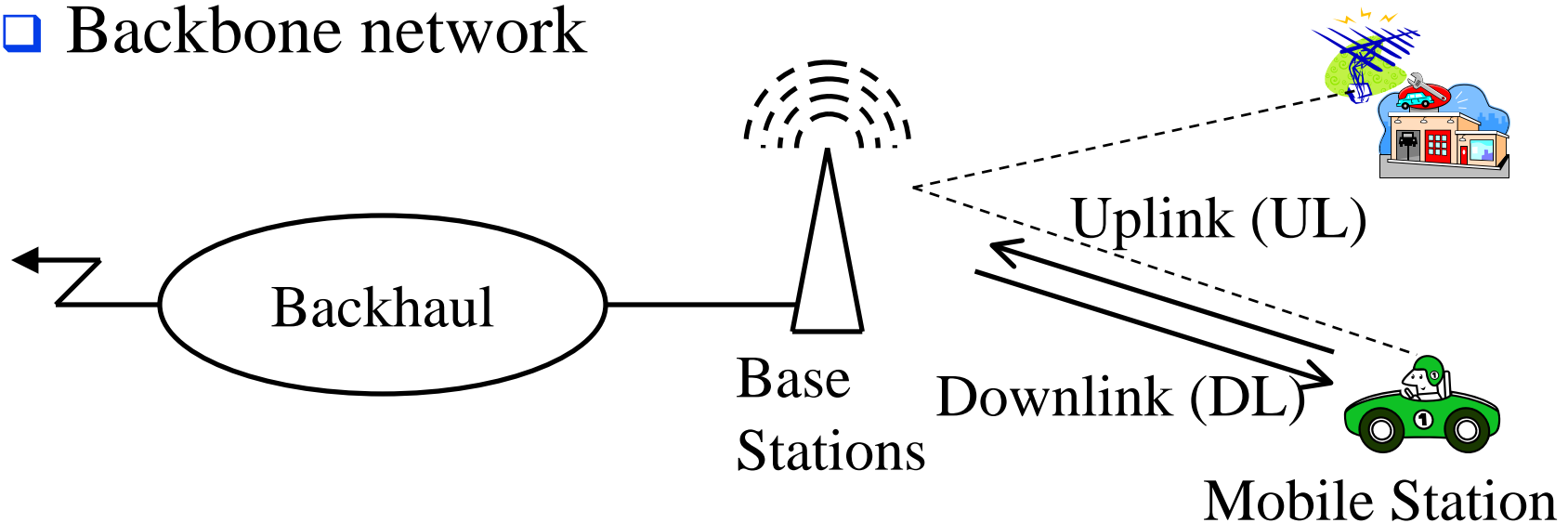
KPIs in 3 Planes

- ❑ Data Plane: User throughput
- ❑ Control Plane: Scheduling overhead
- ❑ Management Plane: Faults

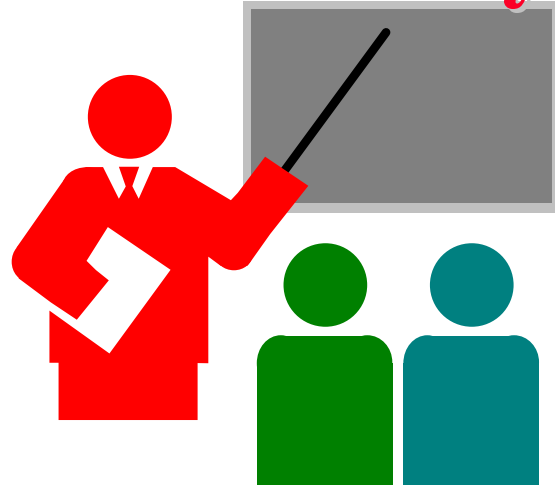


KPIs for All Parts of Networks

- ❑ Mobile/stationary Subscriber
- ❑ Base Stations
- ❑ Base Station to Mobile Subscriber Link
- ❑ Cell
- ❑ Backbone network



Summary



- ❑ Application KPIs can be used by service providers to set their business goals
- ❑ User level KPIs can also be used by major customers to compare services
- ❑ Need to define KPIs that include key systems and subsystems and include operations and data transfer

References

- ❑ R. Kreher, “UMTS Performance Measurement: A Practical Guide to KPIs for the UTRAN Environment,” Wiley, 2006, ISBN:0470032499.
- ❑ 3GPP, “Technical Specification group Services and System Aspects; Telecommunication management; UTRAN and GERAN Key Performance Indicators (KPI) (Release 7),” TR 32.814, V7.0.0, March 2007.

Acronyms

- ❑ EDGE Enhanced Data Rates for GSM Evolution
- ❑ GERAN GSM EDGE Radio Access Network
- ❑ GSM Global System for Mobile Communication
- ❑ KPI Key Performance Indicator
- ❑ KQI Key Quality Indicator
- ❑ RAT Radio Access Technology
- ❑ UMTS Universal Mobile Telecommunications System
- ❑ UTRAN UMTS Radio Access Network