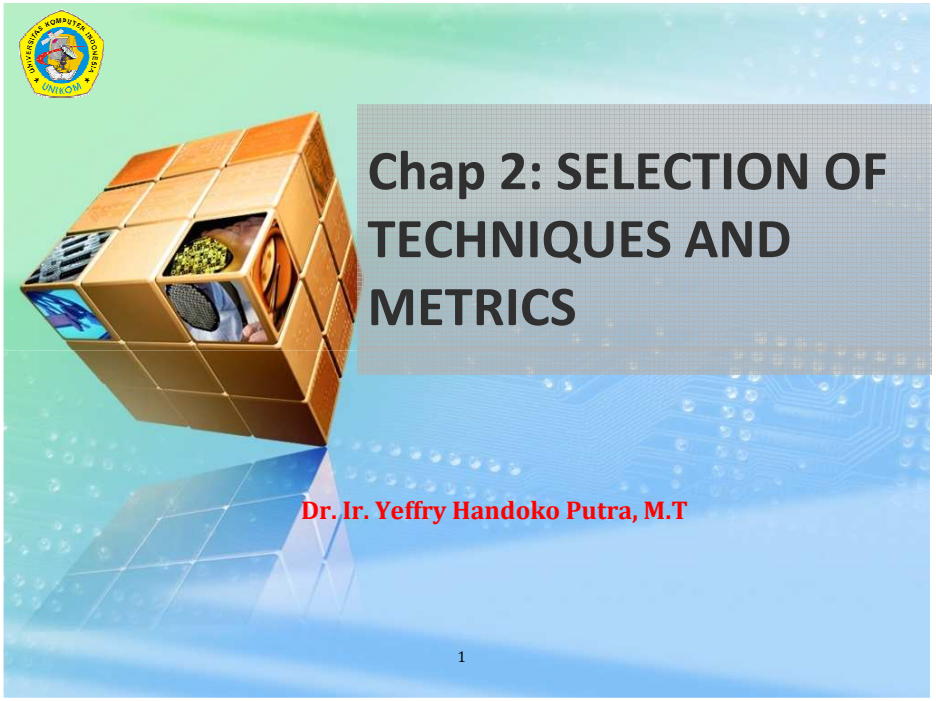


Chap 2: SELECTION OF TECHNIQUES AND METRICS

Dr. Ir. Yeffry Handoko Putra, M.T

Kriteria dan Spesifikasi

- Kriteria: Kinerja yang dibutuhkan (demand) atau yang dipersyaratkan (requirement)
- Spesifikasi: Kinerja yang ditawarkan atau yang terukur

Evaluasi : menghitung spesifikasi untuk disesuaikan dengan kriteria

Analisa : Mengkaji hasil evaluasi untuk tujuan Kualitas Kontrol, laporan, prediksi kinerja

Technique of Performance Evaluation

- analytical modeling
- Simulation
- measurement

TABLE 3.1 Criteria for Selecting an Evaluation Technique

Criterion	Analytical Modeling	Simulation	Measurement
1. Stage	Any	Any	Postprototype
2. Time required	Small	Medium	Varies
3. Tools	Analysts	Computer languages	Instrumentation
4. Accuracy*	Low	Moderate	Varies
5. Trade-off evaluation	Easy	Moderate	Difficult
6. Cost	Small	Medium	High
7. Saleability	Low	Medium	High

Teknik Evaluasi

- Evaluasi berkala → monitoring
- Evaluasi perbandingan (comparing) Menggunakan standar acuan, benchmark
- Evaluasi penilaian (scoring)

Evaluasi dan Analisis Sistem

- Berbandingan sistem
  - Terhadap benchmark (standar acuan)
  - Dengan sistem lain
  - Terhadap dirinya sendiri (history comparison)
- Sistem tunning dan optimasi kinerja
  Misal: tweak UI, Bandwidth previliedge
- Bottleneck identification
  Tahapan yang membatasi kinerja maksimum
- Karakteristik sistem / Metriks
- Perencanaan Kapasitas beban kerja (load-strength analysis)
  Beban berupa waktu penggunaan, jumlah pemakaian, jumlah distribusi, jumlah pengguna, pasokan

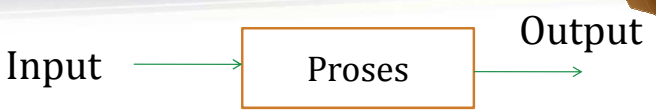
Contoh:

- Dua CD ROM ingin dievaluasi, tentukan metriksnya
  Jawab: kecepatan membaca, bising
- Database pada sistem tiket bioskop, maka metriksnya: kecepatan transaksi, adanya race condition antar client, kesibukan
- Algoritma retransmission packet, maka metriksnya: frame rate, error detection

Teknik analisa

- Penentuan kualitas berdasarkan data statistik
- Penentuan kualitas berdasarkan tabel / gambar
  - Pola unik
  - Pola tersering
  - Pola mirip
- Verifikasi dan validasi model

Analisis Sistem



Input:
Analisa statistik
- RMS, mean, varian
- Anova
- clustering
- datamining

Proses
Model Reliabilitas
Model Database (ERD, DFD)
Model flowchart
Petri net

Output
- Gambar 1D, 2D, 3D
  Misal lokasi hotspot
- Kurva
  tedency, titik min-max, titik balik

Verifikasi dan validasi

- Verifikasi:
  Perbandingan kebenaran hasil dari sebuah model (flowchart, ERD, Context Diagram, dll) dengan logika pemodelan, algoritma, aturan
  Hal yang diamati kesalahan urutan, kekurangan komponen, hasil yang tidak sama orde dan nilainya.

- Validasi → Tidak mudah percaya
  - Perbandingan kedekatan antara model dengan nilai realitas atau standar. Misal himpunan kejadian yang tidak mungkin, rentang yang melewati saturasi, nilai pengukuran yang ordenya terlalu kecil/besar
  - Kebenaran satuan
  - Kebenaran logika

Rule of Validation

- Do not trust the results of a simulation model until they have been validated by analytical modeling or measurements.
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- Do not trust the results of a measurement until they have been validated by simulation or analytical modeling.
- Especially rule 3 should be emphasized
- At least expert intuition
- Sometimes it is a good idea to use two techniques.

Selection of Metrics

Three possible outcomes of service requests

- done correctly - **speed metric:** Time (Responsiveness), Rate (Productivity), Resource (Utilization)
- done incorrectly - **reliability metric:** Probability, Time between errors
- refused to do - **availability metric:** Duration of event, Time between events:

- Common Metrics:

response time, reaction time, throughput
(MIPS, pps), capacity (bandwidth),
efficiency (%), utilization, reliability, availability
(MTTF), cost/performance ratio...

Workloads

- **test workload**
  - workload used in a performance
  - Evaluation
  - real or synthetic
- **real workload**
  - normal operations
  - often not suitable for test
  - not reproduceable
- **synthetic workload**
  - characteristic similar to real
  - Controlled
  - repeatedly applied
  - built in measurement capabilities
  - no sensitive data used

Workload

- Beban uji : rentangnya dari minimum hingga batas maksimum sistem dari semua sisi kriteria

- Beban normal/operasional:

  Beban yang digunakan secara riil

Contoh: pengujian kekuatan tekan baja dari 0,5x 10^8 -10^{12} Young sedangkan beban normalnya hanya 0,5 x 10^{11}-1,0x10^{11} Young

Contoh Pendekatan Sistematik pada Evaluasi

- Tentukan sasaran dan definisikan sistem

  Contoh
  Diberikan : dua CPU
  Sasaran : dampak waktu respon dari pengguna-pengguna interaktif
  Diingikan time sharing yang lebih baik

- Daftarkan servis dan outcome yang dicari
  Service: Paket transmisi jaringan
  Outcome: Paket hilang atau tertunda

  Definisikan yang layak diterima dan tidak, daftar servis dan outcome memudahkan menentukan metriks dan workload

- Pilih Metriks

  Kriteria perbandingan kinerja
  - Speed
  - Akurasi
  - Availability of Services (AoS)

- Daftarkan parameternya

  Parameter sistem:
  Karakteristik software/hardware yang secara umum tidak bervariasi karena instalasi

  Workload Parameter:
  Karakteristik yang diminta pengguna, biasanya bervariasi untuk setiap instalasi

  Buatlah daftar yang secermat mungkin

Contoh kasus Evaluasi dan pemilihan Metriks

comparing two different congestion control algorithms for computer networks.

- The problem of congestion occurs when the number of packets waiting at an intermediate system exceeds the system's buffering capacity and some of the packets have to be dropped
- When a network user sends a block of packets to another end station called **destination**, there are four possible outcomes:
  1. Some packets are delivered in order to the correct destination.
  2. Some packets are delivered out of order to the destination.
  3. Some packets are delivered more than once to the destination (duplicate packets).
  4. Some packets are dropped on the way (lost packets).

Contoh kasus (lanjutan)

- For packets delivered in order, straightforward application of the time-rate-resource metrics produces the following list:

Performance Metrix

1. Response time: the delay inside the network for individual packets.
2. Throughput: the number of packets per unit of time.
3. Processor time per packet on the source end system.
4. Processor time per packet on the destination end systems.
5. Processor time per packet on the intermediate systems.

UTILITY CLASSIFICATION OF PERFORMANCE METRIX

- Depending upon the utility function of a performance metric, it can be categorized into three classes:
  - *Higher is Better* or **HB**. System users and system managers prefer higher values of such metrics. System throughput is an example of an HB metric.
  - *Lower is Better* or **LB**. System users and system managers prefer smaller values of such metrics. Response time is an example of an LB metric.
  - *Nominal is Best* or **NB**. Both high and low values are undesirable. A particular value in the middle is considered the best. Utilization is an example of an NB characteristic. Very high utilization is considered bad by the users since their response times are high. Very low utilization is considered bad by system managers since the system resources are not being used. Some value in the range of 50 to 75% may be considered best by both users and system managers

SETTING PERFORMANCE REQUIREMENTS

- **SMART**.
  - **S**pecific
  - **M**easurable
  - **A**cceptable
  - **R**ealizable
  - **T**horough.